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The relationship of self-determination theory variables to exercise identity

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ABSTRACT

Objectives: The aim of the present study was to examine the patterns of association of self-determination theory variables with exercise role identity and exercise beliefs as parts of exercise identity among men and women.
Design: A cross-sectional study in which perceived autonomy support by the exercise instructor, basic psychological needs, behavioral regulations, and exercise identity were assessed among 733 exercise participants aged 18–64 yrs.
Results: Hierarchical regression analyses revealed that all types of behavioral regulations and the fulfillment of the need for competence were associated with the exercise role identity part of exercise identity whereas introjected regulation, identified regulation, intrinsic motivation and the needs for competence and relatedness were associated with the exercise beliefs part of exercise identity.
Conclusions: The findings revealed meaningful associations between self-determination theory variables and exercise identity supporting the relevance of self-determination theory in better understanding the processes related to the adoption and maintenance of an exercise identity.

Given the alarming physical inactivity trends worldwide (Cavill, Kahlmeier, & Racioppi, 2006; Pleis & Lethbridge-Çejku, 2006) with the detrimental consequences for public health, a better understanding of motivational issues surrounding exercise participation becomes of utmost importance. Considerable evidence now exist showing that approaching the issue of exercise participation from the viewpoint of self-determination theory (Hagger & Chatzisarantis, 2008; Vlachopoulos, 2009; Wilson, Mack, & Grattan, 2008) and identity theory (Anderson & Cychosz, 1994, 1995) is promising for a better understanding of the dynamics of exercise participation. Thus, the need is evident to attempt to investigate the link between self-determination theory and identity theory in order to delineate the role of motivational dynamics in shaping and maintaining an exercise identity.

Exercise identity

The relationship between exercise identity and exercise behavior has been studied to a large extent and evidence has accrued linking exercise identity with self-reported minutes of weekly exercise, number of weeks of exercise participation, perceived exertion during exercise, muscular endurance, percentage of body fat, and fitness levels (Anderson & Cychosz, 1995; Anderson, Cychosz, & Franke, 1998). Further, a gradual increase has been found in exercise identity strength across categories of exercise participants differing in the amount and intensity of their exercise behavior (e.g., non exercisers, walkers, and vigorous exercisers) (Anderson & Cychosz, 1995) as well as over the course of an exercise program (Cardinal & Cardinal, 1997). In these studies exercise identity was measured via the uni-dimensional Exercise Identity Scale (EIS: Anderson & Cychosz, 1994) which later was found to comprise two parts of exercise identity, namely an 'exercise identity role' part and an 'exercise beliefs' part (Wilson & Muon, 2008). Thus, the extensive evidence linking exercise identity with indices of exercise behavior combined with the limited study of the role of this construct in motivational processes underpinning exercise participation make the study of the exercise identity construct warranted.

Two important theoretical approaches to understand identity as a central factor in the regulation of human behavior within social groups have been social identity theory and identity theory, both originating in the realm of sociological social psychology (Stets & Burke, 2000). On the one hand social identity theorists hold that a social identity is a person's knowledge that she/he belongs to a social category or group and concerns the perceived similarities

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between the self and other in-group members and perceived differences between the self and out-group members. On the other hand, identity theorists hold that the core of an identity is categorizing the self as an occupant of a role and incorporating into the self the meanings and expectations associated with that role and its' performance (Burke & Tully, 1977). These expectations and meanings form a set of standards that guide behavior (Stets & Burke, 2000). In terms of the motivational processes related to each of the theories, when a social identity is activated (i.e., becomes salient) and attended to, a number of motives may come into play such as a collective self-esteem motive, a self-knowledge motive, a self-consistency motive, a self-efficacy motive, an uncertainty reduction motive, and a self-regulation motive. In the context of identity theory, activation of an identity would lead to greater effort into enacting the identity while self-verification through performing the role well would increase self-esteem and self-efficacy. Further, the motivational elements of self-consistency and self-regulation would also be implicated into the internal dynamics of identity processes (Stets & Burke, 2000). Role identities are viewed as subcomponents of the self (Stets & Burke, 2003). Studying identities is important given that they are thought to guide behavior and create role expectations both within the individual holding that identity and others (Stets & Burke, 2003). Further, the relationship between a role identity and behavior is reciprocal given that a role identity may be formed via interactions with others in particular contexts (Stryker, 1980). Identity formation reflects a series of ongoing processes between the individual and the social environment responsible for the adoption of values, roles, and beliefs by individuals over time (Ryan & Deci, 2003; Stets & Burke, 2003).

