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Athlete Engagement in Elite Sport: An Exploratory Investigation of Antecedents and Consequences

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In this exploratory study, we examined hypothesized antecedents (basic psychological needs) and consequences (dispositional flow) of athlete engagement (AE); plus the extent to which AE mediated the relationship between basic needs and flow. Structural equation modeling with a sample of 201 elite Canadian athletes (60.20% female, mean age = 22.92 years) showed that needs satisfaction (particularly competence & autonomy) predicted athlete engagement (30% explained variance); and needs satisfaction and athlete engagement predicted dispositional flow (68% explained variance). AE partially mediated the relationship between needs satisfaction and flow. Practical suggestions are offered for needs-supportive coaching programs designed to increase both AE and flow.

In recent years, psychologists have argued strongly for a more positive focus within psychology (e.g., Diener, 2003; Seligman & Csikszentmihalyi, 2000). In line with positive psychology principles, organizational psychologists interested in the negative issue of burnout (e.g., Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002) have suggested that *engagement* is the conceptual opposite of burnout and have advocated the promotion of engagement with one's work as the best method to prevent burnout (Schaufeli & Salanova, 2007). This proposition follows from the positive psychology principle that health includes the presence of wellness (not just the absence of illness or disease). Rather than focusing only on the study of weaknesses, psychology should also include the study of strengths (Diener, 2003).

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The positive psychology movement has also influenced the field of sport psychology (e.g., Gould, 2002), but so far researchers have only just begun to explore the applicability of the engagement concept to sport. To date, only two investigations have been published on athlete engagement (AE). Both studies provided preliminary evidence regarding the existence of AE (Lonsdale, Hodge, & Jackson, 2007; Lonsdale, Hodge, & Raedeke, 2007).

Athlete engagement (AE) is an enduring, relatively stable sport experience, which refers to generalized positive affect and cognitions about one's sport as a whole (Lonsdale, Hodge, & Jackson, 2007; Lonsdale, Hodge, & Raedeke, 2007). AE has been defined as a persistent, positive, cognitive-affective experience in sport that is characterized by confidence, dedication, enthusiasm, and vigor (Lonsdale, Hodge, & Jackson, 2007). According to these authors, confidence represents "a belief in one's ability to attain a high level of performance and achieve desired goals", while dedication represents "a desire to invest effort and time towards achieving goals one views as important" (p. 472). Vigor was defined as "a sense of physical and mental liveliness" (p. 472), and enthusiasm was characterized by "feelings of excitement and high levels of enjoyment" (Lonsdale, Hodge, & Jackson, 2007; p. 479).

In a similar manner to contributions made by multidimensional constructs such as athlete burnout (Raedeke & Smith, 2001) and flow (Jackson & Eklund, 2002), athlete engagement (AE) may allow researchers to better understand the complexities of human behavior in sport, and provide a framework for the promotion of positive sport experiences. Lonsdale, Hodge, and Jackson (2007) suggested that AE may be particularly relevant for elite athletes, who must invest extraordinary amounts of time and effort to be successful (Baker, Cote, & Abernethy, 2003). Given that AE is new to the field of sport psychology, little is known about its potential antecedents and consequences. Gaining knowledge about the antecedents and consequences of AE should lead to practical implications regarding possible benefits from enhanced AE (e.g., decreased burnout, increased enjoyment, & flow).

Self-determination theory (SDT) has been suggested as a potential basis for examining the antecedents for AE (Lonsdale, Hodge, & Jackson, 2007). It has been hypothesized that the "satisfaction" of basic psychological needs (autonomy, competence, relatedness) may represent a likely motivational precursor for AE (Lonsdale, Hodge, & Jackson, 2007).

As a positive sport experience (Jackson & Eklund, 2004), flow would appear to be a logical psychological consequence/outcome variable to examine with respect to AE. Flow is an intrinsically rewarding, state-like experience characterized by total involvement or immersion in an activity (Csikszentmihalyi, 1990). In the work engagement literature, Langelaan, Bakker, Doornen, and Schaufeli (2006) have stated that absorption resembles flow, and that absorption/flow is a consequence of work engagement.

Relationship Between Basic Needs and Athlete Engagement

Ryan and Deci (2002) proposed that humans have basic psychological needs for autonomy, competence, and relatedness, which must be satisfied to experience optimal well-being. Feelings of autonomy indicate a perception of volition, choice, and self-directedness; while relatedness is defined as a sense of mutual caring and connectedness with others (e.g., teammates, coaches). In sport, competence refers to a feeling that one has the ability and the opportunity to be effective in one's sport. According to Ryan and Deci (2002, Deci & Ryan, 2000a, b), the extent to which these needs are satisfied will determine the degree to which positive psychological outcomes are experienced (e.g., engagement, flow); while the extent to which these needs are frustrated will determine the degree to which negative psychological consequences are experienced (e.g., burnout, anxiety).

