Why Don’t You Exercise? Development of the Amotivation Toward Exercise Scale Among Older Inactive Individuals

Symeon P. Vlachopoulos and Maria A. Gigoudi

This article reports on the development and initial validation of the Amotivation Toward Exercise Scale (ATES), which reflects a taxonomy of older adults’ reasons to refrain from exercise. Drawing on work by Pelletier, Dion, Tuson, and Green-Demers (1999) and Legault, Green-Demers, and Pelletier (2006), these dimensions were the outcome beliefs, capacity beliefs, effort beliefs, and value amotivation beliefs toward exercise. The results supported a 4-factor correlated model that fit the data better than either a unidimensional model or a 4-factor uncorrelated model or a hierarchical model with strong internal reliability for all the subscales. Evidence also emerged for the discriminant validity of the subscale scores. Furthermore, the predictive validity of the subscale scores was supported, and satisfactory measurement invariance was demonstrated across the calibration and validation samples, supporting the generalizability of the scale’s measurement properties.

Keywords: self-determination theory, exercise amotivation, physical activity, elderly

Regular exercise and physical activity have been recognized as factors that can delay chronic health problems and disease often associated with aging (American College of Sports Medicine, 1998; Hogan, 2005; Miller, Rejeski, Reboussin, Ten Have, & Ettinger, 2000) and offer opportunities for extending years of active independent life, reducing disability, and improving the quality of life among older adults (Atienza, 2001; Eakin, 2001; Linnan & Marcus, 2001; Netz, Wu, Becker, & Tenenbaum, 2005; U.S. Surgeon General’s Report, 1996). Less than 40% of adults 65–74 years old and less than 30% of adults 75 years and over engage in leisure-time physical activity (Schoenborn, Adams, Barnes, Vickerie & Schiller, 2004). In addition, 77% of adults 65–74 and 88% of adults 75 years and older do not participate at all in vigorous leisure-time physical activity in a typical week (Pleis & Lethbridge-Čejku, 2006), and no more than 10% and 5% of these age groups, respectively, participate one to five times per week (Pleis & Lethbridge-Čejku).
Thus, the need is clear for effective interventions to reverse the trend of physical inactivity among older adults (Hui & Rubenstein, 2006).

**Self-Determination Theory and Amotivation**

Self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2002) has been prominent in explaining the motivational dynamics of human behavior and thus the phenomenon of nonparticipation in exercise. Deci and Ryan have distinguished between different types of motivation based on different reasons or goals that give rise to a behavior. The main distinction has been between intrinsic motivation, extrinsic motivation, and amotivation. Intrinsic motivation refers to doing something because it is inherently interesting or enjoyable. Extrinsic motivation refers to doing something to attain a separable outcome. Amotivation refers to a lack of intentionality and thus the relative absence of motivation (Vallerand, 2001). Put differently, it is a state in which individuals do not perceive any contingency between their behavior and the subsequent outcomes of their behavior; they experience a lack of control and therefore are unable to perceive any motives for enacting a behavior (Deci & Ryan). In the realm of sport and physical activity, amotivation has been correlated with dropout among competitive swimmers (Pelletier, Fortier, Vallerand, & Briere, 2001) and handball players (Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002) and boredom, low involvement, and nonattendance in school physical education (Ntoumanis, Pensgaard, Martin, & Pipe, 2004).

**Multidimensional Amotivation**

Pelletier et al. (1999), in their conceptualization of amotivation for protective environmental behaviors, discussed four types of amotivation beliefs: global helplessness beliefs, whereby individuals view the deterioration of the environment as an insurmountable problem and feel unable to see how they could contribute to its solution; strategy beliefs, which refer to individual expectations that particular behaviors might not produce the desirable effects; capacity beliefs, which represent individuals’ expectations with respect to a lack of capacity to perform a particular behavior; and effort beliefs, which represent individuals’ perceptions that they cannot exert and sustain the effort required to execute and maintain a behavior (Pelletier et al., 1999). In a similar fashion, Legault et al. (2006) developed a taxonomy of reasons that give rise to academic amotivation. In line with Pelletier et al. (1999) they referred to ability beliefs, effort beliefs, characteristics of the task, and value placed on the task. In terms of task characteristics, Legault et al. have argued that when the experience of the activity is neither interesting nor pleasurable or does not stimulate students, it is unlikely that students will be engaged in the activity. With respect to the value placed on the task, the authors stated that when the task is not of value or importance to the student, amotivation might result. That is, when the activity is not authentically accepted by the individual it might not represent an expression of his- or herself (Legault et al.).

Despite considerable SDT research having been conducted to better understand how to promote regular exercise participation in already active individuals (Vallerand & Rousseau, 2001), no SDT research to date has attempted to examine
why individuals, particularly older individuals, do not exercise. A related attempt
to examine the degree of apathy experienced by older individuals has been made
by Marin, Biedrzycki, and Firinciogullari (1991) through the Apathy Evaluation
Scale to assess levels of apathy defined as lack of motivation that is not attributable
to diminished level of consciousness, cognitive impairment, or emotional distress.
In addition, Chantoin, Hazif-Thomas, Billon, and Thomas (2001) developed a scale
aimed at loss of motivation for elderly people. Studying the problem of nonexercise
participation from the SDT viewpoint is advantageous, however, because SDT
provides a multidimensional view of amotivation (Legault et al., 2006; Pelletier
et al., 1999; Ryan & Deci, 2000b). Given the need to motivate sedentary older
individuals to initiate exercise participation, a taxonomy of reasons that give rise
to exercise amotivation was developed to be able to specifically assess the impact
of interventions aiming to modify specific amotivation beliefs. The theoretical
definitions provided by Pelletier et al. (1999) and Legault et al. were used to assess
specific types of exercise amotivation.

Capacity Beliefs

Using the term employed by Pelletier et al. (1999), capacity beliefs were operation-
alized as perceptions that individuals lack the physical and psychological resources
required to cope with the demands of regular exercise participation. Indeed, research
has supported the important role of self-efficacy beliefs as a determinant of exercise
behavior among older adults (McAuley, 1993).

