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The relationship between commitment and exercise behavior

Philip M. Wilson [a,*], Wendy M. Rodgers [a], Paul J. Carpenter [c], Craig Hall [b], James Hardy [b], Shawn N. Fraser [a]

[a] *Department of Physical Education & Kinesiology, 500 Glenridge Avenue, Brock University, St. Catharine's, Ontario, L2S 3A1, Canada*

[b] *School of Kinesiology, University of Western Ontario, London, Ontario, N6A 3K7, Canada*

[c] *Department of Kinesiology and Physical Education, Northern Illinois University, Dekalb, IL 60115, USA*

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Abstract

Objectives: The purpose of this study was to examine the relationship between commitment and exercise behavior using the Sport Commitment Model (SCM; *J Sport & Exercise Psychology, 15,* 1) as a guiding conceptual framework.

Design: Cross-sectional survey.

Methods: Participants at two universities (N_1 = 205; 83.4% female; N_2 = 223; 73.1% female) provided demographic information and completed measures of exercise commitment and frequency of exercise behavior.

Results: Exploratory and confirmatory factor analyses supported the presence of 5 determinants (personal investments, social support, satisfaction, social constraints, and invovlement alternatives) and 2 dimensions ('want' and 'have') of commitment. Structural equation modeling analyses supported the predictive utility of the SCM accounting for 31% and 51% of the commitment dimension variance and 12% of the exercise behavior variance respectively. Satisfaction and personal investment predicted both commitment dimensions, whereas alternatives and social constraints predicted 'have to' commitment only, and the 'want to' commitment dimension was the only significant predictor of exercise behavior.

Conclusion: These results render some support for the psychometric properties of the measures used to assess commitment constructs in the exercise domain and provide partial support for the application of the SCM to the study of exercise motivation issues.

Keywords: Exercise adherence; Commitment; Motivation

* Corresponding author. Tel.: +905-688-5550 ext.4997; fax: +905-688-8364.
E-mail address: Phwilson@brocku.ca (P.M. Wilson).

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Despite the favorable health benefits associated with regular exercise (Blair & Connelly, 1996), the prevalence of sedentary behavior remains high in developed countries (Cameron, Craig, Stephens, & Ready, 2000; Katzmaryzyk, Gledhill, & Shephard, 2000; US Department of Health & Human Services, 1996). Given these participation trends, understanding "why" people exercise is a central focus of motivational research in both health and exercise psychology, and calls for more theoretically driven approaches to clarify the determinants of exercise behavior have been forthcoming (see Biddle, Fox, & Boutcher, 2000 for a review). One construct that holds some appeal for understanding the psychological determinants of exercise behavior is commitment (Corbin, Nielson, Borsdorf, & Laurie, 1987; Martin & Hausenblaus, 1998).

Previous research has defined commitment as a global psychological construct reflecting a person's pledge or obligation towards continued exercise involvement (Corbin, Nielson, Borsdorf & Laurie, 1987; Martin & Hausenblaus, 1998). In addition to being a "binding force" supporting continued exercise behavior, research by Martin and Hausenblaus indicates that commitment is associated with greater self-reported eating disorder symptoms. Collectively, these studies suggest some degree of ambiguity surrounding the functional influence of commitment in the exercise domain. One possible explanation for these divergent findings is the absence of a conceptual model clarifying the relationships between the determinants, dimensions (or faces) of commitment, and the consequences ensuing from exercise commitment. It is conceivable, for example, that the global approaches to understanding exercise commitment used in previous research fail to capture the complexity of exercise commitment, and as such, a more comprehensive and theoretical treatment of the structure and function of commitment to exercise appears justified.

Scanlan and her colleagues (Carpenter, Scanlan, Simons, & Lobel, 1993; Scanlan, Carpenter, Schmidt, Simons, & Keeler, 1993a; Scanlan, Carpenter, Schmidt, Simons, & Keeler, 1993b; Carpenter & Coleman, 1998; Carpenter & Scanlan, 1998) have described the development of the Sport Commitment Model (SCM), a conceptual framework designed to account for persistence behavior in youth sport settings. The SCM delineates the psychological processes underpinning commitment (defined as the desire and resolve to continue playing) that draws on both Rusbult's (1983) Investment Model and previous participant motivation research in youth sport (Scanlan et al., 1993a). The original version of the SCM proposed by Scanlan posited that overall commitment was determined by greater enjoyment, personal investments, involvement opportunities, social constraints, and lower involvement alternatives. Enjoyment refers to feelings of positive affect derived from the sport (Scanlan et al., 1993a) and replaced Rusbult's (1983) satisfaction construct in the SCM. Involvement opportunities reflect the perceived availability of important opportunities made possible only via continued participation. Conversely, involvement attractiveness is concerned with the array of possible alternatives to participation (Scanlan et al., 1993a). The personal investments component of the SCM represents the allocation of irretrievable resources associated with sport participation, while the social constraints construct refers to expectations or norms that create feelings of obligation to continue participating (Scanlan et al., 1993a).