Research in the sport context has generally supported these contentions. Indeed, basic needs satisfaction has been shown to predict positive outcomes such as subjective vitality (e.g., Reinboth & Duda, 2006), self-determined motivation (e.g., Hollembeak & Amorose, 2005), and state flow (Kowal & Fortier, 1999). Conversely, recent studies (Hodge, Lonsdale, & Ng, 2008; Perreault, Gaudreau, Lapointe & Lacroix, 2007) found that basic needs satisfaction showed negative relationships with athlete burnout.

Relationship Between Athlete Engagement and Flow

As a positive sport experience, flow would appear to be a logical psychological outcome variable to examine as we seek to investigate the nature of AE as a positive psychology construct. Flow is a situationally-specific experience; however, flow can also be characterized from a dispositional perspective (Jackson & Eklund, 2002). The frequency with which one typically experiences flow in a specific context (such as one's main sport) can be measured to provide an assessment of the disposition to experience flow in that context (Jackson & Eklund, 2004).

Csikszentmihalyi's (1990) research on flow has identified nine interlinking dimensions that characterize the flow state. Research in the sport context has confirmed the validity of these nine dimensions (see Jackson & Eklund, 2004 for detail): (1) a balance between challenges and skills; (2) a merging of action and awareness; (3) clear goals; (4) unambiguous feedback; (5) total concentration on the task at hand; (6) sense of control; (7) loss of self-consciousness; (8) transcendence of time; and (9) autotelic experience.

Flow experiences tend to be transient, dynamic experiences. On the other hand, athlete engagement (AE) is an enduring, relatively stable sport experience, which refers to generalized positive affect and cognitions about one's sport as a whole. In this investigation, we examined relationships between AE and the frequency of reported flow experiences in one's chosen sport. Overall, it was hypothesized that a positive relationship would exist between AE and the frequency of flow experiences (i.e., dispositional flow). As an enduring and relatively stable sport experience, AE was predicted to form a solid foundation for enhancing the frequency of flow experiences. A moderate positive association was expected

between global measures of AE and flow. On the other hand, this predicted association might also indicate that prolonged or regular flow experiences may enhance the athlete's perceptions of being engaged in their sport. High levels of AE were predicted to be related to high levels of flow, but one could also argue that regular flow experiences might enhance the athlete's perceptions of being engaged with their sport. Given this plausible alternative hypothesis, our study adopted an exploratory focus and we offered exploratory hypotheses regarding the possible mediating role of AE.

Purpose and Hypotheses

The purpose of this exploratory study was to examine hypothesized antecedents (basic needs-AE relationship) and consequences (AE-flow relationship) of athlete engagement in elite sport; and to examine the extent to which AE mediated the relationship between basic needs and flow. We hypothesized the following significant relationships:

1. Needs satisfaction would be positively associated with AE.
2. Needs satisfaction would be positively associated with flow.
3. AE would be positively associated with flow.
4. AE would mediate the relationship between needs satisfaction and flow.

Method

Participants

Athletes representing 51 sports participated in this study (N = 201, 60.20% female, mean age = 22.92 years, age range = 14 to 61 years). On average, participants had participated in their sport for 9.52 years and just under one-quarter of the athletes (23%) held a "Gold" card, meaning that they received the top level of funding support from the Canadian Sport Centre (PacificSport, 2007). The remainder of the participants received Silver (10%), Bronze (60.5%), and development (6.5%) assistance. This sample was also used as part of a related project focused solely on the psychometric properties of the AE measure employed in this study (see Lonsdale, Hodge, & Jackson, 2007; Study 2).

Procedures

Prenotification and invitation emails (with a link to the online survey) were forwarded to athletes at PacificSport's seven training centers in British Columbia, Canada (via PacificSport athlete services staff). A reminder e-mail was sent ten days after the initial invitation (see Lonsdale, Hodge, & Rose, 2006 for detail regarding the utility of online questionnaires). Due to privacy regulations, it was impossible to determine the exact number of invitations sent, and the percentage of emails that were returned due to faulty addresses. However, based on the information provided by the PacificSport staff and the percentage of faulty addresses

found in previous research using online surveys (Lonsdale et al., 2006), we estimated that the response rate in the current study was approximately 30%.