Outcome Beliefs

Outcome beliefs were defined as perceptions that exercise participation is not
conducive to either somatic or psychological benefits. Theoretically, this notion
stems from Bandura’s (1986) concept of outcome expectation, that is, a judgment
of the likely consequence a particular behavior might produce. Cropley, Ayers, and
Nokes (2003) demonstrated in the transtheoretical model framework that precon-
templator nonexercisers provided more “con” reasons (costs) related to exercise
than did maintainers (regular exercisers), who provided more “pro”s (benefits), and
other studies have supported the relationship between outcome expectations and
older adults’ physical activity behavior (Damush, Stump, Saporito, & Clark, 2001;

Effort Beliefs

Effort amotivation beliefs (Pelletier et al., 1999; Legault et al., 2006) refer to per-
cussions that individuals do not want to expend the necessary effort and energy
required to integrate exercise participation in their lifestyle. A number of theoretical
models have considered important aspects of decision making and goal striving,
such as image theory (Beach & Mitchell, 1998), the model of action phases (Goll-
witzer, 1996; Heckhausen & Kuhl, 1985), differentiation and consolidation theory
(Svenson, 1992), and the framework of effortful decision making and enactment
(Dholakia & Bagozzi, 2002; Bagozzi, Dholakia, & Basuroy, 2003).
Value Beliefs

Value placed on the task (Legault et al., 2006) refers to individuals’ values in relation to the task at hand. Ryan (1995) has noted that not valuing an activity might be a source of amotivation, and this amotivation component has been included in the definition of amotivation (Ryan & Deci, 2000a, 2000b). According to Legault et al., when students do not view an activity as important, amotivated behavior might result. Research in the exercise domain has demonstrated that being involved in exercise because of its importance to the individual (i.e., identified regulation) strongly contributed to the prediction of strenuous and total exercise behavior (Edmunds, Ntoumanis, & Duda, 2006). Clearly, the more a behavior is an expression of oneself the more likely it is to be maintained (Stryker & Burke, 2000). The amotivation dimension of task characteristics used by Legault et al. was not included in the current taxonomy, given that the focus of our work was to better understand how to promote initiation of exercise behavior among inactive older individuals.

Because of the emphasis placed by Ryan (1995) and Vallerand (1997) on domain-specific research, domain-specific scales are required to accurately explain and predict amotivated behavior in particular domains. Accordingly, various domain-specific amotivation scales have been developed to assess context-specific amotivation beliefs in the environment-protection (Pelletier et al., 1999) and academic domains (Legault et al., 2006).

Study Objectives

The specific objectives of the study were to (a) develop scale items and examine their content validity; (b) examine the factor structure, internal consistency, and predictive validity of the subscale scores; and (c) examine the generalizability of the factor structure, obtained in the calibration sample (CS) with a separate validation sample (VS), and the scale dimensionality and factor discriminant validity using confirmatory factor-analytical procedures (CFA).

Study Hypotheses

It was hypothesized that (a) outcome beliefs would be more strongly and negatively correlated with attitude toward exercise and intention to initiate exercise than perceived competence because perceiving no benefits from exercise is unrelated to how effectively one thinks one can carry the activity out, (b) capacity beliefs would be more strongly and negatively correlated with exercise perceived competence rather than attitude toward exercise and intention to initiate participation, (c) effort beliefs would be more strongly and negatively correlated with intention for future exercise involvement compared with competence and attitude, (d) value beliefs would be negatively correlated with attitude toward exercise and intention to engage in exercise but not exercise-related perceived competence, and (e) the scale responses obtained from the VS would be measurement invariant with responses obtained from the CS.
Method

Participants

A CS and a VS were used in the current study. The CS included 250 Greek-speaking individuals ranging in age from 64 to 84 years ($M = 70.06$, $SD = 4.72$). There were 117 men (46.8%) and 133 women (53.2%). All the participants resided in Thessaloniki in northern Greece. Regarding education levels, for 181 (72.4%) participants the highest level of education attained was elementary school, for 47 participants (18.8%) it was high school, and for 22 individuals (8.8%) it was higher education. The VS consisted of 300 older Greek-speaking individuals between 62 and 86 years of age ($M = 71.13$, $SD = 5.84$). There were 157 men (52.3%) and 143 women (47.7%). All the participants resided in Thessaloniki in northern Greece. With respect to the education level of the participants, 212 had reached elementary school level (70.7%), 62 had reached high school level (20.7%), 10 individuals were university graduates (3.3%), and 16 individuals did not report their education level (5.3%). All the participants were regular visitors of senior centers.

Measurement Tools

Amotivation Toward Exercise. The Amotivation Toward Exercise Scale (ATES) was developed to assess individuals’ reasons for refraining from exercise based on the amotivation framework provided by Legault et al. (2006) and Pelletier et al. (1999). The intent was to develop a four-factor, 12-item scale with three items per subscale to assess the extent to which older individuals adopt outcome beliefs, capacity beliefs, effort beliefs, and value beliefs for refraining from exercise based on work by Pelletier et al. (1999) and Legault et al. on environmental amotivation and academic amotivation, respectively. Of the 26 items we started with, 12 were selected through the statistical procedures described following. Responses were provided on a 5-point Likert-type scale anchored by 1 (do not agree at all), 2 (agree a little bit), 3 (moderately agree), 4 (strongly agree), and 5 (totally agree) in personal face-to-face interviews.

Perceived Exercise Competence. To assess participants’ perceptions of their levels of exercise competence, the sport competence subscale of the Physical Self-Perception Profile (PSPP; Fox & Corbin, 1989) was modified for the current context. The word sport was substituted with exercise. In addition, the structured alternative response format was modified to a Likert-type scale format to facilitate response. Participants were asked to indicate their levels of agreement with five statements on a 5-point Likert scale using the verbal anchors of 1 (do not agree at all), 2 (agree a little bit), 3 (moderately agree), 4 (strongly agree), and 5 (totally agree). Sample items included “I feel that if I initiate participation in CRPE’s [Center for Rehabilitation and Protection for the Elderly] exercise program I will do very well” and “I feel that if I initiate exercise in CRPE’s program I will not have any difficulty compared with other individuals.” Validity evidence for the use of the Physical Self-Perception Profile has been provided by McAuley, Mihalko, and Bane (1997) for middle-aged adults participating in a 20-week exercise program and by
Li, Harmer, Chaumeton, Duncan, and Duncan (2002) for older adults participating in a 6-month Tai Chi program.

**Attitude Toward Exercise.** Participants’ attitude toward exercise was assessed through the question “I think that participating in this exercise program three times per week for the remainder of this year is...” Participants responded to four bipolar adjectives on a 7-point semantic-differential scale (from 1, extremely boring, to 7, extremely interesting; Ajzen & Fishbein, 1980). The adjectives employed were boring–interesting, harmful–beneficial, pleasant–unpleasant, and important–unimportant. An average of the item scores was created to represent the strength of the participants’ attitude toward exercise. Reliability and validity evidence for this scale have been provided with Greek-speaking exercise participants by Vlachopoulos and Michailidou (2006).

**Intention for Exercise Involvement.** Three items were used to assess participants’ intention to participate in the CRPE exercise program: “I intend/I will try/I am determined to participate three times per week in CRPE’s exercise program during the remainder of this year.” Responses were provided on a semantic-differential scale ranging from 1 (extremely unlikely) to 6 (extremely likely).

**Procedures**

Permission to conduct the study was obtained by the managing council of each CRPE where the data collection took place. The CRPEs are community nonresidential senior centers directed by the municipality of Thessaloniki. These centers provide opportunities for leisure and recreation to older individuals by offering programs including both physical activities such as traditional dancing and aerobic exercise and leisure activities such as leisure trips and social gatherings.