Scanlan and colleagues (Carpenter et al., 1993; Scanlan et al., 1993a; Scanlan et al., 1993b; Carpenter & Scanlan, 1998) provided some preliminary support for the propositions put forth within the framework of their original SCM. Using structural equation modeling analyses in a large sample of youth sport participants, Carpenter et al. (1993) supported the positive contributions of enjoyment, personal investments, and involvement opportunities to the prediction of sport commitment. Following the original development and validation studies, Carpenter and

Scanlan demonstrated that longitudinal changes in SCM determinants predicted concomitant changes in sport commitment in a manner consistent with SCM propositions among a sample of youth soccer players.

Despite the preliminary support for the SCM's propositions, Scanlan et al. (1993a) contend that the framework is developmental and highlight several issues that warrant additional consideration to enhance our understanding of the nature and function of commitment. The first issue concerns the determinants that foster commitment as proposed in the SCM (Scanlan et al., 1993a, 1993b). Scanlan et al. originally proposed that greater commitment to youth sport involvement was determined by higher levels of enjoyment, social constraints, involvement opportunities, personal investments, and less attractive involvement alternatives. Although intuitively appealing, previous research indicates some inconsistency in the relationships posited between determinants and commitment proposed by the SCM. For example, social constraints have been either unrelated or negatively correlated with commitment in previous youth sport studies examining the SCM (Carpenter & Coleman, 1998; Carpenter & Scanlan, 1998). The equivocal nature of the relationship between social constraints and commitment may reflect the voluntary nature of the youth sport context, and possibly, the focus on young children as opposed to adults who may be more sensitized to social pressures coercing their participation (Carpenter, 1995; Yair, 1990). In addition to the questions surrounding the nature of the relationship between social constraints and commitment evident in previous research, subsequent research applying the SCM to the study of persistence issues has included additional determinants that were not originally proposed within the original SCM. For example, Carpenter and Coleman included social support as a commitment determinant in a study of elite youth sport athletes, and noted that changes in social support over time were associated with increased sport commitment. Overall, these studies suggest that the relationship between determinants proposed within the SCM and commitment warrants additional scrutiny particularly in applications of the model to new contexts or populations.

A second issue worthy of consideration according to Scanlan et al. (1993a) is the nature of the commitment itself. In their development of the SCM, Scanlan et al. define commitment as "the desire and resolve to continue sport participation" (p. 6) which conceptually represents the degree of perceived psychological attachment to the activity or behavior (Kelley, 1983). Although this notion is intuitively appealing, the nature of commitment *per se* is not without controversy given that persistence can be motivated through either volitional feelings of choice and personal desire or a sense of external control and obligation (Ryan & Deci, 2000). Brickman (1987) presented a cogent argument in favor of broadening the scope of commitment to include feelings of obligation ("having to commit") as well as functional resolve ("wanting to commit"). If commitment does indeed comprise both of these motivational foundations, then the behavioral and psychological outcomes ensuing from commitment could reasonably be expected to differ. Although feeling obliged to commit might result in some behavioral initiation, it seems unlikely that commitment based on such a fragile basis would result in enduring behavioral persistence or improved psychological well being.

Given that the SCM was developed specifically for an examination of youth sport commitment, it seems reasonable to suggest in line with Brickman's (1987) arguments that other dimensions of commitment may exist. Scanlan et al. (1993a) acknowledged that the voluntary nature of the youth sport context could predispose young athletes to positive feelings of wanting to continue their sport involvement. However, there is some degree of ambiguity associated with previous

research examining the correlates of exercise commitment (Corbin et al., 1987; Martin & Hausenblaus, 1998). One possible explanation for this ambiguity is that exercise commitment is conceptually broader in nature, and as such, represents motivational structures featuring both functional resolve and dutiful obligation that collectively comprise a person's psychological commitment to exercise (Carpenter, 1995). In line with this contention, these commitment dimensions may be particularly important in domains such as exercise, where people can feel coerced to participate through a sense of obligation. Consequently, a second issue that seems worthy of consideration is the nature of exercise commitment.

A final issue noted by Scanlan and her colleagues that seems worthy of examination is the relationship between commitment and exercise behavior. Despite the tautological appeal associated with positing that greater commitment underpins behavioral involvement, Carpenter and Coleman (1998) note that research applying the SCM to the study of commitment has "focused solely on the antecedents of commitment" (p. 208) and excluded an examination of commitment's potential consequences. Previous research in the exercise domain has suggested that motives are differentially related to exercise participation patterns (Mullen & Markland, 1997; Wilson, Rodgers, & Fraser, 2002), and highlights the importance of establishing the relationship between motivational constructs such as commitment and behavioral indicators. Given that few studies have examined the overall tenets of the SCM to date, it seems reasonable to suggest that a preliminary investigation of the relationship between commitment and behavior warrants examination to advance the arguments proposed within the SCM.

The overall purpose of this study was to examine the viability of the SCM as a framework for predicting commitment to exercise and exploring the relationship between commitment and exercise behavior. Carpenter et al. (1993) suggested that persistence issues remain well suited to empirical scrutiny using the SCM. Indeed, their initial arguments can be extended to other domains of physical activity, such as exercise, where the study of persistence issues is of substantive theoretical and practical importance (Biddle et al., 2000). Given that commitment models (including the SCM) draw upon a solid theoretical foundation (Brickman, 1987; Rusbult, 1983), and appear amenable to domain specific modifications, the propositions put forth by Scanlan et al. (1993a, 1993b) within the SCM seem applicable to exercise adoption and adherence issues.