Measures

Basic Needs. Basic needs satisfaction was measured using 12 items adapted from measures of autonomy, competence, and relatedness at work (Deci, Ryan, Gagné, Leone, Usunov, & Kornazheva, 2001), as well as competence in sport (McAuley, Duncan, & Tammen, 1989). In previous sport-based research (Hodge, Lonsdale, & Ng, 2008), the negatively worded items from these scales loaded lowly on the intended factors. As a result, we changed these items so that all items were worded positively. Sample items included 'I feel free to express my ideas in my sport' (autonomy), 'I think I am good at my sport' (competence), and 'I am close to people in my sport' (relatedness). Participants used 7-point Likert scales (1 = *not true at all*, 4 = *somewhat true*, 7 = *very true*) to indicate the degree to which the statements reflected his or her sport experience.

Athlete Engagement. Athlete engagement was measured using the 16-item Athlete Engagement Questionnaire (Lonsdale, Hodge, & Jackson, 2007). The AEQ is comprised of four subscales: confidence, dedication, enthusiasm, and vigor. Participants responded to all AEQ items using 5-point Likert scales (1 = *almost never*, 2 = *rarely*, 3 = *sometimes*, 4 = *frequently*, 5 = *almost always*) to indicate 'How often you felt this way in the past three months'. Sample items included: (a) confidence ('I believe I am capable of accomplishing my goals in sport'), (b) dedication ('I am determined to achieve my goals in sport'), (c) enthusiasm ('I feel excited about my sport'), and (d) vigor ('I feel really alive when I participate in my sport'). Previous research has confirmed the fit of the higher-order AEQ model and the four first-order factors (confidence, dedication, enthusiasm, vigor; Lonsdale, Hodge, & Jackson, 2007; Study 3). These researchers showed adequate model fit according to most indices: scaled χ^2 (100, N = 343) = 262.57, $p < .01$, RMSEA (90% CI) = .07 (.06–.08), CFI = .98, TLI = .98. Correlations among the four latent factors were strong (.54 to .85) and alpha coefficients ranged from .84 to .89. (Lonsdale, Hodge, & Jackson, 2007; Study 3). A global AE score was calculated by averaging scores across the four subscales.

Dispositional Flow. Participants also completed the Dispositional Flow Scale-2 (DFS-2; Jackson & Eklund, 2002, 2004). The DFS-2 assesses the frequency with which one typically experiences flow in a specific context, such as one's main sport. When responding to the DFS-2, participants in this study were asked to consider their sport experiences over the past three months. The DFS-2 is a 36 item questionnaire, with four items assessing each of the nine flow dimensions. Sample items included: 'I am challenged, but I believe my skills will allow me to meet the challenge' (challenge-skill balance) and 'My attention is focused entirely on what I am doing' (concentration on task at hand). Respondents rate the frequency of each item on a 5-point Likert scale, ranging from 1 (*never)* to 5 (*always*). The DFS-2 allows for scores on each of the nine subscales, as well as an overall global score (Jackson & Eklund, 2002, 2004). A global flow score was calculated by averaging the scores across the nine dimensions. Confirmatory factor analyses have demonstrated solid support for the nine dimensional flow model and the

global flow model (Jackson & Eklund, 2002; 2004). Alpha coefficients ranged from .78 to .90 in Jackson and Eklund's study (2002).

Data Analyses

Normality Testing. Mahalanobis distances were calculated to check for the presence of multivariate outliers. There were no missing data due to the online survey program automatically prompting participants when they missed an item.

Confirmatory Factor Analysis for Basic Needs Scale. Confirmatory factor analysis (CFA) was conducted on the basic needs scale, given that this scale did not have established psychometric properties (using LISREL version 8.71; Jöreskog & Sörbom, 2004). Overall model fit was assessed using multiple goodness-of-fit indexes. Traditionally, CFI and TLI scores > .90 and RMSEA scores < .08 represent good model fit, while RMSEA scores between .08 and .10 suggest marginal fit. Hu and Bentler (1999) have proposed alternative standards (CFI and TLI > .95, RMSEA < .06; SRMR < .08); however, Marsh, Hau, and Wen (2004) have warned against the blanket use of these higher cut-off criteria. Therefore, the traditional criteria were adopted as indicators of good fit with Hu and Bentler's (1999) criteria as evidence of very good fit.

Second, the factorial validity of the scores derived from the basic needs scale was assessed by examining the item-factor loadings. Factor loadings lower than .40 were considered small and indicated the need for further item development. Third, the discriminant validity of the factor scores was assessed by examining the 95% confidence intervals ($\pm$ 1.96 $\times$ standard error of the point estimate) of the interfactor-correlations (Φ matrix). Finally, the internal consistency of scores from each basic needs scale subscale (as well as the AEQ and the DFS-2) was assessed by examining Cronbach's alpha coefficients.