Self-determination theory and exercise behavior

Given that ongoing interactions between individuals and the social environment may lead to the development and adoption of particular identities, self-determination theory (SDT: Deci & Ryan, 1985; Ryan & Deci, 2002) seems to be a theoretical viewpoint through which the acquisition and maintenance of identities may be better understood. SDT has been increasingly applied to exercise and physical activity (Ryan & Deci, 2007; Ryan, Williams, Patrick, & Deci, 2009) and outlines the personal and social-environmental determinants of motivated behavior. A special emphasis is also placed on the quality of motivated behavior as well as the mechanisms of internalization of behavior. In general, three main types of motivational regulations are proposed: Amotivation, extrinsic motivation, and intrinsic motivation. Intrinsically motivated behaviors are enacted out of fun, pleasure, and satisfaction derived from the behavior. Extrinsically motivated behaviors are enacted in order to gain something separable from the behavior (e.g., to satisfy an external demand, to avoid feeling bad, gain benefits, etc.). Amotivation is a state of lacking intention to act and is manifested through either not acting at all or going through the motions with no intention to do what one does (Ryan & Deci, 2002). Extrinsic motivation serves the mechanism of internalization of behavior proposed by SDT. That is, extrinsic motivation is theoretically broken down into four more specific behavioral regulations. These regulations may be placed on a continuum of behavioral self-determination. Running from the least to the most self-determined types of regulations, there is a gradual increase in the sense of choice in enacting a particular behavior. External regulation reflects behavior enacted to satisfy an external demand while introjected regulation is a more internalized form of non self-determined extrinsic motivation and reflects behavior enacted to serve the avoidance of feelings of guilt and the facilitation of ego enhancements. Identified regulation, which is a self-determined form of extrinsic motivation, corresponds with an even greater sense of choice in enacting the behavior and energizes behavior that is considered valued for the individual whereas integrated regulation (the most self-determined form of extrinsic motivation) energizes behavior felt as part of the individual's self. These regulations from the least to the most self-determined reflect a gradual increase in the sense of felt choice in enacting the behavior and the extent to which the behavior has been internalized to the self. In line with SDT the fulfillment of individuals' innate psychological needs for autonomy, competence, and relatedness promotes greater internalization of behavior and well-being. Autonomy refers to individuals' need to feel like the origin of their behavior; competence refers to the need to feel effective in their behavior and relatedness refers to the need to be authentically associated and to belong with significant others. Further, perceptions of autonomy support by significant others energize and support the mechanism of internalization via the satisfaction of the three psychological needs (Ryan & Deci, 2002; Vallerand, 2007).

The self-determination theory view of identity assimilation to the self

Ryan and Deci (2003) hold that the acquisition and maintenance of identities is a dynamic process in which identities are developed and adopted to satisfy the basic psychological needs for autonomy, competence, and relatedness and thus may be understood as a complex expression of the interaction between needs and social context affordances. Identities may also be formed in reaction to need deprivation, in which case, are taken on more defensively either to avoid feelings of vulnerability or to gain power over others or even reactively in order to oppose the values of controlling authorities. Identities may be more or less well assimilated to the self as they may be forced on us by the social context or partially assimilated as introjects or even well integrated into the self to serve as meaningful guides to life or they may grow directly from natural inclinations, interests, and curiosity with greater identity assimilation to correspond to greater fulfillment of the basic needs. That is, the reason for which an identity is possessed corresponds to the extent to which the behavioral regulation that underlies that identity has been internalized and integrated into one's sense of self (Ryan & Deci, 2003). Further, according to Ryan and Deci (2003) a particular "identity" (e.g., an identity of a psychologist) may include a number of component roles (e.g., teaching psychology, doing research etc.) that may also vary in the degree to which the behaviors associated with these roles are regulated by different processes and have been integrated to the self. Hence, in the SDT view, the more an identity-related role has been internalized and accepted as one's own "the more it will represent a deeply held and flexibly enacted aspect of one's identity and self" (Ryan & Deci, 2003, p. 262). Social contexts via affordances for the fulfillment of the basic needs for autonomy, competence and relatedness are assumed to facilitate the internalization of behavioral regulation that underlies a particular identity and thus some identities may also be more facilitative of well-being than others.

Purpose of the study and hypotheses

Despite the value of the construct of exercise identity in predicting exercise behavior (Anderson & Cychosz, 1994, 1995; Anderson et al., 1998; Cardinal & Cardinal, 1997), studies that have examined sources and correlates of exercise identity formation are lacking. Clearly such studies are important to better understand the factors that associate with exercise identity as well as the mechanisms through which exercise identity may develop. Wilson and Muon (2008) have provided preliminary evidence on

the relationship between the fulfillment of the needs for autonomy, competence, and relatedness in exercise and the construct of exercise role identity. Given that the assimilation of an exercise identity is theorized to result from the internalization of behavioral regulations that underlie such an identity, a more complete examination of the relevant psychological processes of exercise identity assimilation would require the examination of the predictive role of the variables embedded in SDT. Therefore, the aim of the present study was to examine the nature of the relationship of SDT variables with the exercise role identity part and the exercise beliefs part of exercise identity among adult exercise participants. Firstly, it was hypothesized that the more self-determined behavioral regulations of identified regulation and intrinsic motivation would display stronger associations with both exercise role identity and exercise beliefs compared to the non self-determined regulations of the motivational continuum. The second hypothesis was that exercise role identity and exercise beliefs would be further associated with the fulfillment of the needs for autonomy, competence, and relatedness in exercise and perceptions of autonomy support provided by the exercise instructor.

