Original Article

Assessing Multidimensional Exercise Amotivation Among Adults and Older Individuals

The Amotivation Toward Exercise Scale – 2

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Abstract. The present study reported on the inclusion of a task-characteristics assessment to the Amotivation Toward Exercise Scale (ATES; Vlachopoulos & Gigoudi, 2008) and the evaluation of the revised self-report instrument (ATES-2) among physically active Greek-speaking adults and older individuals. The ATES-2 was completed by two samples of 201 and 150 physically active older individuals aged from 50 to 81 years and 781 adult exercise participants aged from 18 to 68 years. For both populations the results revealed a sound factor structure, strong internal consistency, and evidence supporting five correlated factors against five uncorrelated factors, a single factor, and a hierarchical structure. Factor discriminant validity analyses revealed five distinct factors for the older individuals whereas the outcome and value amotivation factors were perceived as indistinguishable for the adult exercise participants. Further, regression analyses provided initial support for the predictive validity of the scale scores. Overall, initial psychometric evidence emerged in support of the ATES-2 scores pointing to a promising instrument for the study of amotivation beliefs in regard to exercise behavior for both physically active adults and older individuals.

Keywords: amotivation, self-determination theory, physical activity, confirmatory factor analysis, scale refinement

Introduction

Given the plethora of health benefits accruing from regular physical activity and the worldwide trends of physical inactivity, understanding the reasons for refraining from regular exercise becomes of utmost importance. Self-determination theory (SDT: Ryan & Deci, 2002; Ryan, Williams, Patrick, & Deci, 2009) is relevant to the study of physical activity participation and outlines the mechanisms through which the social environment facilitates the internalization of behavior and takes into account the major motivational forces that determine human behavior: intrinsic motivation (doing something for the pleasure derived from the activity), extrinsic motivation (enacting the behavior to gain something separable from the activity), and amotivation (lacking the intention to perform a behavior). Specifically, amotivation is a state of lacking the intention to act and is manifested through either no action at all or going through the motions with no sense of intending to do what one does (Ryan & Deci, 2002). Theoretical advancements have led to the assessment of multidimensional amotivation using domain-specific scales in environment-protection behaviors (Pelletier, Dion, Tuson, & Green-Demers, 1999), the classroom setting (Legault, Green-Demers, & Pelletier, 2006), and exercise among older inactive individuals (Vlachopoulos & Gigoudi, 2008).

Amotivation Toward Exercise Scale

Vlachopoulos and Gigoudi (2008) developed the ATES to assess sources of exercise amotivation among Greek-speaking, physically inactive, older individuals. The amotivation beliefs assessed by the ATES were *capacity beliefs* referring to low perceived exercise competence, perceived lack of somatic and psychological resources to cope with the completion of an exercise program, low exercise self-efficacy expectations, and diminished physical self-percep-

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tions. *Outcome beliefs* referred to perceptions that exercise participation will not lead to either somatic or psychological benefits and that there is nothing to be gained from regular exercise. *Effort beliefs* referred to individuals' denial and lack of motivation to invest the necessary energy and effort required to exercise regularly and integrate exercise into their lifestyle and *value beliefs* were operationalized as perceptions of diminished importance and value of physical activity for the individual. Negative correlations emerged between perceived exercise competence and capacity beliefs; between attitude toward exercise and outcome, capacity, and value beliefs; and between intention to exercise and outcome and effort amotivation beliefs providing initial evidence for the construct validity of the ATES scores.