Relationships Among Basic Needs, Athlete Engagement, and Flow. Structural Equation Modeling (*SEM*; LISREL 8.71, Jöreskog & Sorbom, 2004) was employed to test the mediation model, which hypothesized that basic needs would predict AE, and AE would predict flow (see Figure 1). Before testing structural models, the measurement model was first examined. This CFA model included five latent variables (three needs, global AE, and global flow), which were allowed to correlate freely. In all SEMs, scores from the individual subscales of the AEQ and DFS-2 were used as observed variables when forming the latent AE and flow variables. The decision to use subscale scores as observed variables was made to maintain an acceptable parameters-to-participants ratio (MacCallum, Browne, & Sugawara, 1996), and to avoid false rejection of a true model (Hu & Bentler, 1995). Model identification was achieved by fixing one item-factor loading per latent variable to 1.0.

We then specified structural models that allowed us to test the hypothesis that AE would mediate the positive relationship between basic needs satisfaction and flow. Frazier, Tix and Barron (2004) and Holmbeck (1997) contend that, in order for mediation to be examined, two sets of relationships must be observed. First, basic needs should predict flow (the 'direct effects' model); these relationships are indicated by letters (*a*)—(*c*) in Figure 1. Second, basic needs should predict AE, and AE should predict flow (the 'mediation' model); these relationships are indi-