Method

Participants

Data were collected from 733 exercise participants from thirteen private fitness centers in northern Greece. There were 330 men (45%) and 403 women (55%) aged from 18 to 64 years with approximately 40% aged 18–25, 20% aged 25–30, 10% aged 30–35, 10% aged 35–40 and 20% aged 40–64. The participants engaged in group-type activities such as aerobics and individual activities such as weight lifting. The participants' body mass index (BMI) was calculated based on weight and height self-reported values separately for men ($M_{BMI} = 44.89$ kg/m^2, SD = 5.05) and women ($M_{BMI} = 36.47$ kg/m^2, SD = 4.93). Based on the BMI values the sample was categorized into the following weight classification: (a) Underweight = 9.5% women, 0% men, (b) Normal Weight = 72.8% women, 54.9% men, (c) Overweight = 16.5% women, 41.1% men and (d) Obese = 1.2% women, 4% men. Fourteen individuals (1.9% of the whole sample) did not report information to construct their BMI value.

Measures

Perceived autonomy support

Strength of perceptions of autonomy support (PAS) provided by the exercise class instructor was assessed using a short (6-item) form of the Health Care Climate Questionnaire (HCCQ; Williams, Grow, Freedman, Ryan, & Deci, 1996). This version was adapted to exercise (Edmunds, Ntoumanis, & Duda, 2006) and includes items such as "I feel that my exercise class leader provides me choices and options". Participants' responses were provided on a 7-point scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). The short version of the scale was used to reduce the burden on respondents given the large number of questionnaires administered. Cronbach's alpha coefficients greater than 0.90 have been reported by Edmunds, Ntoumanis, and Duda (2007) for this short version.

Psychological need satisfaction

To assess the extent to which participants' psychological needs for autonomy, competence, and relatedness were fulfilled in exercise, the Basic Psychological Needs in Exercise Scale (BPNES: Vlachopoulos & Michailidou, 2006) were used. The BPNES comprises 12 items divided into three subscales, with four items per subscale, to assess autonomy (e.g., "The way I exercise is in agreement with my choices and interests"), competence (e.g., "I feel I perform successfully the activities of my exercise programme"), and relatedness (e.g., "My relationships with the people I exercise with are close"). Responses were provided on a 5-point scale ranging from 1 (*I don't agree at all*) to 5 (*I completely agree*). A good factor structure along with nomological validity, predictive validity, and reliability evidence for the BPNES responses has emerged from a number of studies with Greek-speaking exercise participants (Vlachopoulos, 2007, 2008; Vlachopoulos & Karavani, 2009; Vlachopoulos & Michailidou, 2006; Vlachopoulos & Neikou, 2007) with Cronbach's alpha values emerging systematically greater than 0.80 for all three subscales either based on the total sample or separately for men and women both in the domain-specific and the situational levels of generality.

Behavioral regulations in exercise

The Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2; Markland & Tobin, 2004) was used to assess levels of behavioral self-determination in relation to exercise. The BREQ-2 measures levels of amotivation, external regulation, introjected regulation, identified regulation and intrinsic motivation. Following the stem "why do you exercise?" participants provided their response to each of the 19 items of the questionnaire using a response scale ranging from 0 (*not true for me*) to 4 (*very true for me*). Markland and Tobin (2004) have provided evidence for the validity and reliability of the BREQ-2 responses while satisfactory initial validity and internal reliability evidence has also emerged with Greek-speaking exercise participants after scale translation using the back-translation method. The CFA goodness of fit indices of the Greek translation of the 18-item BREQ-2 after removing an identified regulation item ("I get restless if I don't exercise regularly") were indicative of a good fit [$\chi^2 = 308.23$, Scaled $\chi^2 = 275.52$, df = 125, $p < 0.001$, Robust NNFI = 0.955, Robust CFI = 0.963, Robust RMSEA = 0.041, RMSEA 90% CI (0.034–0.047)] with standardized factor loadings ranging between 0.63 and 0.90. Further, Cronbach's alpha values were greater than 0.77 (Moustaka, Vlachopoulos, Vazou, Kaperoni, & Markland, 2010).