Initially, a modification of the Physical Activity History questionnaire (Marcus & Forsyth, 2003) was used to assess how long it had been since the older adults had participated in any form of exercise defined as planned, structured, and repetitive physical activity. The cutoff point used was 6 months. Participants who reported that it had been more than 6 months from the time of assessment since they had participated in such a form of physical activity were included in the samples. Participants provided their written informed consent for participation in the study and proceeded to provide their responses on the questionnaire through personal face-to-face interviews (Bowling, 2005). The same data-collection mode was used for both the CS and the VS. The mode of questionnaire presentation affects the cognitive burden placed on respondents and especially the demand for literacy (Bowling). Hence, the interview mode (auditory channel) was used because it is the least burdensome (Bowling). The use of this method was justified by the low educational level (elementary school only) attained by the greatest number of older individuals in the samples. Oppenheim (1992) also concurs that the interview method is appropriate when the sample includes less well-educated respondents and individuals with reading difficulties (because of lower levels of education and vision problems), as was the case in the current samples. The participants verbally provided their responses, and the researcher recorded them on the questionnaire. The same researcher interviewed all of the participants in both the CS and the VS.
Data Analysis

Criteria for Item Selection. In Phase 1, selection of the best three amotivation items per subscale to compose the final version of the scale was based on the CS. Only three items were selected in an attempt to develop a short, reliable, valid scale that was easy to use with older individuals. Item selection was based on multiple criteria including mean score (a mean of about 3 was preferable), skewness (<1 was preferred), kurtosis (<2 was preferable), loadings (>|.50| was preferred), cross-loadings (<|.40| was preferred), and breadth of the construct (a set of items covering the whole content domain was sought).

Item Selection, Factor Structure, and Internal Consistency. Item analyses and principal-axis factor analyses were performed as part of the procedure to select the best items. Oblimin rotation was used as recommended by Floyd and Widaman (1995). Principal-axis common-factor analysis is appropriate for identifying latent variables as the underlying causes of the measured variables in the context of scale development (Floyd & Widaman). Regarding the required sample size, stable factor solutions can be obtained when factor loadings are in the range of .60 or greater with sample sizes greater than 150, such as in the current CS (Guadagnoli & Velicer, 1988). In addition, when the criterion of high item-to-total correlations has been initially used to retain items in the scale, as we did, all factors after the first account for much less variance; hence, their usefulness has to be demonstrated in studies of predictive validity (Floyd & Widaman).

Initially, we tried to eliminate scale items to identify the latent variables best represented by particular sets of items. Such items would load strongly on their respective factor with weak cross-loadings. The expected number of factors was extracted by SPSS for Windows. A scree test was also used to determine the suitability of the number of factors requested. Factors with Eigenvalues considerably less than 1.00 can be accepted through the scree test in the context of common factor analysis (Floyd & Widaman, 1995). At least 50% of the total variance should be explained by the factors extracted (Streiner, 1994). The internal consistency of the subscales was examined through the use of Cronbach’s alpha.

Predictive Validity. The predictive validity of the extracted factors was examined through regressing exercise perceived competence, attitude toward exercise, and intention for future exercise involvement on outcome amotivation beliefs, capacity beliefs, effort beliefs, and value beliefs. Predictive validity was examined by predicting the outcome variables in line with the aforementioned hypotheses on the CS.

CFA, Scale Dimensionality, and Discriminant Validity. The tenability of the four-factor structure, scale dimensionality, and factor-discriminant validity was examined through CFA procedures on the VS. Four different factor models representing different conceptualizations of the scale dimensionality were examined: Model 1 was the correlated four-factor model testing the hypothesis that the scale captures distinct but related sources of amotivation and suggesting the possibility of a hierarchical structure; Model 2 was the single-factor model hypothesizing that participants do not differentiate between different sources of amotivation and that the phenomenon of amotivation should be best represented by a unidimensional construct; Model 3 was an uncorrelated four-factor model testing the idea that the amotivation factors are completely independent, unrelated constructs; and Model 4 was a hierarchical
model testing the idea that the first-order factors are highly interrelated and their common variance can be represented by a higher order factor. Models 2, 3, and 4 were compared and contrasted to Model 1. Among these conceptualizations, the relevant literature supported the validity of the four-factor correlated model in the environmental-protection literature (Pelletier et al., 1999), and the hierarchical model was supported in the academic-amotivation literature (Legault et al., 2006). In the current study we expected support for the four-factor correlated model. That is, individuals might feel that they are efficacious in exercise but might not expect any benefit to accrue, or they might feel that they do not want to invest the effort and energy required to exercise regularly. Thus, no strong factor intercorrelations were expected to justify support for the hierarchical model. Therefore, Model 1 was hypothesized to best represent the instrument responses on the VS. To test the discriminant validity of the scale responses, the four-factor correlated model was compared with a series of CFA models representing all possible combinations of factors in pairs. For instance, Model 2 specified the outcome-beliefs and capacity-beliefs items to load onto the same factor. Chi-square difference tests were conducted to compare the four-factor correlated model with each one of the combined-factor models (Bagozzi & Phillips, 1982).

The goodness-of-fit indexes used to examine the CFA models and conduct model comparisons were the chi-square ($\chi^2$) statistic, the nonnormed-fit index, the comparative-fit index (CFI), the root-mean-square error of approximation, its accompanying 90% confidence interval, and Akaike’s information criterion. The $\chi^2$ examines the discrepancy between the implied and the observed covariance matrix, with a significant result indicating a poor model fit. With a large sample, however, this statistic becomes overly conservative (Byrne, 2006). CFI values less than .90 do not indicate a good model fit (Bentler & Bonett, 1980), whereas values greater than .95 indicate an excellent fit (Hu & Bentler, 1999). A root-mean-square error of approximation less than .05 indicates a good model fit (Hu & Bentler, 1999) and a value of .08 an adequate fit (Browne & Cudeck, 1993), with .10 considered the upper limit (Byrne, 2000). Akaike’s information criterion can be used to compare competing models, allows for comparison of nonnested (i.e., hierarchical) models, and penalizes model complexity (i.e., overparameterization; Byrne, 1998). Smaller values indicate a better model fit.

**Measurement Invariance.** The equivalence of the factor structure between scale responses obtained from the CS and the VS were examined through tests of measurement invariance. Evidence of measurement invariance between these samples would support the robustness of the factor structure of the scale responses. The types of measurement invariance examined were configural invariance, metric invariance, measurement-error invariance, and scalar invariance. These represent Category 1 rather than Category 2 types of invariance (Little, 1997); the latter require theoretical hypotheses to be formulated regarding between-group differences in latent means, variances, and covariances of the latent factors, whereas the former has to do with the psychometric properties of the measurement scales (Cheung & Rensvold, 2002).