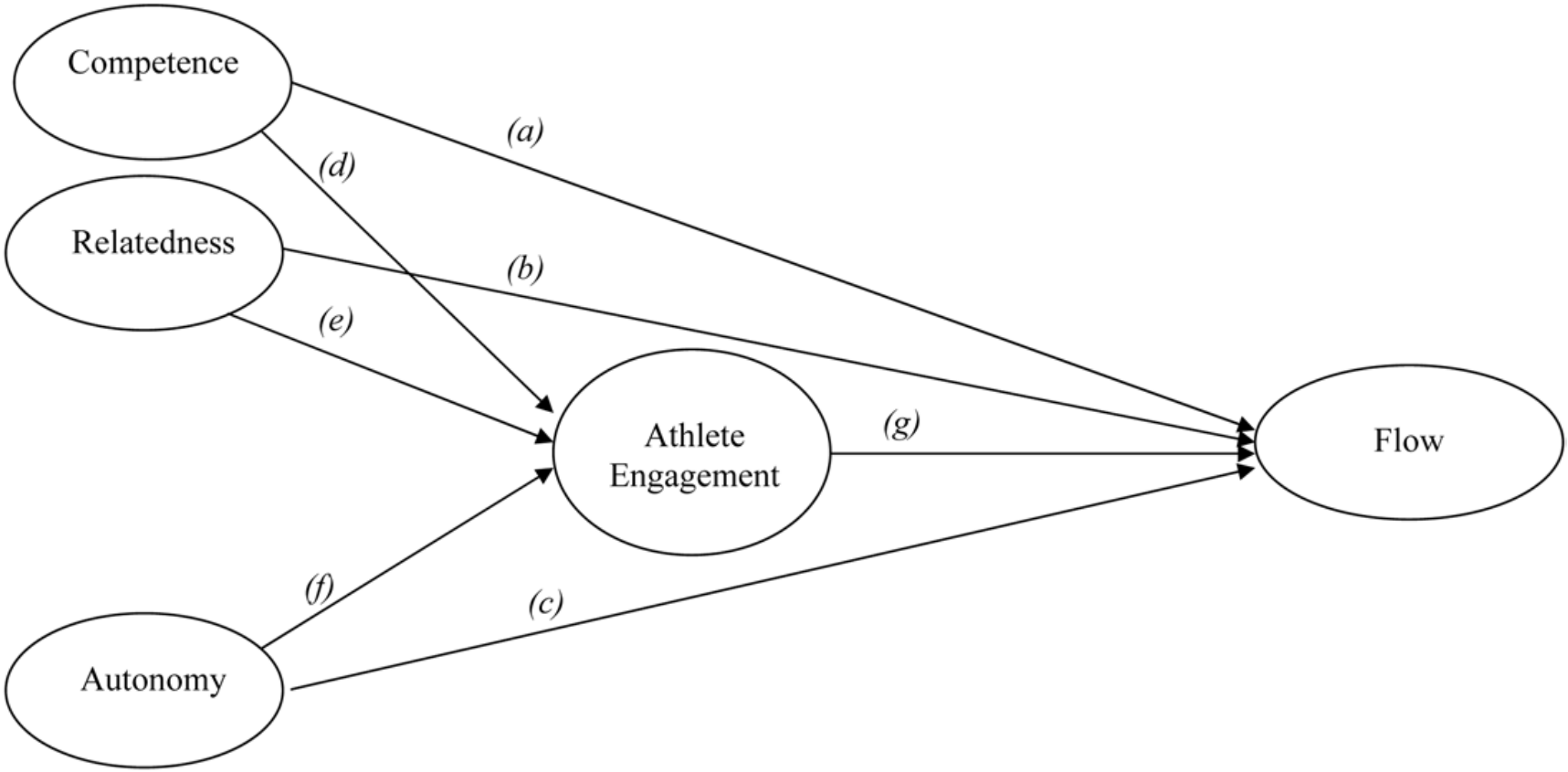

Figure 1 — Hypothesized Structural Model of Basic Needs, AE and Flow. Paths *a*—*g* correspond with those reported in Table 2.

cated in Figure 1 by letters (*d*)—(*f*) and (*g*). To demonstrate full mediation, the mediation model should not show worse fit (i.e., $\Delta\chi^2$, $p > .05$) than a third model in which all paths (*a*—*g*) are freely estimated (the 'combined effects' model). Finally, when mediation exists, the relationships between basic needs satisfaction and flow in the combined effects model should be reduced (indicating partial mediation), or nullified (indicating complete mediation), when compared with the needs-flow path estimates from the direct effects model. We also sought to test a plausible alternative mediation model in which flow was hypothesized as the mediator between basic needs satisfaction and AE.

Results

Preliminary Results

There was evidence of multivariate nonnormality in the data (Mardia's normalized skewness coefficient = 34.45, Mardia's normalized kurtosis coefficient = 15.23). Therefore, we employed ML estimation using a Satorra-Bentler correction to the χ^2 and standard errors for all *SEM* analyses (Satorra & Bentler, 1994). No significant multivariate outliers ($p <$. 001) were found during inspection of the Mahalanobis distances.

The three basic needs subscales had acceptable alpha coefficients: competence = .84, autonomy = .85, and relatedness = .91; while the AEQ alpha coefficients ranged from .85 to .89, and the DFS-2 subscales ranged from .81 to .88. The fit of the CFA model for the basic needs questionnaire, with 12 items and three first-order factors (competence, autonomy, and relatedness), showed very good model fit for most of the fit indices: scaled $\chi^2(51, N = 201) = 90.18$, $p < .00$, RMSEA = .06, RMSEA 90% CI = .04–.08, TLI = .98, CFI = .98, SRMR = .07. Item-factor loadings were strong (range = .54 to .94); while interfactor correlations were low-to-moderate (Φ = .31 to .44), indicating three distinct factors.

In general, these athletes had moderate to high levels of needs satisfaction (i.e., autonomy, competence, relatedness). They also reported moderate to high levels of AE and flow (see Table 1).

Correlations Among Athlete Engagement and Flow Dimensions

Bivariate correlations between AE and flow were examined to assess the relationships among the dimensions for these constructs (see Table 1). At the global level, the constructs exhibited a strong relationship, with an observed score correlation of .65 between AE and flow (support for Hypothesis 3). Global flow also correlated strongly with three of the AE dimensions: confidence (r = .56), vigor (r = .56), and enthusiasm (r = .55), while there was a moderate relationship between global flow and dedication (r = .37). In terms of subscale relationships, vigor had a strong association with autotelic experience (r = .64), and a moderate association with challenge-skill balance (r = .44). Vigor was also moderately associated with clear goals (r = .47), concentration (r = .45), and sense of control (r = .42). Enthusiasm had a strong positive relationship with autotelic experience (r = .77),

Table 1 Correlations Among Needs Satisfaction, Athlete Engagement, and Flow Variables

