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The purpose of the present study was to examine the relative contribution of the needs for autonomy, competence, and relatedness in the prediction of the specific exercise feelings of revitalization, tranquility, physical exhaustion, and positive engagement. Data were collected from 423 Greek-speaking exercise participants using self-report questionnaires. Hierarchical regression analyses revealed that revitalization/positive engagement were predicted by the contextual needs for competence and relatedness, and the situational need for competence. Tranquility was predicted by the contextual need for competence. Physical exhaustion was negatively predicted by the situational need for relatedness. In addition, all three feelings were further predicted by situational exercise-instructor perceived autonomy. The results supported the hypotheses of the basic psychological needs theory of the self-determination framework with respect to exercise feelings assessed in this study.

) ? S Q I self-determination theory, autonomy, competence, relatedness, psychological responses to exercise, physical activity

*An extended Summary Plus English version is freely available at www.hellenicjsport.com

Introduction

The purpose of the present study was to examine the extent of the contribution of the psychological needs for autonomy, competence, and relatedness (Deci & Ryan, 2002) assessed at the contextual and the situational levels of generality, and the situational perceptions of autonomy support by the exercise instructor in the prediction of the specific exercise feelings of revitalization, tranquility, physical exhaustion, and positive engagement (Gauvin & Rejeski, 1993).

Method

Participants

There were 423 Greek-speaking exercise participants of which 344 attended private fitness centers (81.3%) and 79 (18.7%) community exercise programs. The participants were aged between 17 and 64 years ($M = 33.95$, $SD = 10.17$) including 165 males (39%) and 258 females (61%).

Measurement Tools

The Basic Psychological Needs in Exercise Scale (BPNES: Vlachopoulos & Michailidou, 2006) was used to assess the extent to which the participants' needs for autonomy, competence, and relatedness were satisfied in exercise in general. The instrument comprised 12 items divided into three subscales measuring each of the psychological needs with four items per subscale. Situational need satisfaction was also assessed in the present study through modifying the stem of the scale to become appropriate for a situational assessment of these needs. To assess situational perceptions of autonomy support by the exercise instructor, the 6-item version of the Sport Climate Questionnaire (Deci & Ryan, 2007) was translated into Greek and modified for the exercise context. The SCQ assesses perceptions of the extent to which the exercise instructor engages in a number of autonomy-supportive behaviors. The Exercise-induced Feeling Inventory (EFI: Gauvin & Rejeski, 1993) was employed to assess the extent to which participants experienced the feelings of revitalization, tranquility, physical exhaustion, and positive engagement. The scale comprises 12 items divided into four subscales with three items per subscale.

Procedures

The variables that were assessed immediately post-exercise were participants' situational perceptions of need satisfaction, their perceptions of autonomy support provided by the exercise instructor during their class, and their post-exercise feeling states. Before commencement of their exercise class respondents completed the BPNES to assess contextual perceptions of need satisfaction in exercise to more accurately examine the unique contribution of situational need satisfaction and situational perceptions of autonomy support over and beyond the variance explained by contextual need satisfaction. Written informed consent for participation was also granted by the participants whereas the study was conducted in line with the university's research regulations.

Results

The descriptive statistics revealed that on average, the participants reported moderate levels of need satisfaction -- both contextual and situational – and moderate levels of feelings of revitalization, tranquility, and positive engagement after their exercise class. Moreover, they reported increased levels of situational autonomy support and decreased levels of physical exhaustion. All Cronbach’s alpha values were greater than .70 (Table 1).

* Table 1
Descriptive Statistics and Pearson’s Correlations Between Need Satisfaction Variables, Autonomy Support, and Exercise Feelings

Variables	<u>M</u>	<u>SD</u>	1	2	3	4	5	6	7	8	9	10	11
V1. Contextual autonomy	3.68	0.78	[.80]										
V2. Contextual competence	3.52	0.78	.72*	[.78]									
V3. Contextual relatedness	3.69	0.82	.43*	.42*	[.83]								
V4. Situational autonomy	3.59	0.84	.68*	.65*	.45*	[.86]							
V5. Situational competence	3.52	0.82	.61*	.73*	.43*	.84*	[.84]						
V6. Situational relatedness	3.57	0.85	.34*	.35*	.73*	.49*	.49*	[.88]					
V7. Situational autonomy support	5.31	1.29	.47*	.47*	.42*	.53*	.55*	.47*	[.93]				
V8. Revitalization	2.70	0.90	.48*	.56*	.43*	.56*	.59*	.40*	.47*	[.79]			
V9. Tranquillity	2.47	0.85	.32*	.38*	.23*	.34*	.38*	.28*	.37*	.62*	[.77]		
V10. Positive engagement	2.80	0.86	.42*	.48*	.41*	.49*	.53*	.39*	.40*	.80*	.59*	[.79]	
V11. Physical exhaustion	1.41	1.01	-.14*	-.12*	-.18*	-.10*	-.12*	-.21*	-.24*	-.20*	-.11*	-.15*	[.76]

Note. N = 423; * p < .05. Cronbach’s alpha values are presented in brackets on the diagonal.