Clearly, just as is the case with academic amotivation that may result from perceiving the classroom tasks as uninteresting, boring, irrelevant, and lacking stimulating qualities (Legault et al., 2006), it is argued that amotivation toward exercise may also result from the same reasons. Perceptions of task characteristics are central in determining the exercise participants' experience and, consequently, their motivated exercise behavior, and much research has studied the optimal characteristics of exercise programs to maximize participants' positive exercise experience (Berger & Motl, 2001) and factors responsible for the creation of an optimal psychological environment to maximize exercise participants' enjoyment, interest, and positive affect (Raedeke, Focht, & Scales, 2007). The interaction between the person and a particular situation may stimulate interest in the activity (Krapp, 2000). Given that interest in a given activity may include both an intrinsic (emotion) and an extrinsic (value) motivational component (Kunter, Baumert, & Koller, 2007), the relevance of the activity characteristics to intrinsic and extrinsic motivation becomes evident. Task-characteristics beliefs together with outcome beliefs, capacity beliefs, effort beliefs, and value beliefs are conceptualized as complementary aspects of amotivation, each with distinct features. That is, different individuals may refrain from exercise as a result of adopting one or more of the above beliefs to a greater or lesser extent. Further, the concept of task characteristics is directly relevant to the concept of autonomy-supportive exercise-instructing behaviors posited by SDT, that is, behaviors targeted to improve the exercise experience and adherence through the fulfillment of the basic psychological needs for autonomy, competence, and relatedness (Edmunds, Ntoumanis, & Duda, 2007).

Aims of the Study and Hypotheses

The primary aim of the study was to revise the ATES by including an assessment of task characteristics as an additional source of exercise amotivation. Given that the concept of exercise amotivation is relevant not only to physically inactive individuals but also to explaining various levels of exercise behavior, a secondary aim of the study was to examine the psychometric properties of the revised instrument (ATES-2) both on physically active older exercise participants as well as adult exercise participants.

Given the a priori 5-factor structure of the ATES-2 scores, it was hypothesized (a) that the ATES-2 scores would conform to a 5-correlated-factor confirmatory factor analysis (CFA) model accompanied by evidence of scale dimensionality, factor discriminant validity, and strong subscale internal reliability and (b) that associations would be obtained in the expected direction between the ATES-2 subscale scores and the variables of perceived exercise competence, attitude toward exercise, and intention to exercise. As regards the task-characteristics subscale, negative correlations were expected with all of the three variables.

Materials and Methods

Participants

Three samples were used. Sample 1 consisted of 201 Greek-speaking physically active older adults, 75 men (37.3%) and 126 women (62.7%) aged from 53 to 81 years (M = 64.35, SD = 4.80). Responses to the question "How often do you feel you do not want to exercise?" with verbal indicators of 1 (*never*), 2 (*rarely*), 3 (*sometimes*), 4 (*very often*), 5 (*always*) ranged from 1 to 5 (M = 2.18, SD = 1.03). Sample 2 comprised 150 Greek-speaking older individuals aged from 50 to 69 (M = 57.88, SD = 5.07) including 41 men (27.3%) and 109 women (72.7%) who participated in a physical activity program of traditional dancing. Responses to the question "How often do you feel you do not want to exercise?" ranged from 1 to 5 (M = 1.98, SD = 0.95). Sample 3 consisted of 781 Greek-speaking adult exercise participants from two cities in Greece. Participants' age ranged from 18 to 68 years (M = 31.15, SD = 9.63). There were 310 (39.7%) men and 471 (60.3%) women. Responses to the question "How often do you feel you do not want to exercise?" ranged from 1 to 5 (M = 2.29, SD = 0.98).

Measures

Besides exercise amotivation, the variables of perceived exercise competence, attitude toward exercise, and intention to exercise were assessed for Sample 1 whereas exercise behavior was assessed for Sample 2.

Amotivation Toward Exercise

To assess individuals' amotivation beliefs we added to the ATES (Vlachopoulos & Gigoudi, 2008) three items for the

assessment of task characteristics. The revised scale (ATES-2) comprises 15 items divided into five subscales assessing outcome, capacity, effort, value, and task-characteristics amotivation beliefs. The initial 5-point response scale was modified to a 7-point scale to increase response variability anchored by 1 (*totally disagree*), 4 (*neutral*) and 7 (*totally agree*). Given the exercising nature of the samples, responses followed the stem "When you don't want to exercise, why is that"? Sample items are for the outcome beliefs ("because I am absolutely convinced that exercise will not have any positive effect on me"), capacity beliefs ("because I am absolutely convinced that I will not manage to cope with the requirements of an exercise program"), effort beliefs ("because I do not want at all to try to regularly attend an exercise program"), and value beliefs ("because I believe that exercise is not important at all") while the three new task-characteristic amotivation items were "because I find exercise really boring," "because I do not like exercise at all," and "because I do not find exercise interesting at all." These items were adapted from Legault et al. (2006) for the assessment of the task-characteristics amotivation beliefs in the classroom.