The following multigroup CFA models were tested: first, the totally noninvariant configural-invariance model (Model 1) testing the hypothesis that responses from the different samples would reflect conceptualization of the amotivation constructs
in the same way (Cheung & Rensvold, 2002). If this model does not fit the data, then multigroup models with additional constraints will not fit either. Second was a metric-invariance multigroup model with factor loadings constrained equal across the samples (Model 2) testing the cross-sample equivalence of the strength of the item–factor relationships (Cheung & Rensvold). Metric invariance reflects conceptual agreement between the samples regarding the type and number of underlying constructs and the items associated with each. Because the condition of metric invariance is difficult to satisfy, it has been suggested that when the nonequivalent factor loadings represent only a small portion of the model, this condition can be relaxed, accepting partial metric invariance (Byrne, Shavelson, & Muthen, 1989). Third, we tested a multigroup model (Model 3) constraining equal the residuals of the items found to have invariant factor loadings in Model 2. This model tested whether the amount of item measurement error is the same across samples. Fourth, we tested a model (Model 4) with equality constraints on the intercepts of items found to have invariant factor loadings in Model 2, testing the hypothesis of scalar invariance. The goodness-of-fit indexes employed to assess model fit in the single-group CFA analyses were also employed in the multisample tests. The criteria for multigroup-model evaluation were (a) the results of \( \chi^2 \) difference tests for nested models, (b) the goodness-of-fit indexes for each multisample model separately, and (c) the CFI that is considered the most appropriate index to examine multigroup-model differences because it is unaffected by sample size and model complexity and is not correlated with overall fit measures (Cheung & Rensvold). A value of \( \Delta \text{CFI} \) (CFI change) less than or equal to –.01 is an indicator that the null hypothesis of invariance should not be rejected (Cheung & Rensvold).

Results

Content Validity

Initially, and in line with Pelletier et al.’s (1999) operational definitions of the amotivation constructs, five outcome items, nine capacity items, six effort items, and six value items were written. Two experts with PhDs in exercise and sport science and specialization in exercise psychology and self-determination theory examined the items in terms of whether each item corresponded to the construct it was intended to define, relevance to the construct it was intended to define, and clarity in meaning. The experts correctly categorized all the items with respect to the construct they aimed to define. In addition, on a 7-point content-relevance scale (1 = irrelevant, 4 = moderately relevant, 7 = absolutely relevant). Furthermore, judges’ scores on a 7-point item-clarity scale (1 = unclear, 4 = moderately clear, 7 = completely clear) ranged from 5 to 7 for all items except the Effort 3 item, which was given a score of 3. Overall, all the items were judged appropriate, content relevant, and clear and were retained for item-selection analyses.

Factor Structure and Internal Consistency on the CS

Initially, item-to-total correlation analyses were conducted on the CS to search for items with item-total correlations much weaker than most of the items, to be
discarded. One outcome item (Outcome 4), one effort item (Effort 4), and two capacity items (Capacity 5 and 7) were discarded. The remaining items were subjected to a series of principal-axis factor analyses to select those that consistently loaded strongly on their intended factor and cross-loaded as weakly as possible on the remaining factors. Each factor analysis included only items that defined a particular pair of factors. A different pair of factors was employed in each factor analysis. Three items were selected for each of the four factors. After selecting the best items from each of the four sets of items, we subjected all 12 items to a principal-axis factor analysis that explained 90.55% of the variance. Factor-analysis results, together with rotated item loadings, are presented in Table 1. The alpha coefficients for the subscales were .94 for capacity beliefs, .97 for outcome beliefs, .92 for effort beliefs, and .98 for value beliefs. These coefficients appear high; they represent items purposefully selected based on the strongest factor loadings in the CS. To guard against the possibility that the results were sample specific, the items were reexamined and validated in a separate validation sample (VS).

**Predictive Validity on the CS**

Linear-regression analyses were conducted to examine the strength and direction of the standardized beta coefficients in the prediction of exercise-related perceived competence, attitude toward exercise, and intention for exercise participation (Table 2). The predictors significantly predicted exercise competence, \( R = .87, \quad R^2 = .75, \quad F(4, 245) = 192.29, \quad p < .05; \) attitude toward exercise, \( R = .86, \quad R^2 = .74, \quad F(4, 245) = 174.41, \quad p < .05; \) and intention for exercise participation, \( R = .61, \quad R^2 = .37, \quad F(4, 245) = 36.32, \quad p < .05. \) Specifically, outcome amotivation beliefs strongly and negatively predicted attitude toward exercise and intention to initiate exercise participation but not exercise perceived competence, supporting the initial hypothesis. Capacity beliefs strongly and negatively predicted exercise competence and attitude toward exercise but not intention to exercise, supporting the predictive validity of the capacity amotivation belief scores. Effort beliefs strongly and negatively predicted only intention to initiate exercise rather than perceived competence and attitude, supporting the hypotheses. Value beliefs appeared as a negative predictor of attitude toward exercise. Overall, the regression results supported the predictive validity of the ATES scores representing specific types of amotivation beliefs.

**CFA and Scale Dimensionality on the VS**

Results from the VS showed that item skewness ranged from –0.41 to 5.09 and item kurtosis from –1.89 to 26.00. Specifically, it was the three value-belief items that displayed skewness values between 4.85 and 5.09, whereas the remaining skewness values ranged from –0.41 to .53. The value-belief items also presented kurtosis values between 23.84 and 26.00, whereas the remaining items ranged from –1.89 to –1.63. Mardia’s coefficient value was 229.33, indicating multivariate nonnormality because this value was higher than the cutoff point of 168 for a CFA model including 12 items, based on the formula \( p(p + 2) \) where \( p \) equals the number of variables (Bollen, 1989). Therefore, the Satorra-Bentler scaled \( \chi^2 \) statistic was calculated, which incorporates a correction for multivariate nonnormality accompanied by the robust CFI provided by EQS 5.7. The results of the CFA analyses
Table 1  Item Means, Standard Deviations, Communalities, and Pattern Coefficients of the Four-Factor Direct Oblimin Solution of the Amotivation Toward Exercise Scale (ATES) on the Calibration Sample