Confirmatory Factor Analyses

Overall, confirmatory factor analyses supported a sound factor structure for the situational BPNES, the sport climate questionnaire and the EFI. A considerable correlation was found between the situational assessment of autonomy and competence for the BPNES and between the revitalization and the positive engagement factors. Based on similar previous findings, revitalization and positive engagement items were combined into one factor.

Table 2
Correlated 3-factor CFA Model Parameter Estimates of the BPNES Responses at the Situational Level

Scale items	<u>M</u>	<u>SD</u>	Skewness	Kurtosis	Item loadings	Item uniquenesses	SMCs
<u>Situational Autonomy</u>							
Item 3	3.59	0.99	-0.47	-0.19	.781	.624	61%
Item 6	3.57	1.02	-0.54	-0.08	.831	.557	69%
Item 9	3.59	0.97	-0.52	0.00	.805	.594	64%
Item 12	3.60	1.01	-0.55	-0.12	.726	.688	52%
<u>Situational Competence</u>							
Item 1	3.34	0.98	-0.36	-0.18	.736	.677	54%
Item 4	3.55	1.00	-0.44	-0.25	.754	.657	56%
Item 7	3.68	0.99	-0.66	-0.03	.785	.620	61%
Item 10	3.52	0.99	-0.48	-0.16	.786	.618	61%
<u>Situational Relatedness</u>							
Item 2	3.55	0.95	-0.31	-0.51	.798	.603	63%
Item 5	3.60	0.97	-0.46	-0.24	.841	.541	70%
Item 8	3.61	0.98	-0.48	-0.21	.844	.537	71%
Item 11	3.53	1.04	-0.47	-0.31	.786	.618	61%

Note. N = 423; CFA = Confirmatory Factor Analysis; BPNES = Basic Psychological Needs in Exercise Scale; SMC = Squared Multiple Correlation. All factor loadings and item uniquenesses are statistically significant at p < .05.

Table 3
Correlated 4-factor Confirmatory Factor Analysis Model Parameter Estimates for the Translated EFI Items

Scale items	<u>M</u>	<u>SD</u>	Skewness	Kurtosis	Item loadings	Item uniquenesses	SMCs
<u>Revitalization</u>							
Item 1: Refreshed	2.60	1.06	-0.63	-0.01	.761	.649	57%
Item 6: Energetic	2.94	1.02	-0.82	0.06	.727	.687	52%
Item 9: Revived	2.55	1.12	-0.49	-0.42	.766	.643	58%
<u>Tranquillity</u>							
Item 2: Calm	2.55	1.01	-0.37	-0.42	.778	.628	60%
Item 5: Relaxed	2.43	1.04	-0.40	-0.37	.673	.740	45%
Item 10: Peaceful	2.42	1.01	-0.32	-0.42	.715	.699	51%
<u>Physical Exhaustion</u>							
Item 3: Fatigued	1.56	1.21	0.32	-0.84	.747	.665	55%
Item 8: Tired	1.63	1.22	0.20	-0.95	.832	.554	69%
Item 11: Worn-out	1.05	1.25	0.95	-0.25	.587	.810	34%
<u>Positive Engagement</u>							
Item 4: Enthusiastic	2.57	1.03	-0.39	-0.50	.764	.645	58%
Item 7: Happy	2.82	0.97	-0.65	-0.02	.744	.668	55%
Item 12: Upbeat	3.02	1.08	-0.91	0.00	.750	.662	56%

Note. N = 423; EFI = Exercise-induced Feeling Inventory; SMC = Squared Multiple Correlation. All factor loadings and item uniquenesses are statistically significant at $p < .05$.