Perceived Exercise Competence

Perceptions of exercise competence were assessed via the sport competence subscale of the Physical Self-Perception Profile (PSPP; Fox & Corbin, 1989) modified for the exercise context. The word *exercise* was substituted for *sport* whereas the structured alternative response format was modified to a Likert-type scale to facilitate responding. Participants indicated their level of agreement with five statements anchored by 1 (*do not agree at all*) and 5 (*totally agree*). Vlachopoulos and Gigoudi (2008) have provided evidence of reliability and validity of the measure with older adults.

Attitude Toward Exercise

The stem "I think that participating in this exercise program three times per week for the remainder of this year is . . ." was followed by four bipolar adjectives responded to on a 6-point semantic differential scale used to assess attitude toward exercise. The scale ranged from 1 (*extremely boring*) to 6 (*extremely interesting*). The adjectives used were *boring-interesting, harmful-beneficial, pleasant-unpleasant,* and *important-unimportant*. Evidence of reliability and validity of the measure has been provided with older adults (Vlachopoulos & Gigoudi, 2008).

Intention to Exercise

Intention to exercise was assessed via three items: "I intend/I will try/I am determined to participate three times per week in this exercise program during the remainder of this year." Individuals responded on a 6-point semantic differential scale ranging from 1 (*extremely unlikely*) to 6 (*extremely likely*). Vlachopoulos and Gigoudi (2008) have provided evidence of reliability and validity for the measure with older individuals.

Exercise Behavior

The Godin Leisure Time Exercise Questionnaire (GLTEQ; Godin & Shepard, 1985) was used for the assessment of self-reported exercise behavior. Three questions are used to measure frequency of mild, moderate, and strenuous exercise behavior engaged in for at least 15 min during a typical week. An overall exercise behavior score may be calculated by summing the weighted product of each question as follows: (mild × 3) + (moderate × 5) + (strenuous × 9). Validity evidence for the scale has been provided by Jacobs, Ainsworth, Hartman, and Leon (1993).

Procedures

Permission to collect the data was verbally granted from the directors of the community exercise programs and the fitness centers. Self-report data were collected before initiation of the daily exercise program. Selection of the fitness centers and participants represented convenience sampling. The purpose of the study was explained to the participants along with their right to withdraw from the study at any time and questionnaires were completed. The participants provided their written informed consent for participation in the study and conduct of the study followed the university's research regulations.

Data Analysis

Initially Samples 1 and 2 were combined to increase the sample size for older individuals (total $n = 351$). Structural validity was assessed via the examination of the 5-correlated factor CFA ATES-2 model fit within adults and the elderly separately, followed by tests of scale dimensionality and discriminant validity. In scale dimensionality analyses the 5-correlated factor model was compared with a 5-uncorrelated factor model, a unidimensional model, and a hierarchical model. Discriminant validity was assessed through the comparison of the 5-correlated factor model with a series of competing CFA models representing all possible combinations of factors in pairs. The internal consistency of the scales was assessed through Cronbach's α. Following that, the two samples of adults and the elderly were examined for equivalence of the ATES-2 item loadings to determine the extent to which the respective factor solutions can be legitimately compared. Then, subscale correlations were examined for adults and the elderly sep-

Table 1. Five correlated factor CFA model parameter estimates for the ATES-2 scores among physically active adults and older individuals