<table>
<thead>
<tr>
<th>ATES item numbers and item wording</th>
<th>M</th>
<th>SD</th>
<th>Outcome</th>
<th>Capacity</th>
<th>Effort</th>
<th>Value</th>
<th>Initial h²</th>
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</thead>
<tbody>
<tr>
<td>ATES outcome beliefs (Cronbach’s α = .97)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Outcome 1: because I am absolutely convinced that exercise will not do me any good physically</td>
<td>2.75</td>
<td>1.75</td>
<td>.81</td>
<td>.10</td>
<td>−.07</td>
<td>0.15</td>
<td>.96</td>
</tr>
<tr>
<td>Outcome 2: because I am absolutely convinced that exercise will not make me feel better</td>
<td>2.67</td>
<td>1.73</td>
<td>.79</td>
<td>.17</td>
<td>−.05</td>
<td>−0.02</td>
<td>.87</td>
</tr>
<tr>
<td>Outcome 3: because I am absolutely convinced that exercise will not have any positive effect on me</td>
<td>2.83</td>
<td>1.79</td>
<td>.68</td>
<td>.24</td>
<td>−.07</td>
<td>0.21</td>
<td>.96</td>
</tr>
<tr>
<td>ATES capacity beliefs (Cronbach’s α = .94)</td>
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<tr>
<td>Capacity 1: because I am absolutely convinced that I will not manage to cope with the requirements of an exercise program</td>
<td>2.52</td>
<td>1.76</td>
<td>.20</td>
<td>.76</td>
<td>.00</td>
<td>−0.06</td>
<td>.83</td>
</tr>
<tr>
<td>Capacity 2: because I do not feel confident at all to meet the demands of an exercise program</td>
<td>2.72</td>
<td>1.75</td>
<td>.17</td>
<td>.79</td>
<td>.04</td>
<td>−0.11</td>
<td>.87</td>
</tr>
<tr>
<td>Capacity 3: because I feel very strongly that I lack the physical stamina required to meet the demands of an exercise program</td>
<td>2.58</td>
<td>1.76</td>
<td>−.02</td>
<td>.92</td>
<td>−.00</td>
<td>0.03</td>
<td>.76</td>
</tr>
<tr>
<td>ATES effort beliefs (Cronbach’s α = .92)</td>
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</table>

Effort 1: because I do not want at all to try to regularly attend an exercise program  
3.60 1.71  .13  -.10  1.00  -.09  .88
Effort 2: because I do not wish to coordinate my life to regularly attend an exercise program  
3.91 1.60  -.17  .03  .73  0.21  .70
Effort 3: because I do not want to put forth the effort required to regularly attend an exercise program  
3.59 1.71  -.06  .07  .93  -.09  .89
ATES value beliefs (Cronbach’s $\alpha = .98$)
Value 1: because I believe that exercise is not important at all  
1.44 1.19  .12  -.14  -.03  0.92  .98
Value 2: because I believe exercise is useless and vain  
1.46 1.19  .16  -.14  .00  0.92  .98
Value 3: because I do not see any value at all in exercise  
1.54 1.23  -.08  .13  .00  1.01  .92
Correlations among factors
outcome beliefs
capacity beliefs
   .71  —  -.27*  -.11
effort beliefs
   -.49  -.22  —  -.11
value beliefs
   .32  -.12  -.08  —

Note. $N = 250$. Pattern coefficients in bold represent primary factor loadings of the 12 ATES items retained in the final solution. Interfactor correlations are presented below the diagonal; ATES subscale bivariate correlations are presented above the diagonal. The English ATES items have not been systematically translated from Greek using the back-translation procedure and have not been tested for reliability and validity. They are presented to convey their meaning to non-Greek-speaking readers. Target loadings are in boldface.

*p < .05.
conducted on the VS showed that the correlated four-factor model (Model 1) was the only model that fit the data adequately, displaying desirable values for all the goodness-of-fit indexes (Table 3). No model respecification was required. Neither the single-factor model, the uncorrelated four-factor model, nor the hierarchical model displayed adequate goodness-of-fit indexes. Chi-square tests, as well as the Akaikes’ information criterion model values, showed that the correlated four-factor model was statistically superior to the other CFA models (Table 3).

Examination of the strength of the standardized factor loadings based on the correlated four-factor model showed that all the factor loadings were greater than .70 (Table 4). In addition, all the critical ratio values associated with the nonstandardized factor loadings were significant at $p < .05$. Collectively, these findings support the validity of the scale items as indicators of their respective constructs (Table 4).

**Internal Reliability and Discriminant Validity on the VS**

The internal reliability of the instrument subscales was assessed through Cronbach’s alpha, average variance extracted (AVE; Fornell & Larcker, 1981), and composite reliability values (Fornell & Larcker). AVE values provide estimates of the variance captured by the construct in relation to the amount of variance resulting from measurement error. Composite reliability indicates the proportion of shared variance to error variance in the constructs (Li, Harmer, & Acock, 1996). The values indicating satisfactory internal reliability should be at least .80 for Cronbach’s alpha (Nunnally, 1978), .50 for AVE (Fornell & Larcker), and .60 for composite reliability (Bagozzi & Yi, 1988). The Cronbach’s alphas were .92 for outcome, .93 for capacity, .96 for effort, and .98 for value amotivation beliefs. The AVE values were .81 for outcome, .83 for capacity, .90 for effort, and .95 for value beliefs. The composite reliability values were .92 for outcome, .93 for capacity, .96 for effort, and .98 for value beliefs, indicating that the validity of the indicators and the constructs is not questionable.

Regarding the separability of the scale factors, the results showed that the correlated four-factor model displayed a superior fit compared with the other CFA models (Table 5). Furthermore, the estimation of confidence intervals around factor correlation coefficients within 2 standard errors demonstrated that no confidence
Table 3  CFA Goodness-of-Fit Indexes of Various Conceptualizations of the Amotivation Toward Exercise Scale Dimensionality on the Validation Sample

<table>
<thead>
<tr>
<th>CFA model</th>
<th>χ²</th>
<th>df</th>
<th>SB χ²</th>
<th>χ² diff</th>
<th>df diff</th>
<th>NNFI</th>
<th>CFI</th>
<th>RCFI</th>
<th>RMSEA</th>
<th>90% CI</th>
<th>AIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1: correlated 4-factor model</td>
<td>154.61</td>
<td>48</td>
<td>122.85</td>
<td>—</td>
<td>—</td>
<td>.969</td>
<td>.977</td>
<td>.968</td>
<td>.086</td>
<td>.071—.101</td>
<td>58.61</td>
</tr>
<tr>
<td>Model 2: single-factor model</td>
<td>3,153.66</td>
<td>54</td>
<td>4,216.50</td>
<td>4,093.65**</td>
<td>6</td>
<td>.193</td>
<td>.340</td>
<td>.000</td>
<td>.438</td>
<td>.424—.450</td>
<td>3,045.66</td>
</tr>
<tr>
<td>Model 3: uncorrelated 4-factor model</td>
<td>434.74</td>
<td>54</td>
<td>373.88</td>
<td>251.03**</td>
<td>6</td>
<td>.901</td>
<td>.919</td>
<td>.863</td>
<td>.154</td>
<td>.140—.167</td>
<td>326.74</td>
</tr>
<tr>
<td>Model 4: hierarchical model</td>
<td>222.71</td>
<td>51</td>
<td>167.02</td>
<td>44.17**</td>
<td>3</td>
<td>.953</td>
<td>.963</td>
<td>.950</td>
<td>.106</td>
<td>.092—.120</td>
<td>120.71</td>
</tr>
</tbody>
</table>

Note. CFA = confirmatory factor analysis; SB χ² = Satorra-Bentler scaled χ²; NNFI = nonnormed fit index; CFI = comparative fit index; RCFI = robust comparative fit index; RMSEA = root-mean-square error of approximation; CI = confidence interval; AIC = Akaike’s information criterion. N = 300. Models 2, 3, and 4 are contrasted to Model 1. Contrasts are based on the SB χ² values. In Model 4, the D2 parameter (disturbance term) was fixed at .20 to achieve model convergence. **p < .01.
Table 4  Correlated Four-factor Confirmatory-Factor-Analysis Model Parameter Estimates for the Amotivation Toward Exercise Scale Items on the Validation Sample

