Norms and Factorial Invariance of the Athletic Identity Measurement Scale (AIMS)

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ABSTRACT

This study examined the factorial invariance of the Athletic Identity Measurement Scale (AIMS; Brewer, Van Raalte, & Linder, 1993) and developed norms for its future use. Results indicated that a multidimensional model in which three highly correlated first order factors (social identity, exclusivity, and negative affectivity) are subordinate to a higher order athletic identity factor demonstrated factorial invariance across genders and athletic statuses. The findings suggest that a 7-item composite AIMS score is appropriate for assessing athletic identity in both men and women. Applications of the AIMS with student-athletes are discussed.

Success in competitive sport typically requires a high level of commitment. Indeed, some athletes are so invested in achieving excellence in sport that they neglect other important areas of functioning. In intercollegiate sport, for example, a major challenge for support staff is to help student-athletes strike a balance between their development as athletes and their development as individuals, students, and future professionals. At the heart of this struggle for balance is a quest for identity, which is a critical task of adolescence (Erikson, 1959) that has important implications for the personal and career development of college students (Blustein, Devenis, & Kidney, 1989; Blustein & Phillips, 1989; Marcia, 1966). Identity, which refers to "a clearly delineated self-definition comprised of those goals, values, and beliefs which a person finds personally expressive and to which he or she is unequivocally committed" (Waterman, 1985, p. 6), has been examined recently in athletes in the context of "athletic identity" (Brewer, Van Raalte, & Linder, 1993). Researchers have documented associations between athletic identity and phenomena that are directly relevant to those providing support services to student-athletes, such as career maturity (Murphy, Petitpas, & Brewer, 1996), burnout (Baysden, Brewer, Petitpas, & Van Raalte, 1997; Gould, Udry, Tuffey, & Loehr, 1996; Raedeke, 1997), adjustment to injury (Brewer, 1993), and adjustment to sport career termination (Grove, Lavallee, & Gordon, 1997).

A standardized, psychometrically sound measure of athletic identity could be of great utility to athletic counselors and academic athletic advisors in identifying student-athletes at risk for difficulty adjusting to sport career transitions or committing to the full array of responsibilities associated with being a student-athlete (Brewer, Van Raalte, & Petitpas, 2000). A reliable and valid measure of athletic identity would also facilitate conceptual clarity and provide a strong foundation for subsequent assessment and research. The instrument that has been used to assess athletic identity most frequently to date is the Athletic Identity Measurement Scale (AIMS; Brewer, Van Raalte, & Linder, 1993), a 10-item scale designed to reflect the strength and exclusivity of identification with the athlete role. Item content of the AIMS,

which was designed to encompass social (e.g., "Most of my friends are athletes,"), cognitive (e.g., "I have many goals related to sport,"), and affective (e.g., "I feel bad about myself when I do poorly in sport") elements of athletic identity, taps thoughts and feelings central to the daily experience of student-athletes. AIMS items are rated on 7-point Likert-type scales and are summed to create an overall athletic identity score. Thus, the AIMS is consistent with a conceptualization of athletic identity as a superordinate construct incorporating disparate aspects of sport-specific self-identity.

Research has provided general support for the psychometric integrity of the AIMS. Evidence for the test-retest reliability (r = .89 over a two-week period) and internal consistency (alphas = .81 to .93) of the AIMS has been obtained (Brewer, Van Raalte, & Linder, 1993; Good, Brewer, Petitpas, Van Raalte, & Mahar, 1993). With regard to validity, AIMS scores have been found to increase with level of sport involvement (i.e., non-athlete, recreational athlete, competitive athlete), perceived importance of sports competence, and other constructs conceptually related to athletic identity (Brewer, Van Raalte, & Linder, 1993; Good et al., 1993). Further, AIMS scores have been found not to be significantly correlated with measures of constructs conceptually dissimilar to athletic identity, including social desirability, self-esteem, self-rated sports competence, and coach-rated sport skill (Brewer, Van Raalte, & Linder, 1993).

One unresolved issue is whether the AIMS is uni-dimensional or multidimensional. Although Brewer, Van Raalte, and Linder (1993) found the AIMS to be uni-dimensional using exploratory factor analysis in the initial validation study, exploratory factor analyses in other studies (Brewer, 1990; Brewer, Boin, & Petitpas, 1993; Hale, 1995) have suggested that the AIMS is comprised of three factors, tentatively labeled "social identity," "exclusivity," and "negative affectivity" based on item content (Brewer, 1990). Martin and colleagues furnished additional evidence for the multidimensionality of the AIMS, yielding a four-factor solution in an exploratory factor analysis in one study (Martin, Mushett, & Eklund, 1994) and demonstrating the adequacy of a four-factor model through confirmatory factor analysis in another study (Martin, Eklund, & Mushett, 1997). Most recently, Hale, James, and Stambulova (1999) presented confirmatory factor analytic support for a three-factor AIMS model, casting further doubt on the uni-dimensionality of the scale.