Scale items	*M*		*SD*		Item skewness		Item kurtosis		Item loadings		Item uniquenesses		SMCs	
	O	A	O	A	O	A	O	A	O	A	O	A	O	A
Outcome beliefs														
Outcome 1 – Because I am absolutely convinced that exercise will not do me any good physically	1.55	1.36	0.82	0.89	1.95	3.37	5.07	13.44	.760	.690	.649	.724	.578	.476
Outcome 2 – Because I am absolutely convinced that exercise will not make me feel better	1.87	1.56	1.21	1.03	1.68	2.41	2.56	6.44	.867	.767	.499	.641	.751	.589
Outcome 3 – Because I am absolutely convinced that exercise will not have any positive effect on me	1.69	1.53	1.00	1.03	1.64	2.51	2.47	6.64	.887	.822	.462	.569	.787	.676
Capacity beliefs														
Capacity 1 – Because I am absolutely convinced that I will not manage to cope with the requirements of an exercise program	2.95	1.85	1.92	1.27	0.64	1.78	–0.89	2.98	.902	.727	.431	.687	.814	.528
Capacity 2 – Because I do not feel confident at all to meet the demands of an exercise program	2.72	1.80	1.74	1.23	0.79	1.89	–0.50	3.36	.807	.696	.591	.719	.651	.484
Capacity 3 – Because I feel very strongly that I lack the physical stamina required to meet the demands of an exercise program	3.31	2.29	1.99	1.60	0.24	1.28	–1.33	0.67	.882	.753	.472	.658	.778	.567
Effort beliefs														
Effort 1 – Because I do not want at all to try to attend regularly an exercise program	3.04	2.08	1.80	1.45	0.48	1.52	–0.88	1.67	.920	.791	.392	.612	.846	.625
Effort 2 – Because I do not wish to coordinate my life in order to attend regularly an exercise program	2.98	2.27	1.80	1.63	0.55	1.22	–0.80	0.44	.934	.758	.356	.653	.873	.574
Effort 3 – Because I do not want to put forth the effort required to regularly attend an exercise program	3.10	2.13	1.85	1.54	0.36	1.40	–1.14	1.00	.873	.873	.488	.487	.762	.763
Value beliefs														
Value 1 – Because I believe that exercise is not important at all	1.72	1.51	1.07	1.10	2.12	3.06	5.69	10.11	.774	.632	.633	.775	.599	.399
Value 2 – Because I believe exercise is useless and vain	1.60	1.36	1.01	0.80	2.35	3.17	6.52	12.45	.782	.811	.623	.586	.612	.657
Value 3 – Because I do not see any value at all in exercise	1.66	1.45	1.02	0.89	2.00	2.55	4.40	7.78	.914	.822	.405	.569	.836	.676
Task characteristics beliefs														
Task 1 – Because I find exercise really boring	2.01	1.99	1.38	1.43	1.37	1.58	1.10	1.75	.926	.862	.377	.506	.858	.744
Task 2 – Because I do not like exercise at all	1.93	1.82	1.34	1.30	1.50	1.98	1.56	3.81	.901	.883	.433	.469	.812	.780
Task 3 – Because I do not find exercise interesting at all	1.91	1.87	1.28	1.33	1.53	1.85	1.80	3.03	.913	.891	.408	.455	.834	.793

Note. O = older individuals; A = adults. Older individuals: n = 351 (Sample 1 & Sample 2). Adult exercise participants: N = 781 (Sample 3). CFA = confirmatory factor analysis; ATES-2 = Amotivation Toward Exercise Scale – 2; SMC = squared multiple correlation. Responses are provided on a 7-point scale. All factor loadings and item uniquenesses are statistically significant at $p < .05$.

arately, followed by the regression of perceived competence, attitude, intention, and exercise behavior on the ATES-2 subscale scores for the two elderly samples separately. CFA model fit was examined using the chi-square statistic (χ^2), the non-normed fit index (NNFI), the comparative fit index (CFI), the root mean squared error of approximation (RMSEA), its' accompanying 90% confidence interval (RMSEA 90% CI), and Akaike's information criterion (AIC).