<table>
<thead>
<tr>
<th>Scale item</th>
<th>$M$</th>
<th>$SD$</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Item loadings</th>
<th>Item uniqueness</th>
<th>SMC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome beliefs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcome 1: because I am absolutely convinced that exercise will not do me any good physically</td>
<td>2.50</td>
<td>1.85</td>
<td>0.534</td>
<td>−1.630</td>
<td>0.881</td>
<td>0.474</td>
<td>0.775</td>
</tr>
<tr>
<td>Outcome 2: because I am absolutely convinced that exercise will not make me feel better</td>
<td>2.95</td>
<td>1.89</td>
<td>0.061</td>
<td>−1.892</td>
<td>0.845</td>
<td>0.534</td>
<td>0.715</td>
</tr>
<tr>
<td>Outcome 3: because I am absolutely convinced that exercise will not have any positive effect on me</td>
<td>2.68</td>
<td>1.88</td>
<td>0.334</td>
<td>−1.799</td>
<td>0.972</td>
<td>0.235</td>
<td>0.945</td>
</tr>
<tr>
<td><strong>Capacity beliefs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity 1: because I am absolutely convinced that I will not manage to cope with the requirements of an exercise program</td>
<td>3.23</td>
<td>1.79</td>
<td>−0.194</td>
<td>−1.771</td>
<td>0.958</td>
<td>0.287</td>
<td>0.917</td>
</tr>
<tr>
<td>Capacity 2: because I do not feel confident at all to meet the demands of an exercise program</td>
<td>2.96</td>
<td>1.81</td>
<td>0.054</td>
<td>−1.809</td>
<td>0.784</td>
<td>0.620</td>
<td>0.615</td>
</tr>
<tr>
<td>Capacity 3: because I feel very strongly that I lack the physical stamina required to meet the demands of an exercise program</td>
<td>3.26</td>
<td>1.81</td>
<td>−0.258</td>
<td>−1.764</td>
<td>0.986</td>
<td>0.166</td>
<td>0.972</td>
</tr>
<tr>
<td><strong>Effort beliefs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effort 1: because I do not want at all to try to attend regularly an exercise program</td>
<td>3.27</td>
<td>1.85</td>
<td>−0.261</td>
<td>−1.798</td>
<td>0.917</td>
<td>0.399</td>
<td>0.841</td>
</tr>
<tr>
<td>Effort 2: because I do not wish to coordinate my life to attend regularly an exercise program</td>
<td>3.41</td>
<td>1.78</td>
<td>−0.410</td>
<td>−1.642</td>
<td>0.979</td>
<td>0.203</td>
<td>0.959</td>
</tr>
<tr>
<td>Effort 3: because I do not want to put forth the effort required to regularly attend an exercise program</td>
<td>3.39</td>
<td>1.79</td>
<td>−0.394</td>
<td>−1.667</td>
<td>0.955</td>
<td>0.298</td>
<td>0.911</td>
</tr>
<tr>
<td><strong>Value beliefs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value 1: because I believe that exercise is not important at all</td>
<td>1.15</td>
<td>0.65</td>
<td>0.290</td>
<td>−1.794</td>
<td>0.986</td>
<td>0.167</td>
<td>0.972</td>
</tr>
<tr>
<td>Value 2: because I believe exercise is useless and vain</td>
<td>1.15</td>
<td>0.64</td>
<td>0.370</td>
<td>−1.727</td>
<td>0.921</td>
<td>0.389</td>
<td>0.849</td>
</tr>
<tr>
<td>Value 3: because I do not see any value at all in exercise</td>
<td>1.13</td>
<td>0.62</td>
<td>0.261</td>
<td>−1.801</td>
<td>0.949</td>
<td>0.316</td>
<td>0.900</td>
</tr>
</tbody>
</table>

*Note.* SMC = squared multiple correlation. $N = 300$. All factor loadings and item uniquenesses are statistically significant at $p < .05$. 
Table 5  Factor Separability Results Through Confirmatory Factor Analysis (CFA)

<table>
<thead>
<tr>
<th>CFA Model</th>
<th>SB $\chi^2$</th>
<th>df</th>
<th>SB $\chi^2$ diff</th>
<th>df diff</th>
<th>NNFI</th>
<th>CFI</th>
<th>RCFI</th>
<th>RMSEA</th>
<th>RMSEA 90% CI</th>
<th>AIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1: correlated 4-factor model</td>
<td>122.85</td>
<td>48</td>
<td>—</td>
<td>—</td>
<td>.969</td>
<td>.977</td>
<td>.968</td>
<td>.086</td>
<td>.071–.101</td>
<td>58.61</td>
</tr>
<tr>
<td>Model 2: outcome-capacity</td>
<td>457.13</td>
<td>51</td>
<td>334.28**</td>
<td>3</td>
<td>.834</td>
<td>.872</td>
<td>.826</td>
<td>.199</td>
<td>.185–.212</td>
<td>550.59</td>
</tr>
<tr>
<td>Model 3: outcome-effort</td>
<td>1,087.27</td>
<td>51</td>
<td>964.42**</td>
<td>3</td>
<td>.702</td>
<td>.769</td>
<td>.557</td>
<td>.266</td>
<td>.253–.279</td>
<td>1,031.42</td>
</tr>
<tr>
<td>Model 4: outcome-value</td>
<td>1,078.52</td>
<td>51</td>
<td>955.67**</td>
<td>3</td>
<td>.714</td>
<td>.779</td>
<td>.560</td>
<td>.261</td>
<td>.247–.274</td>
<td>985.82</td>
</tr>
<tr>
<td>Model 5: capacity-effort</td>
<td>1,046.59</td>
<td>51</td>
<td>923.74**</td>
<td>3</td>
<td>.668</td>
<td>.743</td>
<td>.574</td>
<td>.281</td>
<td>.267–.294</td>
<td>1,153.51</td>
</tr>
<tr>
<td>Model 6: capacity-value</td>
<td>1,668.44</td>
<td>51</td>
<td>1,545.59**</td>
<td>3</td>
<td>.645</td>
<td>.725</td>
<td>.308</td>
<td>.291</td>
<td>.277–.304</td>
<td>1,238.45</td>
</tr>
<tr>
<td>Model 7: effort-value</td>
<td>1,043.05</td>
<td>51</td>
<td>920.20**</td>
<td>3</td>
<td>.660</td>
<td>.738</td>
<td>.576</td>
<td>.284</td>
<td>.270–.297</td>
<td>1,181.34</td>
</tr>
</tbody>
</table>

Note. SB $\chi^2$ = Satorra-Bentler scaled chi-square statistic; CFA = confirmatory factor analysis; NNFI = nonnormed fit index; CFI = comparative fit index; RCFI = robust comparative fit index; RMSEA = root-mean-square error of approximation; AIC = Akaike's information criterion. $N = 300$. The factor labels in Models 2–7 indicate items specified to load onto the same factor. Models 2–7 are contrasted to Model 1.