	Mean	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Autonomy	5.38	1.24																	
2. Competence	5.90	.89	.45																
3. Relatedness	6.28	.88	.34	.29															
4. Dedication	4.01	.53	.26	.22	.03														
5. Confidence	4.26	.62	.38	.71	.22	.35													
6. Enthusiasm	4.42	.67	.36	.47	.32	.45	.57												
7. Vigor	4.28	.63	.28	.46	.30	.31	.54	.72											
8. Global Athlete Engagement	4.24	.48	.41	.60	.29	.64	.79	.88	.83										
9. Challenge-skill balance	4.14	.61	.39	.72	.32	.23	.61	.40	.44	.54									
10. Merging of action and awareness	3.72	.69	.26	.48	.24	.07	.41	.30	.30	.35	.54								
11. Clear goals	4.21	.67	.36	.41	.25	.45	.46	.45	.47	.58	.49	.28							
12. Unambiguous feedback	4.06	.70	.48	.38	.15*	.28	.35	.29	.30	.39	.49	.35	.52						
13. Total concentration	3.86	.67	.24	.44	.20	.38	.38	.40	.45	.51	.46	.42	.60	.52					
14. Sense of control	3.90	.66	.51	.55	.35	.32	.53	.46	.42	.55	.59	.47	.54	.56	.62				
15. Loss of self-consciousness	3.23	.94	.26	.14*	.11	.07	.17	.21	.20	.21	.25	.23	.26	.42	.31	.33			
16. Transformation of time	3.49	.84	.05	.12*	.17*	.13*	.08	.19	.24	.21	.18	.32	.19	.20	.31	.21	.23		
17. Autotelic experience	4.32	.61	.25	.51	.36	.42	.53	.77	.64	.75	.52	.31	.48	.30	.46	.47	.19	.28	
18. Global Flow	3.88	.47	.45	.59	.34	.37	.56	.55	.56	.65	.72	.64	.70	.72	.77	.78	.58	.51	.64

Note. Needs satisfaction measured on seven-point scales. Athlete engagement and flow scores measured on five-point scales. Underlined correlations were not significant. * indicates the correlation was significant at $p < .05$. All remaining correlations were significant at $p < .01$.

and moderate positive relationships with sense of control (r = .46) and clear goals (r = .45). Dedication had moderate positive relationships with clear goals (r = .45), autotelic experience (r = .42), and concentration (r = .38). Confidence had a strong relationship with challenge-skill balance (r = .61), sense of control (r = .53), and autotelic experience (r = .53).

Basic Needs, Athlete Engagement, and Flow: Testing Mediation

The data fit the measurement model well, according to the TLI, CFI, and RMSEA: scaled χ^2 (265, N = 201) = 574.13, p < .01, TLI = .95, CFI = .96, RMSEA (90%CI) = .08 (.07–.08). However, the SRMR was marginal (SRMR = .10). All structural models fit the data well according to the CFI, TLI, and RMSEA fit statistics. SRMR values were marginal in the combined effects model (SRMR = .10), and were above the specified cut-off for the direct effects and mediation models (see Table 2). Correlations among the latent constructs (Φ matrix) indicated moderate to strong relationships among these variables, supporting Hypotheses one and two (AE-Flow = .71[.06]; AE-Competence = .46 [.03]; AE-Relatedness = .33 [.05]; AE-Autonomy = .44 [.06]; Flow-Competence = .65 [.04]; Flow-Relatedness = .40 [.05]; Flow-Autonomy = .60 [.06]; Competence-Relatedness = .31 [.06]; Competence-Autonomy = .44 [.08]; Relatedness-Autonomy = .41 [.10]; standard errors in parentheses).

The direct effects model indicated that competence and autonomy predicted flow, but relatedness did not (see Table 2). With respect to the mediation model, paths from competence and autonomy to AE were significantly different from zero, and AE scores predicted flow scores. Nevertheless, the combined effects model fit the data better ($\Delta\chi^2$, p < .05) than the direct effects and mediation models. The combined effects model, which included direct paths from needs to AE, needs to flow, and AE to flow, accounted for substantial portions of variance in AE (R^2 = .30) and flow (R^2 = .68). These results indicated that the relationships between needs and flow were not fully mediated by AE. As shown in Table 2, path estimates associated with the competence-flow and autonomy-flow relationships showed decreases from the direct effects model to the combined effects model. These findings suggested that the relationships between satisfaction of these two needs and flow were partially mediated by AE, providing partial support for Hypothesis four. Full mediation was not indicated as the reduced path coefficients for the combined effects model were still significantly different from zero. Partial mediation was also evident when examining the indirect and direct effects (see Table 3). Twenty eight percent of the total effect of competence on flow was due to the indirect effect, thus supporting the partial mediation conclusion. Similarly, 32% of the total effect of autonomy on flow was due to indirect effects, again supporting partial mediation.