Results

Descriptive Statistics, Factor Structure, and Internal Reliability

ATES-2 descriptive statistics for older individuals (n = 351) and the adult exercise participants (N = 781) are presented in Table 1. Given multivariate non-normality of the ATES-2 responses for both the older sample (Mardia's co-

Table 2. CFA goodness of fit indexes of various conceptualizations of the ATES-2 score dimensionality

CFA model	χ^2	*df*	S-B χ^2	χ^2 diff.	*df* diff.	Robust NNFI	Robust CFI	Robust RMSEA	Robust RMSEA 90% CI	Robust AIC
Older individuals (n = 351)										
Model 1: Correlated 5-factor	269.42	80	173.18	–	–	.952	.964	.058	.046–.069	13.18
Model 2: Single-factor	2101.92	90	1173.19	497.96*	10	.505	.576	.185	.176–.195	993.19
Model 3: Uncorrelated 5-factor	1040.42	90	706.76	960.30*	10	.718	.758	.140	.130–.149	526.76
Model 4: Hierarchical	401.60	85	256.36	75.97*	5	.917	.933	.076	.065–.086	86.36
Adults (N = 781)										
Model 1: Correlated 5-factor	596.45	80	272.56	–	–	.902	.925	.056	.048–.063	112.56
Model 2: Single-factor	1914.12	90	831.61	410.67*	10	.663	.711	.103	.097–.109	651.61
Model 3: Uncorrelated 5-factor	2926.41	90	1365.80	1311.14*	10	.420	.503	.135	.129–.142	1185.80
Model 4: Hierarchical	965.41	85	445.70	203.87*	5	.826	.860	.074	.067–.081	275.70

Note. CFA = confirmatory factor analysis; S-B χ^2 = Satorra-Bentler Scaled χ^2; NNFI = nonnormed fit index; CFI = comparative fit index; RMSEA = root mean squared error of approximation; AIC = Akaike's information criterion. *significant at $p < .01$. Models 2, 3, and 4 are contrasted to Model 1 for both populations. Contrasts are based on the S-B χ^2 values.

Table 3. Factor separability results through CFA for older individuals

CFA model	χ^2	S-B χ^2	*df*	S-B χ^2 diff.	*df* diff.	Robust NNFI	Robust CFI	Robust RMSEA	Robust RMSEA 90% CI	Robust AIC
Model 1: 5-Correlated factor model	269.42	173.18	80			.952	.964	.058	.046–.069	13.18
Model 2: Outcome-Capacity	836.53	540.97	84	417.31*	4	.776	.821	.125	.115–.135	372.97
Model 3: Outcome-Effort	933.09	569.18	84	200.37*	4	.762	.810	.128	.118–.138	401.18
Model 4: Outcome-Value	452.27	269.52	84	44.32*	4	.909	.927	.079	.069–.090	101.52
Model 5: Outcome – task	575.01	327.21	84	52.78*	4	.881	.905	.091	.081–.101	159.21
Model 6: Capacity-Effort	680.95	427.57	84	176.60*	4	.832	.865	.108	.098–.118	259.57
Model 7: Capacity-Value	982.34	655.93	84	2123.24*	4	.720	.776	.139	.129–.149	487.93
Model 8: Capacity – task	950.09	621.62	84	693.03*	4	.737	.789	.135	.125–.145	435.62
Model 9: Effort-Value	995.96	598.92	84	190.84*	4	.748	.798	.132	.122–.142	430.92
Model 10: Effort – task	1123.82	780.15	84	–989.37[a]	4	.659	.727	.154	.144–.164	612.15
Model 11: Value – task	551.31	347.61	84	128.62*	4	.871	.897	.095	.084–.105	179.61

Note. n = 351. The factor labels in each of the Models 2 to 11 indicate those items specified to load onto the same factor. S-B χ^2 = Satorra-Bentler scaled χ^2 statistic; CFA = confirmatory factor analysis; NNFI = nonnormed fit index; CFI = comparative fit index; RMSEA = root mean squared error of approximation; AIC = Akaike's information criterion. Models 2 to 11 are contrasted to Model 1. *significantly different at $p < .01$. [a]According to Satorra and Bentler (2001), the Satorra – Bentler test of difference can generate negative scaled difference statistics. When this occurs, a significance test cannot be performed. This is not normally a problem as one would rarely wish to test for a difference when models are clearly highly misspecified.

