Validation of the Athletic Identity Measurement Scale in Youth Academy Soccer Players

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Abstract

The Athletic Identity Measurement Scale (AIMS) is a popular measure of Athletic Identity (AI). The purpose of the present study was to investigate the factor structure (7-item single-factor and three-factor model; Social Identity, Exclusivity and Negative Affectivity) of the AIMS within youth academy soccer players. A total of 259 male youth academy soccer players aged 12-18 years completed the AIMS. A series of confirmatory factor analyses and independent cluster modelling indicated support for the 7-item single-factor (AI) and the three-factor models, but not within the same analysis. The results support the use of AIMS for the measurement of AI in elite male youth soccer players. Practitioners seeking to explore AI in youth soccer populations should use the three-factor model to glean further insight from the three subscales to support the design of more specific interventions where appropriate.

Keywords: athletic identity, confirmatory factor analysis, talent development, youth soccer

Academy soccer represents one of the most common and popular talent development environments in the United Kingdom, with more than 10,000 boys involved in academies at any given time (Green, 2009). Players can be recruited and exposed to formalised training from as young as 5 years old (Football Association, 2010), and from the age of 9 years old receive around 12 hours of coaching per week that includes a games programme (Premier League, 2011). Those players deemed skilful enough will transition through distinct development phases up until the age of 21 years, although players can be offered professional playing contracts as young as 16 years old. As such, participation in soccer academies constitutes players' formative years, that is, the period of adolescence. One key aspect of adolescence is an individual's exploration of different roles and the ultimate development of one's own unique and – ideally – multifaceted, well-rounded identity (e.g., Erikson, 1968; Wylleman et al., 2004).

Given the extensive engagement demanded by soccer academies, it is likely that a salient part of a players identity becomes grounded in their participation in soccer throughout childhood and adolescence. This sport-specific component of self-identity is captured by the concept of athletic identity (AI), defined as "the degree to which an individual identifies with the athlete role" (Brewer et al., 1993, p. 202) and has been related to both positive and negative outcomes (Brewer et al., 1993). A strong but not exclusive (i.e., to the athlete role) AI has been associated with performance benefits through increased commitment to training and a willingness to work hard (Horton & Mack, 2000). When performing well, a strong AI is associated with psychological benefits including increased body image and self-confidence, as well as positive athletic experiences (Brewer et al., 1993; Horton & Mack, 2000).

However, overemphasis on the athlete role may have negative implications. In the short term, a strong and exclusive AI has been associated with i) disturbances in psychological states and self-worth

when dealing with setbacks that accompany high-level sport, for example, injury, de-selection, and performance slumps (Stamulova, 2003; Ryba et al., 2017); ii) an increased risk of overtraining (e.g., Winsley & Matos, 2011) and burnout (e.g., Gustafsson et al., 2018), and iii) increased willingness to risk one's health, for example, not reporting concussion, playing hurt, and eating disorders (Liniger et al., 2017; Voelker et al., 2014). More long term, a strong and exclusive AI resulted in athletes being ill-prepared and experiencing maladjustment in the form of identity loss, depression, and loneliness upon transitioning out of sport either when this transition occurred prematurely, such as due to de-selection or a career-ending injury (Alfermann, 2000; Brown & Potrac, 2009), or naturally, such as at the end of a career (e.g., Sanders & Stevinson, 2017).

The development of a strong AI has been raised as a risk of elite youth sport involvement (e.g., Bergeron et al., 2015), and within academy soccer in particular (e.g., Mitchell et al., 2014). Considering the possible influences of a strong AI on performance, self-identity development, and player wellbeing, a reliable and valid measure that monitors players' AI would be useful to aid identification of those players at risk of the negative impacts of an overly strong and exclusive AI.