Table 2 Fit Statistics and Standardized Path Coefficients for Structural Models

Model	Scaled χ^2	df	TLI	CFI	SRMR	RMSEA (90% CI)	Needs → Flow			Needs → AE			AE → Flow	AE variance explained (R^2)	Flow Variance Explained (R^2)
							Comp *(a)*	Relate *(b)*	Aut *(c)*	Comp *(d)*	Relate *(e)*	Aut *(f)*	*(g)*		
Direct Effects	602.46	269	.95	.97	.19	.08 (.07–.09)	.46*	.11	.35*	—	—	—	—		.56
Mediation	642.97	268	.94	.95	.12	.08 (.08–.09)	—	—	—	.35*	.13	.28*	.75*	.36	.57
Combined Effects	574.13	265	.95	.96	.10	.08 (.07–.08)	.31*	.06	.24*	.31*	.13	.25*	.43*	.30	.68

Note. AE = athlete engagement; Comp = competence; Relate = relatedness; Aut = autonomy

Table 3 Standardized Effects of Needs Satisfaction Scores on Flow Scores

Indirect Relationship	Indirect Effect	*t*-value	Total Effects	*t*-value
Competence→ Flow	.13	3.13*	.47	5.88*
Relatedness→ Flow	.06	1.46	.12	1.66
Autonomy→ Flow	.11	2.52*	.34	4.60*

* indicates that the effect was significant at $p < .05$

Discussion

The purpose of this study was to examine hypothesized antecedents (basic needs-AE relationship) and consequences (AE-flow relationship) of athlete engagement; and to examine the extent to which AE mediated the relationship between basic needs and flow. We hypothesized that: (1) needs satisfaction would be positively associated with AE; (2) needs satisfaction would be positively associated with flow; (3) AE would be positively associated with flow; and (4) AE would mediate the relationship between needs satisfaction and flow. The first three hypotheses were supported, while hypothesis four was partially supported.

Basic Needs and Athlete Engagement

From a SDT perspective, it is logical that AE would be directly influenced by the 'satisfaction' of basic psychological needs. As an enduring, relatively stable sport experience, AE represents generalized positive affect and cognitions about one's sport as a whole. Needs satisfaction, as the phrase 'satisfaction' implies, is an inherently positive experience. Our results indicated that, with respect to AE (& flow), the basic needs of competence and autonomy were particularly important for this group of elite athletes, whereas satisfaction of the basic need for relatedness did not appear to play a substantive role. Ryan and Deci (2002; Deci & Ryan, 2000b) have suggested that while necessary for growth and development, the psychological need for relatedness may play a more distal role than competence and autonomy in relation to intrinsic motivation. Our results support Ryan and Deci's (2002; Deci & Ryan, 2000b) proposition with respect to AE and flow.

Basic Needs and Flow

From a conceptual perspective, it is logical that flow would be directly related to the satisfaction of basic psychological needs. Previous sport research has revealed a positive relationship between self-determined motivation and flow at the contextual level (Jackson, Kimiecik, Ford, & Marsh, 1998; Lonsdale, Hodge & Rose, 2008, study 3), as well as a positive relationship between basic needs satisfaction and flow at the situational level (Kowal & Fortier, 1999). However, the basic needs-flow relationship has not previously been examined at the contextual level.

Feelings of autonomy indicate a perception of volition, choice, and self-directedness. Flow is referred to as an 'autotelic' experience, which as Csikszentmi-

halyi (1990, p.67) explains, is of Greek derivation from 'auto' or self, and 'telos' or goal. Autotelic activities are performed for their own sake, for the intrinsic rewards with which they are associated. Autotelic individuals seek out and find flow in their lives more easily and more often than others. Consequently, there is a logical link between perceptions of autonomy and the facility of some individuals to find flow in their activities (also see Deci & Ryan, 2000b).

Perceptions of competence indicate a feeling that one has the ability to be effective in one's sport. Flow is characterized by a challenge/skill balance (i.e., competence), clear goals, and a sense of control. Consequently, as outlined by Deci and Ryan (2000b), there is a logical link between the basic need of competence and dispositional flow. Jackson and colleagues (Jackson et al., 1998; Jackson, Thomas, Marsh, & Smethurst, 2001) found that perceptions of competence were strong predictors of both dispositional and state flow in two competitive athlete samples. In addition, Kowal and Fortier (1999), while examining situational measures of needs satisfaction and flow for Masters' swimmers, found that perceptions of competence were strong predictors of state flow.

Athlete Engagement and Flow

Relationships between athlete engagement and flow were examined both at a global and a dimensional level. At the global level, a strong positive association was found between AE and flow. At the dimensional level, moderate to strong associations were found between engagement and flow dimensions. The strongest observed associations were between the positive affect-related aspects of both constructs (i.e., enthusiasm [AE] and autotelic experience [flow]). These correlations indicated that positive thoughts and feelings associated with one's sport experience comprised the core link between athlete engagement and flow.