For the most part, research on the dimensionality of the AIMS has been hampered by the use of small samples from specific sports or with specific characteristics (e.g., athletes with disabilities [Martin et al., 1994, 1997]). Consequently, one purpose of the current study was to evaluate the viability of uni-dimensional and multidimensional AIMS models through confirmatory factor analytic techniques with a large sample with diverse characteristics. More pertinent to academic athletic professionals, a second purpose of the current study was to provide norms for the final form of the instrument and determine whether the factor model on which the final form of the instrument is based is applicable across genders and athletic statuses.

METHOD

Participants

A sample of 2,856 participants was assembled from multiple administrations of the AIMS over the past 10 years. Because the data were aggregated in a single computer file from various questionnaire-based studies that differed somewhat in intent and population sampled, the same demographic information was not available for all participants, so the description of the sample's characteristics is based on only those observations for which there are information. The mean age of the sample (based on $n = 2,018$) was 20.61 years ($SD = 3.86$), with participant ages ranging from 13 to 55 years. Of those participants for whom gender was reported ($n = 2,729$), 64.3% were male and 35.7% were female (1,755 males, 974 females, 127 gender not reported). Of those participants for whom race/ethnicity was reported ($n = 1,476$), 82.1% ($n = 1,212$) were Caucasian, 13.9% ($n = 205$) were Black, 1.6% ($n = 23$) were Hispanic, 0.8% ($n = 12$) were Asian/Pacific Islander, and 1.6% reported "other." Information on race/ethnicity was not available for 48.3% ($n = 1,380$) of the sample. The sample was composed of varsity athletes ($n = 1,607$, 56.3%), non-athletes ($n = 529$, 18.5%), sports medicine clinic patients ($n = 171$, 6.0%), and participants for whom athlete status information was not available ($n = 720$, 25.2%). It should be noted that the athlete status categories are not mutually exclusive, as participants from a sports medicine clinic may also be varsity athletes. Of college student participants, 1,545 (57.5%) came from NCAA Division I institutions, 90 (3.4%) came from NCAA Division II institutions, and 928 (34.6%) came from NCAA Division III institutions. Divisional status was not reported for 122 (4.5%) of college student participants. Athlete participants reported involvement in 20 different sports, the most frequently reported being football ($n = 533$, 33.2% of athletes), soccer ($n = 254$, 15.8% of athletes), baseball ($n = 132$, 8.2% of athletes), basketball ($n = 126$, 7.8% of athletes), swimming and diving ($n = 89$, 5.5% of athletes), and lacrosse ($n = 88$, 5.5% of athletes). Data from non-athletes were included for validation purposes.

The total sample was divided into two samples: a derivation sample ($n = 1,462$) and a validation sample ($n = 1,394$). The samples were stratified to insure equivalence in gender and varsity athlete/non-athlete composition. No significant differences were detected between the derivation and validation samples in AIMS item mean scores or demographic variables (all $ps > .10$).

Analysis

Confirmatory factor analytic (CFA) methods were performed on the derivation sample data to examine four AIMS models (the original uni-dimensional model and three multidimensional models, designated Models A, B, C, and D) that have been previously proposed and investigated in the literature. The results of these analyses, which are described in the Appendix, supported the development of a new higher-order model, Model E. As shown in Figure 1, Model E consists of seven items. Three items from the original 10-item scale (item 6 – "I need to participate in sport to feel good about myself," item 7 – "Other people see me mainly as an athlete," and item 9 – "Sport is the only important thing in my life") were deleted due to poor performance in the factor analysis. The seven remaining items were renumbered 1 to 7 (see Table

I) and were modeled to comprise three first order factors. Items 1, 2, and 3 were indicators of social identity; items 4 and 5 were indicators of exclusivity; and items 6 and 7 were indicators of negative affectivity. These three first order factors were modeled to be related directly to one higher order athletic identity factor. Using AMOS version 4.0 (SmallWaters Corporation, Chicago, IL), the covariance matrix of the validation sample ($n = 1,394$) was used in a CFA to evaluate the adequacy of fit of Model E. In addition, two multi-group CFA were performed to examine the factorial invariance of Model E across athletes and non-athletes and across males and females. Factorial invariance means that items are measuring their underlying constructs the same way across different groups. This is a necessary condition for the instrument to be validly used for comparisons of these different groups. Participants were not included in analyses involving variables for which their data were missing.