**$p < .01$. *$p < .05$.**
interval included the value of 1, supporting the discriminant validity of the scale scores (Anderson & Gerbing, 1988). In addition, all AVEs were greater than the squared factor correlations, further supporting the discriminant validity of the scale.

**Generalizability Validity Across the CS and the VS**

To examine the extent of measurement invariance of scale responses obtained from the CS and the VS, a series of multisample analyses were performed. In the context of measurement invariance, one item in each factor should be used as a reference indicator to assign a metric to the latent variable. Model 1 (configural invariance) fit the data well, supporting the configural-invariance hypothesis (Table 6). Model 2 (metric invariance), in which equality constraints were imposed on the factor loadings, was supported by the data. One item loading in each factor was fixed to 1 to assign a metric to the latent variable, whereas the factor variances and covariances were free to be estimated. The goodness-of-fit indexes showed a good fit for Model 2 to the data (Table 6). The statistical probability values associated with the \( \chi^2 \) univariate increments expected for each item given the release of the respective factor-loading equality constraint were examined with the Lagrange multiplier test (LM test) provided by EQS. The results showed that the factor-loading equality constraints associated with the items Capacity 2 and Effort 2 were not tenable, indicating partial metric invariance. The \( \Delta \text{CFI} \) value did not indicate any meaningful difference between the models, given that it was less than .01 (Cheung & Rensvold, 2002). When Model 2 was reestimated releasing the item-loading constraints initially fixed to 1 to examine the invariance of these item loadings, as well, the results showed that in total the noninvariant item loadings were associated with the items Capacity 2 and 3, Effort 2, and Value 1 and 3, indicating partial metric invariance.

Regarding Model 3 (measurement-error invariance), the goodness-of-fit indexes showed that the model fit the data well (Table 6). In Model 3, except the items whose factor loading was fixed to 1, item-uniqueness equality constraints were imposed only on items found to possess invariant loadings in Model 2. The LM test showed that the uniqueness equality constraints associated with items Outcome 2 and 3 were not tenable. The model did not differ meaningfully from Model 2; the \( \Delta \text{CFI} \) value was smaller than .01. A reestimation of Model 3 adding the uniqueness constraints on items with factor loadings previously fixed to 1 and now free to be estimated showed that, in total, the noninvariant item uniquenesses were associated with all items except Capacity 1 and Effort 3.

Model 4 (item-intercept invariance) had a good fit to the data, supporting the scalar-invariance hypothesis (Table 6). One item loading was fixed to 1 per factor to assign a metric to the latent variable, whereas the factor variances and covariances were free to be estimated. The LM test results showed that only the Outcome 2 item-intercept constraint was nontenable. The \( \Delta \text{CFI} \) value comparing Models 2 and 4 showed no meaningful difference (\( \Delta \text{CFI} = .002 \)). A reestimation of Model 4 adding item-intercept constraints on the items previously fixed to 1 showed that, in total, the nontenable item-intercept constraints were associated with Outcome 2, Capacity 1, Effort 1, and Value 2, indicating partial scalar invariance.
Table 6  Goodness-of-Fit Indexes for the Generalizability Measurement-Invariance Models Across the Calibration Sample and the Validation Sample

<table>
<thead>
<tr>
<th>Confirmatory-factor-analysis model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$ diff</th>
<th>df diff</th>
<th>CFI</th>
<th>$\Delta$CFI</th>
<th>SRMR</th>
<th>RMSEA</th>
<th>90% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multisample Model 1: configural invariance</td>
<td>441.79</td>
<td>96</td>
<td>—</td>
<td>—</td>
<td>.964</td>
<td>—</td>
<td>.058</td>
<td>.081</td>
<td>.073–.089</td>
</tr>
<tr>
<td>Multisample Model 2: metric invariance</td>
<td>502.56</td>
<td>104</td>
<td>60.77**</td>
<td>8</td>
<td>.959</td>
<td>.005</td>
<td>.081</td>
<td>.084</td>
<td>.076–.091</td>
</tr>
<tr>
<td>Multisample Model 3: measurement-error invariance</td>
<td>499.52</td>
<td>102</td>
<td>3.04b</td>
<td>2</td>
<td>.959</td>
<td>.000</td>
<td>.061</td>
<td>.084</td>
<td>.077–.092</td>
</tr>
<tr>
<td>Multisample Model 4: scalar invariance</td>
<td>474.50</td>
<td>102</td>
<td>28.06**</td>
<td>2</td>
<td>.961</td>
<td>.002</td>
<td>.059</td>
<td>.082</td>
<td>.074–.089</td>
</tr>
</tbody>
</table>

Note. CFI = comparative fit index; $\Delta$CFI = comparative fit index difference value; SRMR = standardized root-mean residual; RMSEA = root-mean-square error of approximation. Calibration sample: $n = 250$; Validation sample: $n = 300$.

*Compared with Model 1. **Compared with Model 2.

*p < .05.
The \( \chi^2 \) difference test based on the models with one item loading per factor fixed to 1 across groups demonstrated that Model 4 was significantly worse than Model 2. Nonetheless, the \( \Delta \text{CFI} \) value showed that this was not the case, supporting equivalence of Models 2 and 4. Overall, the results demonstrated partial metric and partial item-intercept invariance but not measurement-error invariance of the ATES responses between the CS and the VS. Hence, reasonable support was provided for the equivalence of the scale responses across the samples, supporting the robustness of the factor structure (Table 6).

**Discussion**

The current study reported on the development of a taxonomy of reasons to refrain from exercise of older inactive individuals. The amotivation dimensions investigated were outcome beliefs, capacity beliefs, effort beliefs, and value beliefs. These types of belief were drawn from the extant literature on the assessment of multidimensional amotivation undertaken in the environmental-protection (Pelletier et al., 1999) and the academic-amotivation literature (Legault et al., 2006).

**Structural Validity and Internal Reliability**

The data supported four correlated factors representing the dimensions of outcome, capacity, effort, and value amotivation beliefs. Such support was obtained for both the CS and the VS with data collected using a face-to-face mode of scale administration (Bowling, 2005). On the VS, the four-factor correlated model fit the data better than the single-factor model, the four-factor uncorrelated model, and the hierarchical model, supporting the notion that respondents perceived the four sources of amotivation as distinct but related. The fact that the hierarchical model was not a good representation of the data supported the notion that researchers might use the information derived from the four separate sources of amotivation to better understand the phenomenon of nonexercise participation. In line with our findings, Pelletier et al. (1999) demonstrated the utility of distinct sources of amotivation to better understand amotivation toward environmental behaviors, whereas Legault et al. (2006) in the academic domain demonstrated that the sources of amotivation shared a large amount of variance and might also be viewed through a global amotivation perspective. Clearly, whether different sources of amotivation are related to a large extent or not seems to be context specific depending on the nature of the behavioral domain under study (Legault et al.; Pelletier et al., 1999). Furthermore, the results demonstrated the strength of the item loadings, the separability of the ATES factors, and their internal reliability, providing strong support for the validity of the scale items as indicators of the exercise amotivation constructs.