efficient normalized estimate = 77.08) and the adult sample (Mardia's coefficient normalized estimate = 220.60), the goodness-of-fit indexes (corrected for nonnormality) were consulted. The indexes for the older individuals provided a good fit to the data: Satorra-Bentler (S-B) scaled χ^2 = 173.18, df = 80, robust NNFI = .952, robust CFI = .964, robust RMSEA = .058, and 90% CI = .046 – .069. The completely standardized item loadings ranged from .760 to .934. All alpha values of the variables assessed were greater than .70 (Table 5). The goodness-of-fit indexes for the adult sample were S-B scaled χ^2 = 272.56, df = 80, robust NNFI = .902, robust CFI = .925, robust RMSEA = .056, and 90% CI = .048 – .063. The completely standardized item loadings ranged from .632 to .891. All the ATES-2 alpha values were greater than .70 (Table 5).

In regard to scale dimensionality, the 5-correlated factor model was a significant improvement over the 5-uncorrelated factor model, the unidimensional model, and the hierarchical model for both the older individuals and the adult samples (Table 2). The hierarchical model was a tenable representation of the ATES-2 scores but only for the older participants and still statistically significantly worse than the 5-correlated factor model (Table 2).

The discriminant validity analyses resulted in clear distinctions between the 5 hypothesized factors for the elderly (Table 3). However, for the adult sample, the model that

Table 4. Factor separability results through CFA for adult exercise participants

CFA model	χ^2	S-B χ^2	*df*	S-Bχ^2 diff.	*df* diff.	Robust NNFI	Robust CFI	Robust RMSEA	Robust RMSEA 90% CI	Robust AIC
Model 1: 5-Correlated factor model	596.45	272.56	80	–	–	.902	.925	.056	.048–.063	112.56
Model 2: Outcome-Capacity	972.30	446.57	84	192.15*	4	.823	.859	.075	.068–.081	278.57
Model 3: Outcome-Effort	1233.69	574.11	84	468.61*	4	.761	.809	.087	.080–.093	406.11
Model 4: Outcome-Value	607.29	272.07	84	–	–	.908	.927	.054	.047–.061	104.07
Model 5: Outcome – task	1234.93	552.70	84	202.43*	4	.772	.817	.085	.078–.092	384.70
Model 6: Capacity-Effort	723.38	328.10	84	50.10*	4	.881	.905	.061	.054–.068	160.10
Model 7: Capacity-Value	1000.06	453.73	84	160.36*	4	.820	.856	.075	.069–.082	285.73
Model 8: Capacity – task	874.99	398.44	84	118.51*	4	.847	.878	.069	.063–.076	230.44
Model 9: Effort-Value	1325.48	603.90	84	313.80*	4	.747	.798	.089	.083–.096	435.90
Model 10: Effort – task	909.59	410.72	84	114.26*	4	.841	.873	.071	.064–.078	242.72
Model 11: Value – task	1295.66	564.82	84	158.75*	4	.766	.813	.086	.079–.093	396.82

Note. n = 781. The factor labels in each of the Models 2 to 11 indicate those items specified to load onto the same factor. S-B χ^2 = Satorra-Bentler scaled χ^2 statistic; CFA = confirmatory factor analysis; NNFI = nonnormed fit index; CFI = comparative fit index; RMSEA = root mean squared error of approximation; AIC = Akaike's information criterion. Models 2 to 11 are contrasted to Model 1. *significantly different at $p < .01$. Model 4 cannot be statistically compared to Model 1 given a S-B χ^2 value lower than the respective Model 1 value.