To address our purpose, a number of hypotheses were developed from two main sources. First, we hypothesized that both exercise commitment determinants and dimensions would be multidimensional in nature. This hypothesis was based on previous SCM research (Scanlan et al., 1993a, 1993b) and Brickman's (1987) arguments regarding the nature of commitment itself. Second, it was hypothesized that exercise commitment would be positively correlated with personal investment, satisfaction, involvement opportunities, and social support, and differentially linked with social constraints and involvement alternatives. These second sets of hypotheses were formulated from previous research developing (Carpenter et al., 1993; Scanlan et al., 1993a, , 1993b) and applying (Carpenter & Coleman, 1998; Carpenter & Scanlan, 1998) the SCM to the study of motivation in youth sport settings. Finally, it was hypothesized that the volitional aspects of commitment would be more positively associated with exercise behavior than commitment based upon feelings of obligation. This final hypothesis was formed on the basis of previous exercise motivation research (Mullen & Markland, 1997; Ryan et al., 1997) that indicates volitionally endorsed exercise motives exert a more positive influence over exercise behavior in comparison with motives fueled by a reluctant sense of duty to exercise.

Method

Participants

A total of 428 participants were recruited from two universities to take part in this study (N_1 = 205; 83.4% female; N_2 = 223; 73.1% female). All participants were either university students or staff enrolled in group-based exercise classes emphasizing cardiovascular conditioning (e.g., aerobics, cross training) as the primary mode of exercise. Each exercise class was led by a certified fitness instructor and met twice per week for a total of 12 weeks. On average, each class lasted 55 min and was conducted at a self-selected intensity level. The participants ranged in age from 18 to 69 (M = 32.85; SD = 11.52) and reported levels of weekly exercise (M_{mets} = 55.91; SD = 30.94) similar to those found in previous research using university samples (Hayes, Crocker, & Kowalski, 1999).[1]

Measures

Exercise Commitment Scale (ECS)

An initial item pool (n = 34) was compiled for this study based on the work of Scanlan and her colleagues (Scanlan et al., 1993a, 1993b; Carpenter & Scanlan, 1998). The initial pool (see Appendix A) included modified items representing both dimensions and determinants of exercise commitment that have been used in previous commitment research. *Commitment* was measured using nine items that reflected both functional and obligatory resolve to continue exercising. The *personal investment* items tapped the degree to which people perceived they had invested resources (time, money, energy, and effort) into exercising. The *involvement alternatives* construct examined how attractive or beneficial other activities or behaviors appeared compared to exercise. The *involvement opportunities* construct reflected the degree to which continued exercise involvement provided social and health related benefits. *Social support* items represented the degree of perceived support received from other people for exercise. The *social constraint* items addressed the degree of pressure people perceive from social agents pertaining to their exercise behavior. Finally, the *satisfaction* construct represented the degree to which current exercise participation was perceived as rewarding. A stem ("Please read the questions carefully and circle the response that best describes how you usually feel about exercise…") was included to emphasize our interest in examining commitment to exercise in general rather than specific types or subtypes of exercise. Participants responded to each item on a 10-point Likert scale anchored at the extremes by 1 ("Not at all true for me") and 10 ("Completely true for me").

Godin Leisure Time Exercise Questionnaire (GLTEQ)

The GLTEQ (Godin & Shepherd, 1985) is a 3-item self-report measure that assesses the frequency of mild, moderate, and strenuous exercise done for at least 20 min per session during a typical week. A total exercise score can be calculated by weighting, then summing, each frequency

[1] These values were computed from summing the participant's weighted responses to the 3 questions contained with the GLTEQ (Godin & Shepherd, 1985).

dimension by its associated MET value (a unit representing the metabolic equivalent of physical activity in multiples of resting oxygen consumption) using the following equation: [Strenuous × 9] + [Moderate × 5] + [Mild × 3]. Previous researchers have demonstrated that the GLTEQ is easy to understand, responsive to changes in exercise behavior, and exhibits positive relationships with other indices of physical activity behavior and physical fitness (Jacobs, Ainsworth, Hartman, & Leon, 1993). Each individual item was weighted by the appropriate MET value and then summed to form a composite exercise behavior score (METS).

Procedure and analyses

Permission was obtained from exercise instructors to approach participants who were registered in their programs. Following the consent of the instructors, a researcher approached the participants at the end of a regularly scheduled exercise class and invited them to participate in a study examining participants' thoughts and feelings associated with exercise. Following a brief explanation of the study purpose, participants gave informed consent and completed a survey packet containing demographic questions, the ECS, and the GLTEQ. The data were collected at the mid-point of each exercise program (i.e., sixth week).

Data analysis proceeded in sequential stages. In the calibration sample ($N_1 = 205$), descriptive statistics were calculated to assess the suitability of the ECS inter-item correlation matrices for factor analysis. Two separate exploratory factor analyses (EFA) were conducted to determine the initial composition and structure of the commitment determinant and dimension items, and internal consistency reliability estimates were computed (Coefficient α; Cronbach, 1951). The first EFA was conducted using only the ECS determinant items whereas the second EFA used the ECS dimension items exclusively. In the cross-validation sample ($N_2 = 223$), two separate confirmatory factor analyses (CFA) were conducted in an initial attempt to replicate the ECS's factor structure and composition. Furthermore, structural equation modeling analysis (SEM) was used to examine the relationships between commitment determinants, dimensions, and exercise behavior. This analytical approach was based on Gerbing and Hamilton's (1996) recommendation of using EFA prior to CFA procedures as a viable method for examining the structure of measurement instruments, and arguments favoring the use of SEM for the evaluation of psychological models (MacCallum & Austin, 2000).