Exercise identity

Strength of participants' exercise identity was measured via the Exercise Identity Scale (EIS: Anderson & Cychosz, 1994). The EIS is a 9-item uni-dimensional scale that measures the extent to which exercise is descriptive of the concept of self. Sample items include "When I describe myself to others, I usually include my involvement in exercise" and "Physical exercise is a central factor to my self-concept". Participants provided their responses on a Likert-type scale anchored by 1 ("*Strongly disagree*") and 7 ("*Strongly agree*"). Anderson and Cychosz (1994) reported an adequate single-factor structure based on principal components factor analysis with factor loadings ranging from 0.62 to 0.91 and a Cronbach's alpha of 0.94. They also presented validity evidence through correlations of the EIS scores with exercise participation variables such as number of weeks exercising and minutes per week exercising and evidence of a 1-week interval test-retest reliability of 0.93. Vlachopoulos, Kaperoni, Moustaka, and Anderson (2008) provided evidence of a marginally acceptable single-factor CFA model representing EIS responses among Greek-speaking exercise participants whereas Wilson and Muon (2008) demonstrated an inadequate fit for the single-factor EIS model but a good fit for an alternative two-factor CFA EIS model consisting of a role identity factor (items 1, 2, and 6) and an exercise beliefs factor (items 3, 4, 5, 7, 8, and 9) among a Canadian university sample (see Table 1 for EIS items).

Procedures

Exercise participants were asked to participate in the study at the reception area in private fitness centers after verbal permission

Table 1
Exercise identity scale items.

EIS item number and wording
Item 1: I consider myself an exerciser
Item 2: When I describe myself to others, I usually include my involvement in exercise
Item 3: I have numerous goals relating to exercising
Item 4: Physical exercise is a central factor to my self-concept
Item 5: I need to exercise to feel good about myself
Item 6: Others see me as someone who exercises regularly
Item 7: For me, being an exerciser means more than just exercising
Item 8: I would feel a real loss if I was forced to give up exercising
Item 9: Exercising is something I think about often

was granted from the center directors. Participants completed the questionnaires before their exercise class. Data were collected every day of the week. Initially the respondents were informed about the purpose of the research and received assurance about confidentiality and anonymity of their responses. Written informed consent for participation in the study was provided by all participants. In the end, participants were thanked for their participation.

Data analysis

Initially the EIS data were subjected to confirmatory factor analysis (CFA) to determine the fit of the single-factor EIS model to the data using the EQSWIN 6.1 software. The factor variance was fixed to 1.0 and item error covariances were fixed to zero. The goodness of fit indexes used were the chi-square value (χ^2), the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) accompanied by its 90% confidence interval (90% CI). Given the sensitivity of the χ^2 to sample size (Byrne, 2006) evaluation of model fit was based mainly on the remaining fit indexes. CFI values close to 0.95 indicate an excellent fit to the data (Hu & Bentler, 1999) whereas values 0.90 or greater indicate a reasonable fit. An RMSEA value less than 0.05 is an indication of a good model fit (Hu & Bentler, 1999) while a value of 0.08 indicates an adequate fit (Browne & Cudeck, 1993) with 0.10 being the upper limit (Byrne, 2000). Then, linear regression analyses were used to examine the contribution of age, BMI and gender, the behavioral regulations, the needs for autonomy, competence and relatedness, and perceived autonomy support by the exercise instructor in explaining variability in the exercise identity role and exercise beliefs parts of exercise identity.

Results

Preliminary statistics

The participants reported on average quite high levels of perceived autonomy support, fulfillment of their needs for autonomy, competence, and relatedness and a quite self-determined motivational profile characterized by low levels of amotivation and external regulation, moderate levels of introjected regulation and increased levels of identified regulation and intrinsic motivation (Table 2). Further, they reported above average identification with the role of an exerciser and exercise beliefs highlighting a certain degree of importance and centrality of exercise to themselves. All Cronbach's alpha values were greater than 0.80 except for introjected regulation that displayed an alpha of 0.77. All of the Pearson's correlations coefficients between the variables were in the theoretically expected direction (Table 2).

EIS confirmatory factor analysis

Given multivariate non-normality of the data (Normalized estimate of Mardia's coefficient of multivariate kurtosis = 47.98; Byrne, 2006), we employed the ML robust method, using EQSWIN 6.1 (Bentler, 2003). This method provides indexes corrected for non-normality such as the Satorra–Bentler Scaled χ^2 (S–B χ^2), CFI, RMSEA and its' 90% CI (also called robust estimates). The CFA results did not support the fit of the single-factor EIS model to the data: S–B scaled $\chi^2 = 224.14$, df = 27, $p < 0.001$, Robust CFI = 0.900, Robust RMSEA = 0.100 (90% CI = 0.088–0.112). The fully standardized item loadings ranged from 0.670 to 0.856. Given the deviation of the robust RMSEA 90% CI values from the normal range and the marginal value of the robust CFI, the CFA model was re-estimated adopting the 2-factor EIS model tested by Wilson and Muon (2008). This model was tested given its' theoretical underpinning in relation to identity theory regarding the separation of EIS items into a role identity factor and an exercise beliefs factor (Wilson & Muon, 2008). The role identity factor comprised items 1, 2, and 6 while the exercise beliefs factor comprised items 3, 4, 5, 7–9. The 2-factor EIS model provided a good fit to the data [S–B scaled $\chi^2 = 114.00$, df = 26, $p < 0.001$, Robust CFI = 0.955, Robust RMSEA = 0.068 (90% CI = 0.055–0.081)] in agreement with the good fit of the 2-factor EIS model found among Canadian university students. The fully standardized item loadings ranged from 0.685 to 0.868 and were statistically significant at $p < 0.01$. The correlation between the latent factors was 0.87. Cronbach's alpha values were 0.87 for exercise role identity and 0.90 for the exercise beliefs.