The AI construct has been measured by the Athletic Identity Measurement Scale (AIMS), originally a 10-item self-report scale (Brewer et al., 1993), but at present the 9-item (Hoiness et al., 2008) and 7-item (Brewer & Cornelius, 2001) versions are widely used. The 7-item (Brewer & Cornelius, 2001; Brewer et al., 2010; Houle et al., 2010) and 9-item versions (Hoiness et al., 2008) have been supported as measuring a unidimensional concept.

There also is support for the multidimensionality of the AIMS measure. Brewer and Cornelius (2001) conducted a study with data collected over 10 years from North American sport and non-sport students in order to test the fit of different proposed factor structures as well as to develop norms. This resulted in the most current 7-item version of the

AIMS (see Table 1), which showed acceptable internal consistency (Cronbach alpha = .81) and highly correlated with the original 10-item version (Brewer & Cornelius, 2001). Subsequent research has supported this 7-item three-factor structure in Hong Kong Chinese sports students aged 18-27 years (Visek et al., 2008), Greek physical education undergraduate students (Proios, 2012b), Turkish undergraduate physical education students (Tunckol, 2015), and Japanese collegiate students (Hagiwara, 2019). However, given mixed support for the higher-order and unidimensional structure, questions remain as to whether it is appropriate to "use higher-order summary scores in addition to – or possibly instead of – scale scores" as suggested by Proios (2012b). Furthermore, most of these studies seem to have used undergraduate students or college level athletes to validate the AIMS, and these contexts are significantly different from elite youth soccer academies, both in terms of the athletes' age as well as the professionalism and level of involvement required. So far, no study has tried to examine the factor validity of the AIMS in this sample or any other youth sport-specific sample. As a result, there is a need to demonstrate validity and offer best practice guidance to practitioners and researchers wishing to explore AI by using the AIMS with elite youth soccer players. Understanding how best to use the AIMS may provide a more refined understanding of AI for those working with elite youth soccer players. Therefore, the aim of this study was to examine the factor structure of the AIMS measure in elite youth soccer players.

Method

Participants

Participants recruited for this study included 259 (n = 259) male youth team soccer players aged 12-18 years (M, 16.49, SD, 2.13) years from 13 clubs within the four major English professional soccer leagues. With institutional ethical approval and gatekeeper consent, parental and player informed consent

and assent were obtained prior to data collection. Within each club, academy players currently part of the Youth Development Phase (12-16 years, n = 57) and Professional Development Phase (16-18 years, n = 202) participated in the study.

Measures

The Athletic Identity Measurement Scale (AIMS; Brewer & Cornelius, 2001) was used to assess participants' perception of their identity in relation to sport, where responses were made on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree; see Table 1). Total scores on the AIMS range from 7 to 49, with higher scores indicative of higher levels of AI. The AIMS is composed of three subscales: social identity (i.e., the degree to which an individual views themselves as occupying the role of an athlete; includes Q1-3), exclusivity (i.e., the degree to which an individual's self-worth is established through participating in the athletic role; includes Q4-5), and negative affectivity (i.e., the degree to which an individual experiences negative emotions from unwanted sporting outcomes; includes Q6-7). Researchers administered the AIMS during club visits after training sessions or within educational sessions. Written instructions were given guiding participants to read each statement and circle the number that best described the degree to which they agreed with the statement.

Table 1

Items of the AIMS

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

Data Analysis

Preliminary analyses screened for missing data and outliers and examined univariate normality. Internal consistency was assessed using omega point estimates, bootstrapped confidence intervals (Dunn et al., 2013), and mean inter-item correlation (MIIC). Omega point estimates and confidence intervals were calculated using the MBESS package (Kelley & Lai, 2012) in R (R Development Core Team, 2012) with 1,000 bootstrap samples. The factor structure of the AIMS was examined through a series of structural models in Mplus 7 (Muthén & Muthén, 2012). First, a single-factor model, where all items load onto a general factor, was applied (Figure 1).