Table 5. Variable means, standard deviations, and correlations among older individuals and adult exercise participants

ATES-2 subscales	Older individuals										
	M	*SD*	1	2	3	4	5	6	7	8	9
1. Outcome	1.70	0.91	[.85]								
2. Capacity	2.99	1.72	.45*	[.89]							
3. Effort	3.04	1.71	.44*	.59*	[.93]						
4. Value	1.66	0.92	.66*	.28*	.24*	[.86]					
5. Task	1.95	1.26	.67*	.35*	.45*	.65*	[.93]				
6. Comp.	3.23	1.06	–.44*	–.57*	–.44*	–.31*	–.39*	[.94]			
7. Attitude	5.01	0.92	–.57*	–.40*	–.41*	–.53*	–.60*	.52*	[.82]		
8. Intention	4.53	1.47	–.29*	–.32*	–.31*	–.21*	–.24*	.51*	.56*	[.92]	
9. Exercise	33.82	16.59	–.26*	–.40*	–.32*	–.22*	–.13	–	–	–	–
	Adults										
	M	*SD*	1	2	3	4	5				
1. Outcome	1.49	0.83	[.79]								
2. Capacity	1.98	1.13	.54*	[.76]							
3. Effort	2.17	1.35	.53*	.65*	[.84]						
4. Value	1.44	0.79	.79*	.50*	.51*	[.79]					
5. Task	1.90	1.24	.62*	.60*	.71*	.57*	[.90]				

Note. Response scale for ATES-2: 1–7; Competence: 1–5; Attitude and intention: 1–6. Exercise = total exercise behavior; comp. = competence. Pearson's correlations have been calculated for older individuals (n = 351) and adults (N = 781) separately. Correlations within older individuals with competence, attitude, and intention are based on Sample 1 (N = 201). Correlations within elderly with exercise are based on Sample 2 (N = 150). Alphas for competence, attitude, and intention are based on Sample 1 (N = 201). Alphas are presented on the diagonal. Total exercise scores ranged from 10 to 107.

allowed for the outcome and value factors to be merged (Model 4) could not be compared to the 5-correlated factor model given a S-B χ^2 value lower (i.e., better) than the value of the target model. Model 4 appeared slightly better than the target model, showing a lack of conceptual discrimination between the outcome and value subscale item meaning (Table 4).

In regard to ATES-2 cross-sample comparison, the configural CFA multigroup analysis demonstrated a good fit of the model to the data: S-B scaled χ^2 = 462.59, df = 160, robust CFI = .941, robust RMSEA = .041, and 90% CI = .037–.045. The metric invariance multigroup model also had a good fit to the data with S-B scaled χ^2 = 546.94, df = 175, robust CFI = .927, robust RMSEA = .043, and 90% CI = .039–.048. The CFI difference (ΔCFI) between the models was larger than .01 (ΔCFI = .014), indicating a fit

Table 6. Standardized β regression coefficients and part correlations from the prediction of external variables by ATES-2 scores

ATES-2 subscales	Perceived competence		Attitude toward exercise		Intention to exercise		Total exercise behavior	
	β	part	β	part	β	part	β	part
Outcome	–.11	–.07	–.20*	–.13	–.07	–.05	–.15	–.07
Capacity	–.41*	–.31	–.03	–.02	–.17*	–.13	–.27*	–.19
Effort	–.14	–.11	–.11	–.08	–.18*	–.14	–.13	–.08
Value	–.08	–.05	–.20*	–.14	–.11	–.08	–.02	–.01
Task	.01	.00	–.27*	–.17	.05	.03	.13	.08

Note. Prediction of exercise competence, attitude, and intention is based on sample 1 (N = 201). Prediction of exercise behavior is based on Sample 2 (N = 150). Part = part correlation. *$p < .05$.

deterioration for the metric invariance model (Cheung & Rensvold, 2002). In addition, evidence emerged for non-equivalence for the three ability, three effort, and the third value item loadings, indicating a different item interpretation across the two populations.

The subscale means were quite low for both the active adult and the older individual sample (Table 5) with satisfactory standard deviations for all the subscales for both samples. The strength of the subscale correlations was of a moderate magnitude for the adult sample whereas the magnitude of the correlations for the older individuals sample was a bit weaker.