Table 2
Descriptive statistics and Pearson's correlations between the variables.

Variables	1	2	3	4	5	6	7	8	9	10	11
M	5.22	3.67	3.55	3.51	0.32	0.56	2.38	3.23	3.00	4.93	5.49
SD	1.25	0.80	0.79	1.01	0.48	0.65	0.96	0.63	0.77	1.33	1.17
Cronbach's alpha	0.93	0.85	0.85	0.92	0.87	0.84	0.77	0.82	0.88	0.87	0.90
1. Autonomy support	–										
2. BPNES autonomy	0.47*	–									
3. BPNES competence	0.42*	0.72*	–								
4. BPNES relatedness	0.44*	0.60*	0.62*	–							
5. BREQ-2 amotivation	−0.26*	−0.31*	−0.41*	−0.25*	–						
6. BREQ-2 external regulation	−0.27*	−0.36*	−0.41*	−0.27*	0.51*	–					
7. BREQ-2 introjected regulation	0.11*	0.16*	0.27*	0.20*	−0.20*	−0.01	–				
8. BREQ-2 identified regulation	0.42*	0.54*	0.63*	0.47*	−0.53*	−0.45*	0.44*	–			
9. BREQ-2 intrinsic motivation	0.48*	0.65*	0.68*	0.56*	−0.49*	−0.49*	0.26*	0.72*	–		
10. EIS exercise role identity	0.35*	0.51*	0.66*	0.48*	−0.41*	−0.30*	0.36*	0.61*	0.65*	–	
11. EIS exercise beliefs	0.44*	0.54*	0.66*	0.53*	−0.49*	−0.39*	0.47*	0.75*	0.73*	0.76*	–

Note. *$p < 0.01$. BPNES = Basic Psychological Needs in Exercise Scale. BREQ-2 = Behavioral Regulation in Exercise Questionnaire-2. EIS = Exercise Identity Scale.

Hierarchical regression of exercise identity parts to SDT variables

Inspection of the participants' responses showed that no more than one case had missing data for any one of the items. No extreme responses were found in the sample data except for a slight deviation in kurtosis values on the amotivation and external regulation items of the BREQ-2. Examination of multivariate outliers evaluated at $p < 0.001$ (Tabachnick & Fidell, 1996) led to the deletion of 14 multivariate outliers leaving a sample of 719 cases to be analyzed. Examination of the Cook's distances for all cases showed that no case existed that could exert undue influence on the regression parameters. The average VIF was 1.98 indicating some collinearity between the predictor variables of the equation while no variable had a VIF value greater than 10. Further, the assumptions of linearity, homoscedasticity, and normality were met.

Exercise role identity

The hierarchical regression analyses revealed that age, BMI, and gender made a very small (5%) but statistically significant contribution to the prediction of exercise role identity (Table 3). In Step 2, and after controlling for the association with age, BMI, and gender, motivational regulations explained an additional 43% of the variance in exercise role identity scores. Exercise role identity was significantly predicted by introjected regulation, identified regulation, and intrinsic motivation but not the non self-determined types of behavioral regulations (Table 3). In Step 3, the inclusion of the psychological need scores explained a further 5% of the variance in the outcome variable with only the fulfillment of the need for competence making a substantial contribution to explaining outcome variance (Table 3). In Step 4, the addition of perceived autonomy support by the exercise instructor did not increase the percentage of variance explained and did not make any contribution at all to exercise role identity scores (Table 3). Overall, in Step 4 exercise role identity was predicted by all types of behavioral regulations and the need for competence.

Exercise beliefs

The hierarchical regression analyses revealed that age, BMI, and gender made an almost zero contribution to the prediction of exercise beliefs (Table 4). In Step 2, and after controlling for the association with age, BMI, and gender, motivational regulations explained an additional 64% of the variance in exercise beliefs scores. Exercise beliefs were moderately predicted by introjected regulation and identified regulation and substantially predicted by intrinsic motivation scores (Table 4). In Step 3, the psychological need scores explained a very small amount of additional variance in exercise beliefs with both the needs for competence and relatedness making a moderate contribution to the prediction of exercise beliefs (Table 4). In Step 4, the addition of perceived autonomy support by the exercise instructor did not increase the percentage of variance explained and did not make any contribution at all to exercise beliefs scores (Table 4). Overall, in Step 4, it was introjected regulation, identified regulation, intrinsic motivation and the needs for competence and relatedness that made a significant contribution to the prediction of exercise beliefs.