**Predictive Validity**

The regression of exercise perceived competence, attitude, and intention on the four amotivation subscales supported the predictive validity of the ATES scores. Outcome beliefs negatively predicted intention to exercise and to a lesser extent attitude toward exercise. When individuals do not expect any positive outcome to accrue from regular exercise involvement, they seem not to intend to be involved in
exercise and do not hold a positive attitude toward exercise. Cropley et al. (2003) demonstrated that precontemplator nonexercisers provided more disadvantage reasons for exercising (cons) than advantage reasons (pros), whereas the reverse was true with regular exercisers.

Capacity beliefs negatively predicted perceived competence, supporting the initial hypothesis, and also negatively predicted attitude toward exercise. With respect to the negative correlation with attitude toward exercise, individuals might discount the importance of activities they are not capable of carrying out. Harter (1993) has discussed the self-enhancement dimension of discounting the importance of and withdrawing from domains that tend to produce failure.

Effort beliefs negatively predicted intention to exercise, supporting the hypothesis. Clearly, whether individuals wish to expend the necessary effort to exercise is unrelated to how capable they feel in exercise. In addition, a negative relationship emerged between effort beliefs and attitude toward exercise, but it was weak and nonsignificant. Bagozzi et al. (2003), in the context of examining the influence of decision making on subsequent goal striving and decision enactment, built on Dholakia and Bagozzi’s (2002) theoretical framework by elaborating on the mediating role of goal and implementation desires, positive and negative anticipated emotions, and constructs such as attitudes, subjective norms, and perceived behavioral control in the decision-making and enactment process. Clearly, an understanding of how older sedentary individuals decide to invest the effort to initiate exercise is very important in terms of behavioral change in this important health domain.

Value beliefs also negatively predicted attitude toward exercise, as expected because not valuing an activity is not equivalent to either not feeling capable of carrying it out or not intending to perform it. Values might influence behaviors through determining the desirability of specific objects and situations (Feather, 1995) and also through the organization of goals to implement a particular behavior (Emmons, 1989). Furthermore, and in line with Kasser’s (2002) self-determination framework of values, some values might be conducive to intrinsically motivated behaviors and others to extrinsically motivated behaviors, with the respective levels of persistence being evident in the particular behavior. Hence, future research should explore ways to promote the value of exercise among older individuals, thereby increasing the probability of exercise initiation and regular involvement. Overall, the current findings to a large extent support the predictive validity of the ATES subscale responses through their relations to other self-relevant variables associated with regular exercise participation and adherence.

**Generalizability Validity**

The measurement-invariance results supported configural and partial metric invariance, with the Capacity 2 and 3, Effort 2, and Values 1 and 3 item loadings appearing noninvariant. Almost no item measurement error appeared invariant. Furthermore, the item-intercept hypothesis was supported, with Capacity 1, Outcome 2, Effort 1, and Value 2 item intercepts appearing nonequivalent across the samples. The results demonstrated that the two samples employed the same conceptual frame of reference when responding to the measures that reflect the four constructs of amotivation beliefs (Vandenberg & Lance, 2000). The support obtained for partial metric invariance indicated that the respondent groups interpreted most of the
scale items in the same way, providing stronger support for the robustness of the ATES response factor structure. Regarding item measurement-error invariance, the results showed that the scale items did not display the same quality as indicators of their respective construct across the groups. The overall internal reliability of each subscale, however, was good for all the subscales and both samples. Significant support was also obtained for the item-intercept equivalence hypothesis, indicating that most of the item intercepts were invariant, strengthening even more the generalizability evidence of the ATES responses across the samples.

**Study Limitations**

Given the interview mode of scale administration we used, future research should examine the psychometric properties of the scale based on responses obtained through the method of self-completion. Despite the greater cognitive burden on the respondent (Bowling, 2005), such a method might be more appropriate for older individuals with higher educational levels who are in a position to provide responses to the questionnaire through self-completion. In addition, items referring to beliefs about task characteristics that have been used by Legault et al. (2006) in the classroom setting should be added to the scale. Clearly, such beliefs that are influenced by the exercise experience might also explain differences in the levels of exercise behavior attained by individuals. The more positive the experience of the activity because of the characteristics of the task, the greater the desire to engage in the activity. Elements of the physical activity that determine such beliefs might be not only the characteristics of the exercise program itself (e.g., mode of exercise) but also the social environment that is created by the exercise instructor (Turner, Rejeski, & Brawley, 1997). Thus, in contrast to the current research that employed inactive older individuals, future research should extend the scale to include the task-characteristics dimension and further test it with populations that represent various levels of exercise behavior.

**Practical Implications and Theoretical Significance of Findings**

The practical implications of the current findings focus on interventions to modify specific exercise amotivation beliefs. For instance, a decrease in outcome beliefs might necessitate an intervention to inform older individuals about the somatic and psychological gains that might be expected through exercise. That is, it might be necessary to provide detailed information regarding the specific positive changes that might occur in various body systems or deterioration of body functions with aging that might be prevented through regular exercise. To achieve a decrease in capacity beliefs, older individuals might need to experience exercise programs tailored to their current levels of physical ability and stamina. What might prove even more effective would be programs that are diverse in activities and pleasant, including social interaction with the other participants and leading postexercise to increased feelings of positive well-being, revitalization, and tranquility (Gauvin & Rejeski, 1993; McAuley & Courneya, 1994). Furthermore, the value attached to particular behaviors is linked to the satisfaction of the innate psychological needs for autonomy, competence, and relatedness (Kasser, 2002). Hence, future research
might attempt to examine the relationships between the value attached to exercise and the fulfillment of innate psychological needs. Moreover, a number of theoretical models of decision making provide the challenge of designing effective interventions to increase the probability of effecting such a behavioral change.

In terms of theoretical significance of findings, we concur with Legault et al. (2006) that the increasing number of research attempts to assess amotivation in various important behavioral domains from a multidimensional perspective might point to an extension of the behavioral-regulation continuum suggested by SDT theorists to formally include a multidimensional view of amotivation. Clearly, such a multidimensional view of amotivation opens new research avenues to more effectively study important amotivated behaviors.

Overall, our findings supported the validity of a four-dimensional conceptualization of exercise amotivation among inactive older individuals. The evidence supported the use of the ATES in future research attempting to uncover the factors that might facilitate or inhibit exercise amotivation among older inactive individuals and test the effectiveness of various interventions to weaken such beliefs and promote exercise initiation and regular involvement. Clearly, such a behavioral change would prove beneficial for sedentary older individuals, given the enormous health benefits that regular exercise can provide for this age group.

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References