Regression Analyses

Before proceeding to the regression analyses, a CFA that tested (in Sample 1) a model involving only the task characteristics and attitude items supported discrimination of the constructs: S-B χ^2 = 33.91, df = 13, $p < .01$, robust NNFI = .942, robust CFI = .964, robust RMSEA = .090, and 90% CI (.053–.127). Linear regression analyses positing the variables of perceived exercise competence, attitude toward exercise, intention to exercise, and exercise behavior to be regressed on the five ATES-2 subscale mean scores demonstrated that perceived competence was negatively predicted only by the capacity amotivation beliefs; attitude toward exercise was negatively predicted by outcome, value, and task-characteristics beliefs; and intention to exercise was negatively predicted by capacity and effort beliefs. Exercise behavior was predicted only by capacity amotivation beliefs.

Discussion

In the present study the ATES (Vlachopoulos & Gigoudi, 2008) was revised to include an assessment of task characteristics in line with previous amotivation research in other important behavioral domains (Legault et al., 2006). The task-characteristics subscale was included, given the important role that perceptions of the exercise characteristics may play in motivational processes in relation to exercise participation and adherence. The findings provided initial support for the use of the instrument with both physically active adults and older exercise participants. The results pointed to a sound factor structure for both adults and older exercise participants with strong item loadings and high internal consistency. Both the adults and the older participants perceived the scale items as assessing five related sources of exercise amotivation. The discriminant validity analyses for the older adults provided evidence of distinctiveness between the 5 ATES-2 factors but that was not the case for the adult exercise participants, who did not distinguish between the outcome and the value subscale items. That is, items referring to positive outcomes (physical and psychological) that may be derived from exercise were not distinguished from perceptions that exercise is important and of value to the individuals. Older adults may acknowledge that exercise may have a positive effect on them (possibly in terms of health benefits: Rasinaho, Hirvensalo, Leinonen, Lintunen, & Rantanen, 2007) but the importance of exercise behavior may not be much augmented for these individuals owing to minimal past socialization to the value and health relevance of exercise. Adults may both acknowledge the positive effects that exercise may have on them and at the same time may attach much greater importance to exercise given greater socialization in regard to the importance and health relevance of this behavior. Assessment of exercise amotivation via the ATES-2 among adult exercise participants may require viewing the outcome and value subscale items as indicators of a single construct until more evidence is gathered to shed more light on this issue.

The four initial amotivation subscale scores were correlated once again with important motivational determinants of exercise such as attitude toward exercise, intention to exercise, and perceived exercise competence. Task characteristics also contributed significantly to a positive attitude toward exercise, emerging as an additional amotivation factor relevant to the exercise experience. Further, and in line with previous research highlighting the central role of perceptions of self-efficacy and perceived competence in exercise attendance and adherence/dropout (Bock et al., 1997), exercise behavior was predicted by capacity amotivation beliefs.

The present work provides a measure useful in the assessment of the impact of characteristics of particular exercise programs and exercise-instructing behaviors on participants' task-characteristics amotivation and its' influence on exercise behavior. The present findings are limited to adult and elderly Greek-speaking exercise participants attending either private or community-based fitness centers. Further psychometric evaluation of the instrument should take place with adults and older individuals who refrain from exercise as well as children and adolescents given the high levels of physical inactivity linked with obesity and cardiovascular heart disease in these populations.

Theoretical and Practical Significance of Findings

The ATES-2 represents a comprehensive approach to the assessment of sources of exercise amotivation and allows for research targeted toward (1) a better understanding of the role of amotivation beliefs in refraining from exercise, (2) the explanation of various levels of exercise behavior, and (3) the examination of the effectiveness of various interventions aimed either at behavior change in sedentary individuals to initiate exercise or the increase of exercise among physically active individuals by further diminishing levels of amotivation that may be experienced during exercise.

Given that validation of instrument scores is an ongoing process, further research should examine other select psychometric properties of the revised instrument among both adults and older individuals. In sum, the initial evidence for the use of the ATES-2 in relation to exercise behavior is promising and the revised instrument is deemed useful for a more holistic understanding of the role of amotivation beliefs in exercise behavior.

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