Table 3
Hierarchical regression analyses predicting exercise role identity from demographics and self-determination theory variables.

Predictor variables	F_{change}	df	Adj. R^2	*B*	SE *B*	β	*p*-values	Part
Step 1	15.81	3706	0.05					
Age				0.15	0.02	0.27	<0.01	0.23
BMI				0.08	0.01	0.21	<0.01	−0.16
Gender				0.47	0.11	0.18	<0.01	−0.15
Step 2	118.26	5701	0.48					
Age				0.09	0.01	0.16	<0.01	0.14
BMI				0.05	0.01	0.12	<0.01	−0.10
Gender				0.38	0.08	0.14	<0.01	−0.12
Amotivation				0.20	0.10	0.06	0.05	−0.05
External reg.				0.12	0.07	0.06	0.07	0.04
Introjected reg.				0.16	0.04	0.12	<0.01	0.10
Identified reg.				0.42	0.09	0.19	<0.01	0.12
Intrinsic motiv.				0.77	0.06	0.45	<0.01	0.30
Step 3	26.35	3698	0.53					
Age				0.07	0.01	0.13	<0.01	0.10
BMI				0.03	0.01	0.09	<0.01	−0.07
Gender				0.24	0.08	0.09	<0.01	−0.07
Amotivation				0.21	0.09	0.07	<0.05	−0.05
External reg.				0.17	0.07	0.08	<0.05	0.06
Introjected reg.				0.14	0.04	0.10	<0.01	0.09
Identified reg.				0.27	0.09	0.12	<0.01	0.07
Intrinsic motiv.				0.54	0.07	0.31	<0.01	0.18
Autonomy				0.07	0.06	0.04	0.22	−0.03
Competence				0.55	0.07	0.33	<0.01	0.20
Relatedness				0.03	0.04	0.02	0.44	−0.02
Step 4	0.42	1697	0.53					
Age				0.07	0.01	0.13	<0.01	0.11
BMI				0.03	0.01	0.09	<0.01	−0.07
Gender				0.24	0.08	0.09	<0.01	−0.07
Amotivation				0.21	0.09	0.07	<0.05	−0.05
External reg.				0.17	0.07	0.08	<0.05	0.06
Introjected reg.				0.14	0.04	0.10	<0.01	0.09
Identified reg.				0.26	0.09	0.12	<0.01	0.07
Intrinsic motiv.				0.53	0.07	0.31	<0.01	0.18
Autonomy				0.08	0.06	0.05	0.19	−0.03
Competence				0.56	0.07	0.33	<0.01	0.20
Relatedness				0.02	0.04	0.02	0.53	0.01
Autonomy support				0.02	0.03	0.02	0.51	0.01

Note. Part = Part correlation coefficient controlling for the influence of all other predictor variables in the regression equation (Hair, Black, Babin, Anderson, & Tatham, 2006). Adj. R^2 = Adjusted *R*-squared value. All *p*-values reported were based on two-tailed tests of statistical significance.

Discussion

The present study examined the pattern of associations of the SDT variables with the exercise role identity and exercise beliefs parts of exercise identity among adult exercise participants. The impetus of the study was the need to identify factors that may be associated with variation in levels of assimilation of exercise identity to the self. In the present study and in line with findings of Wilson and Muon (2008), the factor structure of the EIS responses was best represented by a 2-factor EIS model rather than the unidimensional model originally proposed by Anderson and Cychosz (1994). The exercise role identity factor consisted of items that focused on the extent to which exercise has been incorporated into one's identity while the exercise beliefs factor largely concerned ruminations about the exercise behavior itself. Such exercise beliefs have been previously linked with the salience and strength of identity perceptions (Strachan, Woodgate, Brawley, & Tse, 2005).

Associations of SDT variables with exercise role identity

Behavioral regulations

With regard to exercise role identity it was identified regulation and intrinsic motivation that emerged as substantial and significant correlates of exercise role identity while the fulfillment of the need for competence also played an additional important role in explaining variance in the outcome variable. The present findings supported the hypothesis in that it was only the regulations that reflected a greater degree of internalization of exercise behavior that were strongly associated with exercise role identity. That is, given the self-determined nature of identified regulation, the association found with exercise role identity speaks to the greater

Table 4
Hierarchical regression analyses predicting exercise beliefs from demographics and self-determination theory variables.