RESULTS

The 7-item version of the AIMS indicated in Model E is displayed in Table I. The magnitudes of the fit indices for the validation sample indicate an acceptable fit for Model E (see Table II) and were very close to those obtained for the derivation sample. The validation sample was used to test Model E in two multi-group analyses: one comparing the model for males and females ($n = 1337$ due to 57 participants not reporting gender) and one comparing the model for athletes and non-athletes ($n = 1032$ due to 362 participants whose athletic status was unknown). The model was an acceptable fit for males ($n = 845$) and females ($n = 482$) separately, and when combined in a multi-group model allowing all parameter estimates for the two genders to be free to vary, the fit continued to be acceptable (see Table II). This supports the equivalence of the factor form across samples, meaning that the hypothesized factor structure of three first-order factors and one higher-order factor is acceptable for both samples. Constraining the factor loadings to be equal for males and females also provided an acceptable fit, indicating factor invariance across samples. These additional constraints on the model did not significantly worsen the fit ($c^2_{diff}(6) = 8.85$, $p < .05$), indicating that the items are measuring their respective factors in a similar way for males and females. The mean AIMS score for males ($M = 35.92$, $SD = 8.59$) was significantly different from the mean AIMS scores for females ($M = 30.15$, $SD = 10.68$, $t = 10.23$, $p < .01$), indicating that males tend to have higher athletic identity than females.

When tested on samples of athletes ($n = 788$) and non-athletes ($n = 244$) separately, Model E provided an acceptable fit for each of these samples (see Table II). When combined in a multi-sample analysis (i.e., athletes and non-athletes) allowing factor loadings to vary for each sample, the model continued to perform well, again indicating that the factor form was consistent across samples. When the factor loadings were constrained to be equal across samples, there was a significant deterioration of fit ($?^2_{diff} = 44.12$, $df = 6$, $p < .05$), though the fit of the model was still acceptable. Examination of the un-standardized factor loadings for the athlete and non-athlete samples showed that all the loadings were substantially smaller in magnitude for the non-athlete sample when compared to the athlete sample. This reduction in magnitude for the factor loadings for the non-athlete population makes sense, as the instrument is geared toward assessing a characteristic of athletes, and it is reasonable that a non-athlete sample would have reduced relationships between the items and their

corresponding latent constructs. The mean AIMS score for athletes ($\underline{M}$ = 38.21, $\underline{SD}$ = 6.54) was significantly different from the mean AIMS scores for non-athletes ($\underline{M}$ = 24.45, $\underline{SD}$ = 9.56, $\underline{t}$ = -21.01, $\underline{p} < .01$), supporting the validity of the AIMS by showing that athletes score substantially higher than non-athletes.

The total sample for which complete data was available ($\underline{N}$ = 2114) was used to compute norms for the 7-item version of the AIMS separately by gender and by athlete status. These norms, which are presented in Table III, will enable researchers and practitioners to compare individual AIMS scores to this large, diverse sample of athlete and non-athletes.

DISCUSSION

In combination with the findings of previous psychometric research with the AIMS (Brewer, Van Raalte, & Linder, 1993) and studies in which the AIMS has been used (e.g., Brewer, 1993; Brewer, Selby, Linder, & Petitpas, 1999; Cornelius, 1995; Dollinger, 1996; Good et al., 1993; Gould et al., 1996; Grove et al., 1997; Lavallee, Gordon, & Grove, 1997; Matheson, Brewer, Van Raalte, & Andersen, 1995; Murphy et al., 1996; Wiechman & Williams, 1997), the results of the current study suggest that AIMS is a valid and reliable means of assessing athletic identity. The abbreviated, 7-item version of the AIMS developed in this investigation is internally consistent (alpha = .81) and highly correlated with the original 10-item version of the AIMS. The higher order factor structure of the AIMS was found to be applicable to both men and women, and to both athletes and non-athletes. Nevertheless, further research is needed to determine whether the factor structure of the higher order model is generalizable to populations not sampled in the current study, particularly those in cultures where English is not a primary language.