A number of indices were used to evaluate the model fit in both the CFA and SEM analyses. The χ^2 /df (Q) ratio was used in this study as an index of absolute model fit (Kelloway, 1998). However, the χ^2 statistic has been criticized for being overly sensitive to sample size, and being ambiguous in terms of how close the implied and observed covariance matrix must be to indicate that the model fits the data (Kelloway, 1998). Given these limitations, the Incremental Fit Index (IFI), Comparative Fit Index (CFI), and Normed Fit Index (NFI) were examined given their suitability as indicators of global model fit in research using small samples (West, Finch, & Curran, 1995). The Root Mean Square Error of Approximation (RMSEA) was also examined to assess the discrepancy between the implied and observed correlation matrices (Kelloway, 1998). Fit indices greater than 0.90 (IFI, CFI, NFI) and less than 0.10 (RMSEA) were deemed indicative of acceptable model fit, although recent research (Hu & Bentler, 1999) and commentary (Thompson, 2000) suggests our understanding of the behavior of these fit indices under various conditions is limited and remains the topic of considerable debate.

Results

Exploratory Factor Analyses of ECS items

Based on the recommendations of Dzubian and Shirkey (1974), several indicators were examined to determine the suitability of the ECS interitem correlation matrix for EFA procedures. Both commitment determinant and dimension items demonstrated (a) satisfactory interitem dependence ($c^2_{\text{determinants}} = 3121.21$, $p < 0.001$; $c^2_{\text{dimensions}} = 1373.46$, $p < 0.001$), (b) an acceptable KMO sampling adequacy statistic ($\text{KMO}_{\text{determinants}} = 0.84$; $\text{KMO}_{\text{dimensions}} = 0.86$), and (c) an anti-image matrix approximating the desired diagonal matrix (only 7.25% and 6.01% of the off-diagonal elements for determinants and dimensions respectively exceeded >0.10). Collectively, these results suggest that the initial ECS item pool was suitable for the application of factor analysis procedures.

The latent factor structure and composition of the ECS was examined in two separate Principal-Axes Factor Analyses (PAF) conducted for the determinant and dimension items. Following joint consideration of the Kaiser-Guttman (eigenvalues > 1) and scree plot (Cattell, 1978) stopping rules, it was decided that a 5-factor (determinants) and a 2-factor (dimensions) solution should be pursued. However, an examination of the resultant pattern coefficients indicated that both solutions were initially problematic. The first solution conducted on the determinant items did not conform to Thurstone's (1947) criteria for simple structure and exhibited factor interpretability problems (2 of the 5 factors were uninterpretable due to aberrant loadings associated with Involvement Opportunity items on both the Social Support and Satisfaction factors). The second solution conducted on the dimension items was also problematic given that three items demonstrated discernibly lower (<0.47) pattern coefficients compared with the other items (pattern coefficients >0.89) suggesting these items contribute minimally to the definition of this latent factor (Fabrigar, Wegener, MacCallum, & Strahan, 1999). Consequently, a series of PAF solutions followed by direct oblimin transformations ($\delta = -1$) were pursued using Thurstone's simple structure criteria, factor interpretability, and factor definition as the criteria for item retention.

These analyses resulted in the retention of 22 ECS items (16 determinant and 6 dimension) that accounted for 76.8% (determinants) and 78.9% (dimensions) of the ECS item variance. An examination of the transformed pattern matrix presented in Table 1 indicates adequate simple structure (i.e., all items loaded <|0.30| on non-intended factors), strong item loadings on latent ECS factors, and a solution interpretable within the context of previous commitment research (Scanlan et al., 1993a, 1993b; Carpenter & Scanlan, 1998). Finally, the internal consistency reliability estimates for each ECS subscale (see Table 1) were considered acceptable given the small number of items per factor (Cortina, 1993).

CFA of ECS items, descriptive statistics, and correlations

CFA procedures were applied in the cross-validation sample ($N_2 = 223$) to test the viability of the determinant and dimension solutions derived from the EFA. For the purposes of testing the measurement models (see Figs. 1 and 2), factors were allowed to correlate, uniquenesses were not free to correlate, items were loaded exclusively on relevant factors, and the variance of each latent factor was fixed at one. An examination of the distributional properties suggested there

Table 1
PAF (Direct Oblimin) solution for exercise commitment determinants and dimensions