Predictor variables	F_{change}	df	Adj. R^2	B	SE B	β	p-values	Part
Step 1	4.32	3704	0.01					
Age				0.07	0.02	0.14	<0.01	0.12
BMI				0.04	0.01	0.11	<0.05	−0.09
Gender				0.19	0.10	0.08	0.06	−0.07
Step 2	263.66	5699	0.65					
Age				0.00	0.01	0.01	0.54	0.01
BMI				0.00	0.01	0.01	0.51	−0.01
Gender				0.08	0.06	0.03	0.16	−0.03
Amotivation				0.09	0.07	0.03	0.18	−0.02
External reg.				0.00	0.05	0.00	0.99	0.00
Introjected reg.				0.26	0.02	0.22	<0.01	0.19
Identified reg.				0.55	0.06	0.29	<0.01	0.18
Intrinsic motiv.				0.64	0.04	0.44	<0.01	0.29
Step 3	12.42	3696	0.67					
Age				0.00	0.01	0.01	0.53	−0.01
BMI				0.00	0.01	0.00	0.87	0.00
Gender				0.02	0.06	0.01	0.69	0.00
Amotivation				0.12	0.07	0.04	0.08	−0.03
External reg.				0.02	0.05	0.01	0.65	0.01
Introjected reg.				0.25	0.02	0.22	<0.01	0.19
Identified reg.				0.48	0.06	0.25	<0.01	0.15
Intrinsic motiv.				0.51	0.05	0.34	<0.01	0.20
Autonomy				0.04	0.04	0.03	0.30	−0.02
Competence				0.19	0.05	0.13	<0.01	0.08
Relatedness				0.10	0.03	0.09	<0.01	0.07
Step 4	2.11	1695	0.67					
Age				0.00	0.01	0.01	0.69	0.00
BMI				0.00	0.01	0.00	0.79	0.00
Gender				0.03	0.06	0.01	0.60	−0.01
Amotivation				0.12	0.07	0.04	0.08	−0.03
External reg.				0.02	0.05	0.01	0.62	0.01
Introjected reg.				0.24	0.02	0.22	<0.01	0.19
Identified reg.				0.47	0.06	0.25	<0.01	0.15
Intrinsic motiv.				0.50	0.05	0.34	<0.01	0.20
Autonomy				0.05	0.04	0.04	0.20	−0.02
Competence				0.20	0.05	0.13	<0.01	0.08
Relatedness				0.09	0.03	0.08	<0.01	0.06
Autonomy support				0.03	0.02	0.03	0.14	0.03

Note. Part = Part correlation coefficient controlling for the influence of all other predictor variables in the regression equation (Hair et al., 2006). Adj. R^2 = Adjusted R-squared value. All p-values reported were based on two-tailed tests of statistical significance.

degree of assimilation of an exercise identity to the self when identified regulation underpins such an identity for the individual. The contribution of intrinsic motivation may be explained by the degree to which this type of regulation is also characterized by volitional choice of the behavior and thus the facilitation of the assimilation of the role of an exerciser to the self. These findings imply that the more an identity has been internalized and accepted as one's own the more it will represent a deeply held aspect of one's self that may be expressed through relevant identity-related behavior underpinned by autonomous rather than controlled regulations.

Basic needs and autonomy support

The fulfillment of the need for competence but neither autonomy nor relatedness emerged as a substantial correlate of exercise role identity. The findings partially support the hypothesis. It seems that in the particular context of the private fitness centers it is only the fulfillment of the need for competence that may facilitate the internalization of behavioral regulation that underlies an exercise role identity. That is, the adoption of the identity of an exerciser in the context of the private fitness centers may serve to satisfy the need for competence or in other words the need to feel effective in carrying out challenging physical activities which in turn may promote a more autonomous regulation underpinning such an exercise identity. The fact that neither autonomy nor relatedness contributed to the prediction of exercise role identity may be likely due to the substantive inter-correlations systematically appearing between the three needs irrespective of the instrument used (e.g., Psychological Need Satisfaction in Exercise Scale [PNSE]: Wilson, Rogers, Rodgers, & Wild, 2006; BPNES: Vlachopoulos & Michailidou, 2006). Further, a similar pattern of results was reported by Wilson and Muon (2008) were the need for competence emerged as a predictor stronger than the needs for autonomy and relatedness (in both the Wilson and Muon study and the present study significant bivariate correlations emerged between the three need subscales and the two parts of exercise identity). As these authors argued, a factor accounting for these results may be the extent to which the participants are novice or experienced exercisers where the needs for autonomy and relatedness may be more important for exercise identity formation in the initial stages rather than the advance stages of exercise participation where the need for competence may become of greater importance. Another related factor may be that exercise participants in fitness centers may perceive affordances related to the fulfillment of the need for competence to a greater extent compared to affordances for the needs of autonomy and relatedness.