As an enduring and relatively stable sport experience, AE appears to form a solid foundation that could enhance the frequency of flow experiences. Our results demonstrated positive associations between AE and flow. However, the exact nature of this relationship will need to be examined in future research. Interesting areas for future research include examining relationships between AE and flow over time, and the potential for interventions designed to foster AE to also increase the frequency of flow experiences. It is not possible at this point to infer any causal relationships between AE and flow, and it is likely that the nature of the relationship would be reciprocal. High levels of AE are clearly related to high levels of flow, but one could also argue that prolonged or regular flow experiences may enhance the athlete's perceptions of being engaged in their sport. From an applied viewpoint, increasing both AE and flow experiences is likely to lead to a growth in positive self-perceptions related to sport involvement.

Does Athlete Engagement Mediate the Relationship Between Basic Needs and Flow?

Strong support was found for a positive relationship among AE, basic needs, and flow. Autonomy and competence appeared to exert AE-mediated and direct effects on flow, suggesting that knowledge of an athlete's AE is not sufficient to predict flow. Instead, those seeking ways to enhance an athlete's ability to experience

flow should also understand the extent to which the athlete's basic needs for autonomy and competence are being satisfied. In the combined effects model, AE, competence, and autonomy (but not relatedness) were all significant predictors of flow. While the combined effects model revealed the direct contribution of two basic needs (competence, autonomy) to global flow, the variable that explained the most variance in global flow was global AE (supporting Hypothesis 3). Along with the positive correlations among the four AE dimensions and five of the flow dimensions, this finding indicated a strong relationship between AE and flow for this sample of elite athletes.

Lonsdale, Hodge, and Jackson (2007) suggested that AE was a psychological construct of clear relevance to elite athletes, who must invest extraordinary amounts of time and effort to be successful (Baker, Cote, & Abernethy, 2003). As hypothesized, needs satisfaction predicted athlete engagement; and needs satisfaction and athlete engagement predicted dispositional flow for this sample of elite athletes. In addition, our results indicated that the basic needs of competence and autonomy were particularly important for this group of elite athletes with respect to AE and flow. These findings also provide additional evidence regarding the construct validity of the AEQ as a measure of athlete engagement.

Given that the combined effects model best represented the relationships among needs, AE, and flow, we were not able to test alternative models (as we had planned) with the current dataset. The best way to overcome this problem would be to collect longitudinal data. With longitudinal data, even in a combined effects model, there would be numerous relationships between variables that would not be specified and competing models could therefore be tested. Unfortunately, access to our sample was limited and we were not able to collect longitudinal data.

Limitations and Future Research Directions

As outlined earlier, the extraordinary amount of effort required to succeed at the elite level of sport makes it likely that engagement would be relevant for elite athletes. Further research with other elite athlete samples is necessary to examine the relative importance of AE and its overall role in the elite athlete's sporting experience. Given that this study employed a cross-sectional design, no causal inferences can be drawn from these findings. Future research employing a longitudinal design would afford the opportunity to investigate changes in AE over time, and the relative impact of AE on key outcome/consequence variables for elite athletes (e.g., intrinsic motivation, anxiety, burnout, performance). Longitudinal, prospective research could also examine the frequency and duration of AE experiences (e.g., in parallel with athlete burnout experiences over time), as well as other potential antecedents of AE. This type of work could shed light on the ways in which AE might be promoted and the extent to which AE may or may not help prevent burnout.

Practical Recommendations

Our results indicated that needs satisfaction accounted for substantial proportions of variance in both AE and flow. These findings are important for practitioners as

they suggest that supporting needs satisfaction may help athletes to enhance both AE and flow. While a causal relationship cannot be inferred from our cross-sectional data, the strong associations indicate the value of evaluating an intervention program designed to increase needs satisfaction, with a view to increasing AE and flow. The next logical question is how can needs satisfaction be promoted? Mageau and Vallerand (2003) proposed practical guidelines for needs-supportive coaches to follow. These authors primarily focused on the basic need for autonomy. Grounding their recommendations in educational and psychological research, they outlined seven behaviors they proposed would influence autonomy. While the efficacy of implementing these seven guidelines within a competitive sport environment has yet to be investigated, Mallett (2005) has described his use of needs-supportive coaching practices with elite track and field athletes.

Lonsdale, Hodge, and Jackson (2007) suggested that a greater understanding of athlete engagement might help sport psychologists develop effective burnout-prevention strategies and promote more positive sport experiences. In line with positive psychology principles (Seligman & Csikszentmihalyi, 2000), the promotion of needs satisfaction should foster AE and flow; and enhanced AE should lead to a number of positive/adaptive outcomes (e.g., increased flow, increased persistence, decreased stress, and decreased burnout).

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