Item # and abbreviated item content	I	II	III	IV	V	VI	VIII
Determinants							
Want to commitment (α = 0.95)							
20. I am determined	**0.94**						
21. I am dedicated	**0.93**						
22. I am committed	**0.89**						
Have to commitment (α = 0.71)							
17. I feel obligated to exercise		**0.82**					
18. I feel it is necessary to exercise		**0.59**					
19. I feel exercise is a duty		**0.59**					
Dimensions							
Satisfaction (α = 0.86)							
1. Exercise is satisfying			**0.81**				
2. Feel satisfied when exercise			**0.77**				
3. Exercise is rewarding			**0.76**				
Social constraints (α = 0.82)							
4. Pressure from other people				**0.82**			
5. Keep exercising to please others				**0.78**			
6. People disappointed if I quit				**0.74**			
Personal investment (α = 0.94)							
7. Invested lot of effort					**0.95**		
8. Invested lot of energy					**0.89**		
9. Invested lot of time					**0.82**		
Involvement alternatives (α = 0.86)							
10. Other things are more fun						**0.85**	
11. Other things more enjoyable						**0.78**	
12. Happier doing something else						**0.77**	
13. Other things more worthwhile						**0.69**	
Social support (α = 0.73)							
14. People support my exercising							**−0.83**
15. People think exercise is okay							**−0.61**
16. People encourage exercise							**−0.59**
Eigenvalue	3.25	1.45	4.63	2.64	2.02	1.68	1.33
% variance	54.7	24.2	28.9	16.5	12.6	10.5	8.3
Mean	8.41	6.49	8.66	2.71	5.29	7.53	7.60
Standard deviation	1.62	2.09	1.41	1.82	2.12	2.10	1.90

Note: Pattern coefficients $< |0.30|$ are not shown. Interfactor correlations ranged from low ($r_{iii.iv}$=−0.15; $r_{iv.v}$=−0.04; $r_{iv.vi}$=0.15; $r_{iv.vii}$=0.14; $r_{v.vi}$=−0.26; $r_{v.vii}$=0.26; $r_{vi.vii}$=0.08) to moderate ($r_{i.ii}$=0.44; $r_{iii.v}$=0.45; $r_{iii.vi}$=−0.35; $r_{iii.vii}$=0.36). All interfactor r's$>|0.16|$ significant at $p < .01$.

were no particular univariate concerns with the ECS items, although, the multivariate distributions for both determinant (Mardia's estimate = 156.15) and dimension (Mardia's estimate = 43.66) items deviated substantially from normality.[2] Although alternative estimation procedures have been advocated for nonnormal data (Hu & Bentler, 1995), they typically produce biased estimates

[2] Univariate descriptive statistics and inter-item covariance matrices are available from the second author upon request.

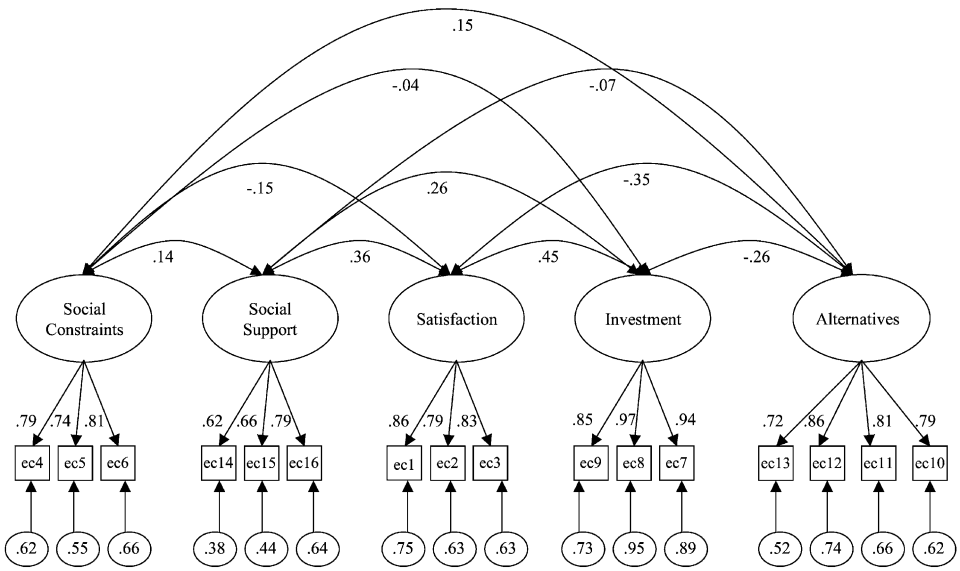

Fig. 1. Confirmatory factor analysis of ECS determinants. Large circles represent latent ECS factors. Small rectangles represent manifest ECS items. Standardized factor loadings (λ's) are placed along the pathway from latent determinant factors to each manifest ECS item (all p's<0.001). Small circles represent residual error variances. Interfactor correlation estimates are presented for each pair of ECS latent variables ($p < 0.001$).