Of particular relevance to academic athletic professionals, norms on the AIMS were developed for both male and female athletes and non-athletes. The norms enable practitioners to determine the extent to which student-athletes with whom they are working are invested in the athlete role relative to other athletes. Given that high levels of athletic identity are associated with increased risk for experiencing mood disturbance following injury (Brewer, 1993), encountering difficulty adjusting to sport career termination (Grove, Lavallee, & Gordon, 1997), possessing low career maturity (Murphy et al., 1996), and implementing potentially dangerous performance enhancement strategies such as using anabolic steroids (Hale & Waalkes, 1994; Smith & Hale, 1997), it can be useful for providers of support services to student-athletes to know their clients' levels of athletic identity. Such knowledge can facilitate greater understanding of student-athletes' orientations toward academics and athletics, and may assist in the process of matching student-athletes to appropriate personal and career development interventions. The AIMS provides a rapid, reliable, and valid tool for assessing an important aspect of student-athletes' personalities, and can serve as a tool to help identify those student-athletes who may be at elevated risk for experiencing some of the pitfalls of maintaining a strong and exclusive athletic identity (Brewer, Van Raalte, & Linder, 1993; Brewer et al., 2000).

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TABLE I

7-Item Version of the Athletic Identity Measurement Scale (AIMS)

Please circle the number that best reflects the extent to which you agree or disagree with each statement regarding your sport participation.

1.	I consider myself an athlete.							
	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
2.	I have many goals related to sport.							
	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
3.	Most of my friends are athletes.							
	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
4.	Sport is the most important part of my life.							
	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
5.	I spend more time thinking about sport than anything else.							
	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
6.	I feel bad about myself when I do poorly in sport.							
	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
7.	I would be very depressed if I were injured and could not compete in sport.							
	Strongly disagree	1	2	3	4	5	6	7	Strongly agree

TABLE II

Fit Indices for Model E for Validation Sample and Subsamples

Sample	n	c^2	df	SRMR	CFI	c^2_{diff}
Validation sample	1394	174.12	11	.04	.97	
Males	845	122.41	11	.04	.96	
Females	492	54.17	11	.03	.98	
Athletes	788	71.51	11	.05	.96	
Non-athletes	244	25.22	11	.03	.98	
Multi-group models						
Males and females						
Factor loadings free		176.57	22	.04	.97	
Factor loadings equal		185.43	28	.05	.97	8.85
Athletes and non-athletes						
Factor loadings free		96.74	22	.05	.97	
Factor loadings equal		140.86	28	.06	.95	44.12*

Note. SRMR = Standardized Root Mean Square Residual; CFI = Comparative Fit Index * $p < .01$

TABLE III

Norms for 7-Item AIMS

	Group			
	Male athletes	Female athletes	Male non-athletes	Female non-athletes
Percentile	(n = 1254)	(n = 331)	(n = 195)	(n = 334)
100	49	49	49	49
95	47	46	41	39
90	46	44	38	36
85	45	43	36	34
80	44	42	34	32
75	43	41	33	29
70	42	41	32	27
65	41	40	31	26
60	41	39	29	24
55	40	39	28	23
50	39	38	27	21
45	38	37	26	20
40	37	36	25	19
35	37	35	24	18
30	36	34	22	16
25	35	33	20	14
20	33	32	18	12
15	31	30	17	11
10	29	27	13	10
5	25	24	11	8

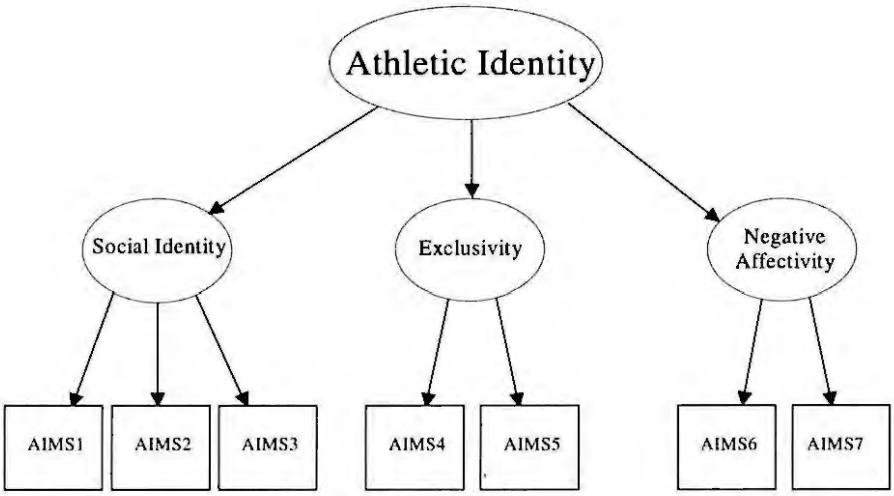

Figure 1. Model E of the AIMS depicting three first order factors subordinate to one higher order athletic identity factor.

AUTHOR NOTE

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