In regard to perceived autonomy support, the findings did not support variance explanation in the outcome variable over and beyond the variance explained by the motivational regulations and the psychological needs. Such a finding may not be surprising given that according to SDT the effects of autonomy-supportive instructing practices operate via the satisfaction of the psychological needs which are the central variables exerting their influence on the quality of exercise motivation and related exercise behavior consequences.

Associations of SDT variables with exercise beliefs

Behavioral regulations

The variables that substantially and significantly associated with exercise beliefs were introjected regulation, identified regulation, and intrinsic motivation with the more self-determined regulations displaying the stronger associations with exercise beliefs. Further, the need for competence contributed to the explanation of variation in exercise beliefs to a small degree while the need for relatedness displayed an almost zero association. Further, the need for autonomy and perceived autonomy support by the exercise instructor were not associated with exercise beliefs. Despite the fact that these exercise beliefs items do not directly assess the construct of exercise role identity, the associations with the degree of internalization of behavior are in the expected direction. That is, a closer look at the exercise belief items shows that these items refer to the centrality and the importance of exercise for the individual and thus the pattern of associations with the behavioral regulations seems theoretically justified. The more self-determined individuals' regulations for exercise participation the more central and important to the individual exercise is perceived.

Basic needs and autonomy support

Further, in terms of psychological needs, again it was the need for competence that was mainly associated with the centrality and importance of exercise for the individuals. Again, the explanation as to why the needs for autonomy and relatedness and perceptions of autonomy support by the exercise instructor did not emerge as equally important correlates of exercise role identity may also hold for exercise beliefs. The reason for this finding may be the substantive inter-correlations that systematically emerge between

the three needs irrespective of the instrument used (e.g., PNSE: Wilson et al., 2006; BPNES: Vlachopoulos & Michailidou, 2006). Wilson and Muon (2008) also found that it was the need for competence that emerged as a correlate of exercise beliefs stronger than the needs for autonomy and relatedness. The present finding may be explained by the extent to which the participants are novice or experienced exercisers where the needs for autonomy and relatedness may be more important in strengthening the centrality and importance of exercise for the individuals in the initial stages rather than the advanced stages of exercise participation. In the advanced stages the need for competence may become of greater importance in terms of the centrality of exercise for individuals. Further, as already discussed in relation to the exercise role identity findings, exercise participants in fitness centers may perceive affordances facilitative of the fulfillment of the need for competence to a greater extent compared to affordances for the needs of autonomy and relatedness facilitating the centrality of exercise for them. Overall, the data supported to a large extent the study hypotheses revealing a prominent role for self-determined types of regulations and the need for competence in explaining variation in the exercise role identity and exercise beliefs parts of exercise identity.

Limitations and future directions

The present findings are limited to healthy adults, men and women exercising in private health and fitness centers. The present study should be replicated with other populations such as older individuals and individuals with chronic disease (e.g., obese individuals) where regular exercise may be equally important in terms of individuals' health promotion. Further, replication of the present study would be required in a community context where such a context may provide greater affordances for the fulfillment of the need for relatedness. Indeed, Vlachopoulos and Michailidou (2006) demonstrated that in a private exercise/fitness centers enjoyment-interest was predicted only by autonomy and competence whereas Vlachopoulos (2007) found that in a community exercise/fitness context all three needs emerged as significant predictors of enjoyment/interest. Another limitation of the present study concerns the representativeness of the sample presently studied and the generalizability of the findings given that an average of 60% of exercise participants had a BMI value within the normal range with a non-negligible number of participants representing the underweight and overweight categories. Given the cross-sectional nature of the present data, future studies should attempt to examine the relationships between the SDT variables and exercise identity using longitudinal designs to determine the extent to which SDT variables and related psychological processes are responsible for the trajectories of exercise identity growth/variation over time. Further, experimental designs are also important to determine the effectiveness of autonomy-supportive interpersonal environments in promoting the assimilation of the role of the exerciser in the self. Such environments are characterized by particular autonomy-supportive behaviors enacted by the exercise instructor such as providing a meaningful rationale, opportunities for choice and positive feedback, by acknowledging the difficulties, and by using neutral language during interpersonal communication. In sum, the present findings seem to be in agreement with other findings on the relationship of SDT variables with parts of exercise identity (Wilson & Muon, 2008), thus, furthering the evidence base of situating the construct of exercise identity within the SDT and further supporting the value of the exercise identity construct in better understanding long-term exercise behavior.

Conclusions

All types of behavioral regulations and the need for competence were significantly associated with exercise role identity reflecting identification with the role of an exerciser whereas introjected regulation, identified regulation, intrinsic motivation, the need for competence, and to a very small extent the need for relatedness were significantly associated with exercise beliefs reflecting the centrality and importance of exercise for individuals. The results support the usefulness of further studying the psychological processes of exercise identity assimilation to the self using self-determination theory.

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