Table 4
Situational BPNES Factor Separability Results Through Confirmatory Factor Analysis

CFA Model	χ^2	df	χ^2 diff	df diff	NNFI	CFI	SRMR	RMSEA	RMSEA 90% CI	AIC
Model 1: Correlated 3-factor model	184.81	51			.945	.958	.041	.079	.067 - .091	82.81
Model 2: Autonomy - Competence	188.45	53	3.64	2	.947	.957	.041	.078	.066 - .090	82.45
Model 3: Autonomy - Relatedness	796.20	53	611.39*	2	.708	.766	.112	.182	.171 - .193	690.20
Model 4: Competence - Relatedness	781.90	53	596.09*	2	.714	.770	.110	.181	.169 - .192	675.90

Note. N = 423. The factor labels in each of the Models 2, 3, and 4 indicate those items specified to load onto the same factor. NNFI = Non-normed Fit Index; CFI = Comparative Fit Index; SRMR = Standardized Root Mean Squared Residual; RMSEA = Root Mean Squared Error of Approximation; AIC = Akaike's Information Criterion. * significantly different at $p < .05$.

Table 5
EFI Factor Separability Results Through Confirmatory Factor Analysis

CFA Model	χ^2	df	χ^2 diff	df diff	NNFI	CFI	SRMR	RMSEA	RMSEA 90% CI	AIC
Model 1: Correlated 4-factor model	232.78	49			.891	.919	.059	.094	.082 - .106	134.77
Model 2: Revital - Tranquil	299.08	51	66.30*	2	.858	.890	.059	.107	.096 - .119	197.08
Model 3: Revital - Exhaustion	532.17	51	299.39*	2	.725	.787	.108	.150	.138 - .161	430.17
Model 4: Revital - Engagement	214.74	51	18.04*	2	.906	.928	.050	.087	.075 - .099	112.74
Model 5: Tranquil - Exhaustion	560.17	52	327.39*	3	.715	.775	.114	.152	.141 - .163	456.17
Model 6: Tranquil - Engagement	300.55	51	67.77*	2	.857	.890	.059	.108	.096 - .119	198.55
Model 7: Exhaustion - Engagement	554.95	52	322.17*	3	.718	.778	.113	.151	.140 - .163	450.95

Note. N = 423. The factor labels in each of the Models 2 to 7 indicate those items specified to load onto the same factor. NNFI = Non-normed Fit Index; CFI = Comparative Fit Index; SRMR = Standardized Root Mean Squared Residual; RMSEA = Root Mean Squared Error of Approximation; AIC = Akaike's Information Criterion. Revital = Revitalization; Tranquil = Tranquillity; Models 2 to 7 are contrasted to Model 1. * significantly different at $p < .05$.

Linear Regression

Both need satisfaction and autonomy support contributed to the prediction of all three EFI variables. Specifically, for revitalization/positive engagement, both context-level competence and relatedness contributed to the prediction while situational competence need satisfaction and situational autonomy support further enhanced this prediction (Table 6). In total 43% of the variance was explained by the predictor variables. The significant predictors of tranquility were context-level competence satisfaction and situational autonomy support

explaining a total of 22% of the tranquility variance. The significant predictors of physical exhaustion were situational relatedness and situational autonomy support explaining a total of 8% of the variance.

Table 6
Prediction of EFI Variables by Context- and Situational-Level Need Satisfaction and Situational Autonomy Support

Predictor variables (Step 4)	Standardized Beta Coefficients		
	Revitalization/ Positive Engagement	Tranquility	Physical Exhaustion
Gender	.02	.00	-.03
Age	.03	.06	.03
Contextual Autonomy	.02	.03	-.07
Contextual Competence	.18*	.19*	.00
Contextual Relatedness	.14*	-.07	-.02
Situational Autonomy	.08	.00	.13
Situational Competence	.23*	.07	.00
Situational Relatedness	.02	.12	-.14*
Situational Autonomy Support	.11*	.18*	-.20*

Note. Variance explained within each regression step for revitalization/positive engagement: Step 1: 2%; Step 2: 37%; Step 3: 42%; Step 4: 43%; Tranquility: Step 1: 2%; Step 2: 16%; Step 3: 18%; Step 4: 20%; Physical exhaustion: Step 1: 0%; Step 2: 4%; Step 3: 5%; Step 4: 8%. All steps were statistically significant ($p < .05$) except for Step 1 in physical exhaustion. * $p < .05$.

Discussion

Hierarchical regression analyses revealed that revitalization/positive engagement were predicted by the contextual needs for competence and relatedness, and the situational need for competence. Tranquility was predicted by the contextual need for competence. Physical exhaustion was negatively predicted by the situational need for relatedness. In addition, all three feelings were further predicted by situational exercise-instructor perceived autonomy. The results supported tenets of the basic psychological needs theory of the self-determination framework with respect to specific exercise feelings.

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