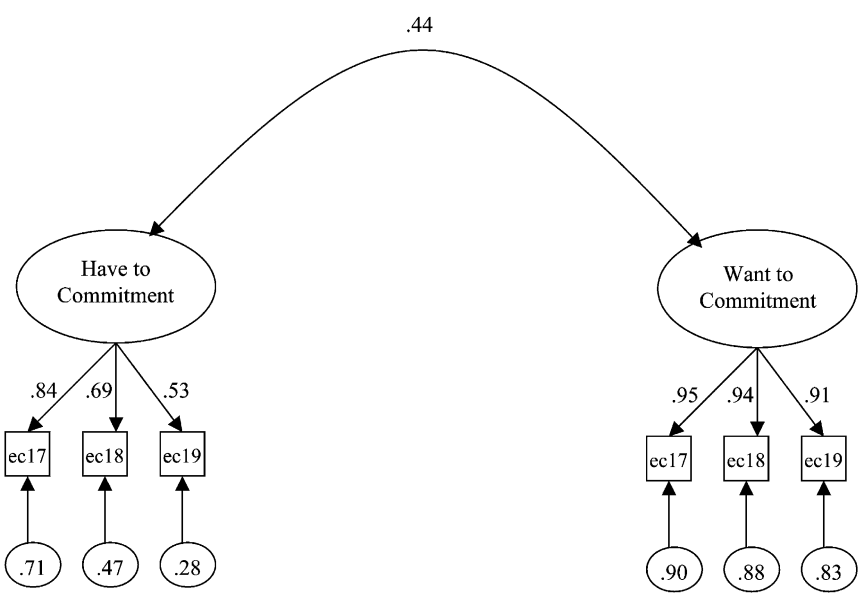

Fig. 2. Confirmatory factor analysis of ECS dimensions. Large circles represent latent ECS factors. Small rectangles represent manifest ECS items. Standardized factor loadings (λ's) are placed along the pathway from latent dimension factors to each manifest ECS item (all p's<0.001). Small circles represent residual error variances. Interfactor correlation estimates are presented between both ECS commitment dimensions (standardized estimates > 0.15 are significant at $p < 0.05$).

of model fit when used with small samples (Maruyama, 1998). Therefore, maximum likelihood (ML) estimation procedures were employed for these analyses.

The results of the CFA indicated that both measurement models appear tenable given the satisfactory global fit indices exhibited by both determinant (Q = 1.89; *NFI* = 0.92; *IFI* = 0.96; *CFI* = 0.96; *RMSEA* = 0.06 [90% CI = 0.05–0.08]) and dimension (Q = 1.47; *NFI* = 0.98; *IFI* = 0.99; *CFI* = 0.99; *RMSEA* = 0.04 [90% CI = 0.01–0.08]) measurement models, and the moderate-to-strong standardized parameter loadings (see Figs. 1 and 2). Table 2 presents the descriptive statistics, reliability estimates, and Pearson correlations between commitment determinants, dimensions, and exercise behavior. Consistent with the results derived from the calibration sample, all internal consistency estimates for ECS subscales exceeded 0.70. Bivariate correlations among commitment variables were weak-to-moderate in nature suggesting some degree of independence amongst ECS constructs. Furthermore, exercise behavior was moderately correlated with 'want to' commitment and personal investment, and weakly related to satisfaction and social support.

SEM analyses predicting commitment dimensions and exercise behavior

The relationships between commitment constructs measured by the ECS and exercise behavior measured by the GLTEQ were examined using SEM procedures. In these analyses, items were loaded exclusively on relevant latent ECS factors, and an item loading was fixed at 1.0 for latent factors measured with manifest items. Latent factors, uniquenesses and error variances were not free to correlate, and unidirectional paths were specified between commitment determinants and dimensions, and from both commitment dimensions to exercise behavior (see Fig. 3). An examination of the global fit indices suggested that the model was tenable (Q = 2.18; *NFI* = 0.97; *IFI* = 0.98; *CFI* = 0.98; *RMSEA* = 0.07 [90% CI = 0.06–0.08]). The overall fit of the structural model was corroborated by the moderate-to-strong standardized parameter loadings on relevant latent factors (λ's ranged from 0.55 to 0.98), and the amount of commitment dimension variance accounted for by the model (R^{2want} = 0.51; R^{2have} = 0.31). Satisfaction and personal investment were significant predictors of both commitment dimensions, whereas, alternatives and social constraints predicted 'have to' commitment only. Overall, the model accounted for 12% of the variance in exercise behavior, although the 'want to' dimension of commitment was the only significant predictor.

Discussion

The purpose of the present investigation was to examine the suitability of the SCM for understanding exercise commitment, and to link different dimensions of commitment with exercise behavior. The results of this study partially support the factorial composition and structure of the ECS subscales in two separate samples, and support certain structural relationships among commitment constructs outlined by the SCM in the exercise domain. Consistent with our hypotheses, the results of both the EFA and CFA supported the multidimensional factor structure of both determinants (satisfaction, involvement alternatives, social support, social constraints, personal investments) and dimensions ('want to' and 'have to') of exercise commitment. Furthermore, the results of this study corroborate previous commitment research (Carpenter et al., 1993) indicating

Table 2
Descriptive statistics and bivariate correlations from subscale commitment scores and self-reported exercise behavior

Variable	*M*	*SD*	1.	2.	3.	4.	5.	6.	7.	8.
1. Want to commitment	8.45	1.73	(0.92)							
2. Have to commitment	6.70	2.08	0.29**	(0.73)						
3. Satisfaction	8.78	1.39	0.49**	0.20**	(0.84)					
4. Personal investment	7.52	2.19	0.67**	0.41**	0.48**	(0.94)				
5. Social constraints	2.43	1.78	−0.10*	0.20**	−0.10*	−0.01	(0.78)			
6. Social support	7.89	1.75	0.15**	0.17**	0.27**	0.19**	0.20**	(0.71)		
7. Involvement alternatives	4.53	2.16	−0.25**	0.03	−0.29**	−0.23	0.20**	−0.02	(0.85)	
8. METS	55.91	30.94	0.32**	0.06	0.22**	0.33**	−0.01	0.11*	−0.07	–

Note: METS=Metabolic Equivalent calculated by summing weighted GLTEQ indicators. Internal consistency reliability estimates (Cronbach's α) are placed along the principal diagonal for ECS subscale response from sample 2 (N_2 = 223; 73.1% female).*$p < 0.05$; **$p < 0.01$ (two-tailed significance).

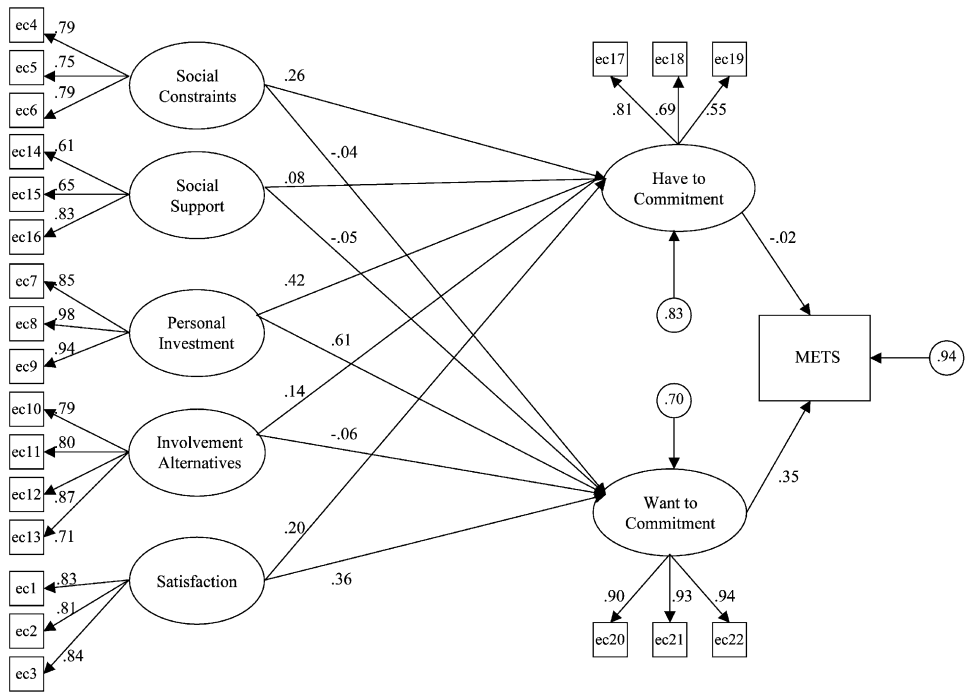

Fig. 3. Structural equation modeling predicting dimensions of commitment and exercise behavior from ECS determinants. Pathway coefficients represent standardized estimates using maximum likelihood estimation procedures. Standardized estimates > 0.10 are significant at $p < 0.05$. All other standardized estimates are non-significant.

that personal investment and satisfaction were the strongest predictors of exercise commitment, and suggest that only the 'want to' dimension of commitment predicted greater exercise frequency.

The results of both the EFA and CFA provide preliminary support for the multidimensional factor structure of the ECS. Consistent with calls for repeated assessment of scale dimensionality across contexts of interest (Messick, 1995), our findings both support and extend previous SCM and commitment research in several ways. First, we provided initial support for the dimensionality of the commitment determinants that have been proposed by Scanlan and colleagues (Carpenter & Coleman, 1998; Carpenter & Scanlan, 1998; Carpenter et al., 1993; Scanlan et al., 1993a, 1993b) within the framework of the SCM in a sample of exercise participants. Second, we have extended the measurement of commitment to include both 'want to' and 'have to' dimensions that have been highlighted more generally within the commitment literature (Brickman, 1987).

Despite these encouraging findings, it should be noted that the final pool of ECS items retained in this study did not encompass the full array of determinants originally proposed within the SCM (Scanlan et al., 1993a; Carpenter & Coleman, 1998), or advocated more generally in models of commitment (Kelley, 1983) and investment (Rusbult, 1983). For example, the results of the initial EFA indicated that the items originally constructed to represent Involvement Opportunities were factorially complex (Thurstone, 1947) and ambiguous. One possible explanation for these findings is the lack of item:content clarity (Dunn, Bouffard, & Rogers, 1999) expressed in the Involvement Opportunity items which included aspects of social experience (e.g., "exercising gives me the opportunity to be with my friends") and positive feelings (e.g., "exercising gives me the opport-

unity to do something exciting") that conceptually overlap with both social support and satisfaction. Carpenter and colleagues (Carpenter, 1995; Carpenter & Coleman, 1998) have recently advocated greater distinction in the measurement of involvement opportunities, and empirically supported the contributions of both social and recognition opportunities to the prediction of sport commitment among young elite athletes. Given that previous research suggests both social and recognition motives pervade exercise contexts (Frederick & Ryan, 1993; Ryan et al., 1997), future research may wish to address the content relevance and representation of the ECS items comprising the involvement opportunities subscale using the procedures advocated by Dunn et al. Such an approach may clarify the role of involvement opportunities in the exercise domain.

Consistent with our second hypothesis, the results of both the correlation and SEM analyses in the cross validation sample extend previous exercise commitment research by providing partial support for the differential pattern of relationships between commitment determinants and dimensions. These findings suggest that dimensions of commitment share both common and unique determinants in the exercise domain. For example, the results of the SEM analyses indicate that social constraints and involvement alternatives contribute differentially to the prediction of exercise commitment dimensions. This suggests that the extent to which a person perceives social pressure to exercise, or is lured by attractive alternatives to exercise, collectively fosters a sense of 'having' to commit based upon a sense of duty or obligation. Alternatively, the degree to which people are satisfied with their exercise involvement and perceives themselves to have invested important and irretrievable resources into exercising seems conducive to the development of more adaptive dimensions of commitment.

Consistent with our final hypotheses, only the 'want to' dimension of commitment appears to be associated with exercise behavior. This finding supports Carpenter et al's. (1993) assertion that commitment influences important consequences that includes but is not limited to "motivated behaviors such as actual persistence" (p. 130). This finding is in line with a large body of motivational research in the exercise domain that suggest volitionally endorsed or intrinsic motives are positively related to persistent exercise behavior (Mullen & Markland, 1997; Wilson et al., 2002). Although the 'have to' dimension of commitment was unrelated to exercise behavior in the present study, it does seem reasonable to continue including this dimension of commitment in applications of the SCM to the exercise domain. Given that the data were collected at the mid-point of the exercise program in this study, it is plausible that participants who feel compelled to exercise out of a sense of duty or obligation had already terminated their involvement in the exercise program. Proponents of commitment models (Kelley, 1983; Rusbult, 1983) including the SCM (Carpenter & Coleman, 1998; Carpenter & Scanlan, 1998) have continually stressed the importance of using designs that facilitate an examination of the dynamic nature of commitment within the domain of interest. Consequently, future research may wish to examine changes in commitment dimensions across the context of an exercise program to determine the impact of 'having to' commit on motivational consequences over time.

Despite the appeal of these results, several limitations of the present study should be acknowledged. First, the samples were somewhat homogeneous in nature and comprised predominantly young females enrolled in university-based exercise programs emphasizing cardiovascular exercise as the primary mode of exercise. Since previous research (Frederick & Ryan, 1993; Ryan et al., 1997) suggests that motives are sensitive to participant's age and sex, it would seem prudent for future research to address the veracity of these findings in more diverse samples and across

different modes of exercise. Second, this study was correlational and cross-sectional in design. Commitment researchers (Carpenter & Coleman, 1998; Carpenter & Scanlan, 1998) have consistently argued for longitudinal research examining the dynamic nature of commitment in domains where motivational issues are salient. Consequently, future research would do well to examine the influence of changes in commitment determinants on dimensions over time to elaborate more clearly the mechanisms associated with changes in the motivational resolve to continue exercising. Future research may wish to address this issue by either manipulating the context to satisfy one (or more) of the commitment determinants established within SCM, or measure the determinants and dimensions of commitment at separate points in time to assess their temporal influence. Third, no attempt was made to link the SCM with consequences of commitment other than self-reported exercise behavior. Scanlan et al. (1993a, 1993b) suggest that the dimensions of commitment should be associated with other cognitive and affective parameters that influence persistence or adherence decisions. Future research may wish to address this issue by determining the utility of the commitment dimensions measured by the ECS for understanding exercise adherence related cognitions (e.g., barrier efficacy, behavioral intentions) and emotions (e.g., subjective well-being, exercise induced affect).

In summary, this study partially supported the central propositions of SCM by providing preliminary psychometric support of the constructs measured by the ECS in the exercise domain. Given the importance of understanding the central role of motivation in continued exercise behavior, and the potential physical and psychological health benefits ensuing from exercise persistence (Biddle et al., 2000), research applying the SCM in the exercise domain holds both theoretical and applied promise for understanding adherence related issues. In this regard, the SCM has the potential to make a positive contribution to our understanding of the influential role of motivational structures surrounding exercise commitment. As such, future research applying the SCM to the study of the exercise commitment-behavior relationship and examining the measurement properties of the ECS appears warranted.

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Appendix A. Item pool comprising the Exercise Commitment Scale

Commitment constructs and subscale items

Want to Commitment
I am determined to keep exercising
I am dedicated to keep exercising
I am committed to keep exercising

I am willing to do almost anything to keep exercising
I want to keep exercising
It would be hard for me to quit exercising

Have to Commitment
I feel obligated to continue exercising
I feel it is necessary for me to continue exercising
I feel exercise is a duty

Satisfaction
All thing considered, exercise is very satisfying
Because I exercise I feel satisfied
I find exercising to be very rewarding

Social Constraints
People will think I am a quitter if I stop exercising
I feel pressure from other people to exercise
I have to keep exercising to please others
People disappointed with me if I quit exercising

Involvement Alternatives
Compared to exercising, there are other things I could do which would be more fun
Compared to exercising, there are other things I could do which would be more enjoyable
Compared to exercising, there are other things I could do which would be more worthwhile
I would be happier doing something else instead of exercising
I would like to do something else instead of exercising

Personal Investment
I have invested a lot of effort into exercising
I have invested a lot of energy into exercising
I have invested a lot of time into exercising
I have invested a lot of my own money into exercising

Social Support
People important to me support my exercising
People important to me think it is okay to exercise
People important to me encourage me to exercise

Involvement Opportunities
Exercising gives me the opportunity to do something exciting
Exercising gives me the opportunity to relieve any stress I am feeling
Exercising gives me the opportunity to have a good time
Exercising gives me the opportunity to be with my friends
Exercising gives me the opportunity to improve my health and fitness
Exercising gives me the opportunity to improve my physical skills

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