Figure 1

Single-factor model
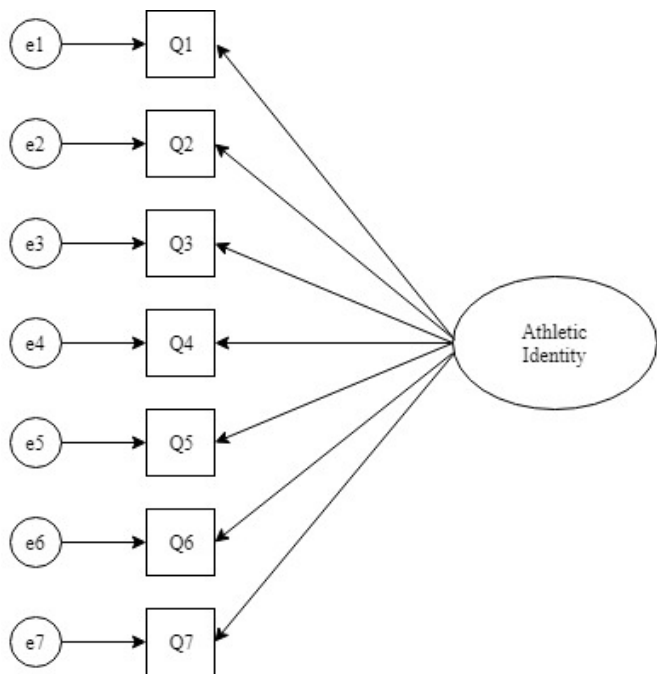
Figure 2

Three-factor CFA-ICM model
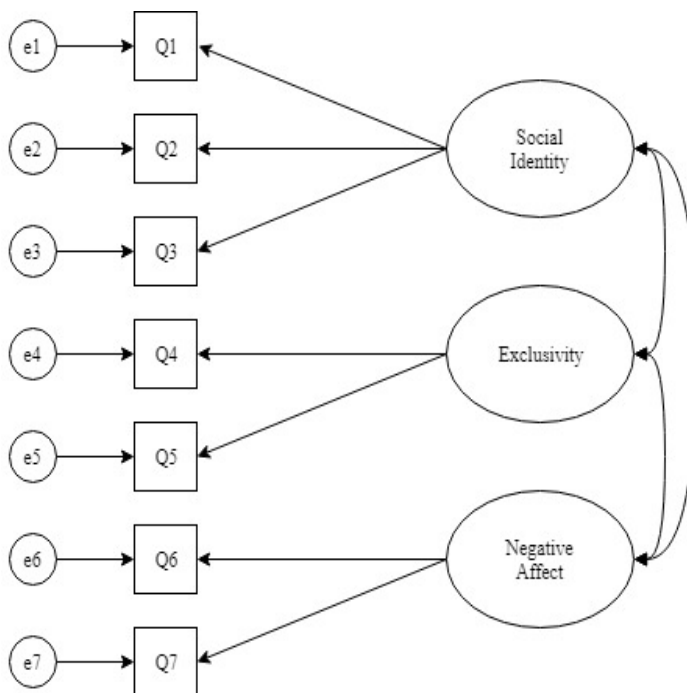
Note. Q represents question number, e represents error.

Second, a traditional confirmatory factor analysis, independent cluster model (CFA-ICM) was test-ed, whereby three latent variables, each representing a subscale, are indicated by their respective items with cross-loadings fixed to zero (Figure 2). Third, we tested a bifactor model (Figure 3), in which a general factor is posited to account for the commonality of all manifest variables and orthogonal factors representing hypothesized unique influence (McKay et al., 2015). Essentially, this is an examination of the extent to which the hypothesized factors cumulatively represent an overall effect but is advantageous over higher-order models, as the observed items are indicative of the general factor, and it allows the assessment of predictive relations between specific factors above with external measures beyond the general factor (Chen et al., 2006).

Figure 3

Bifactor CFA model
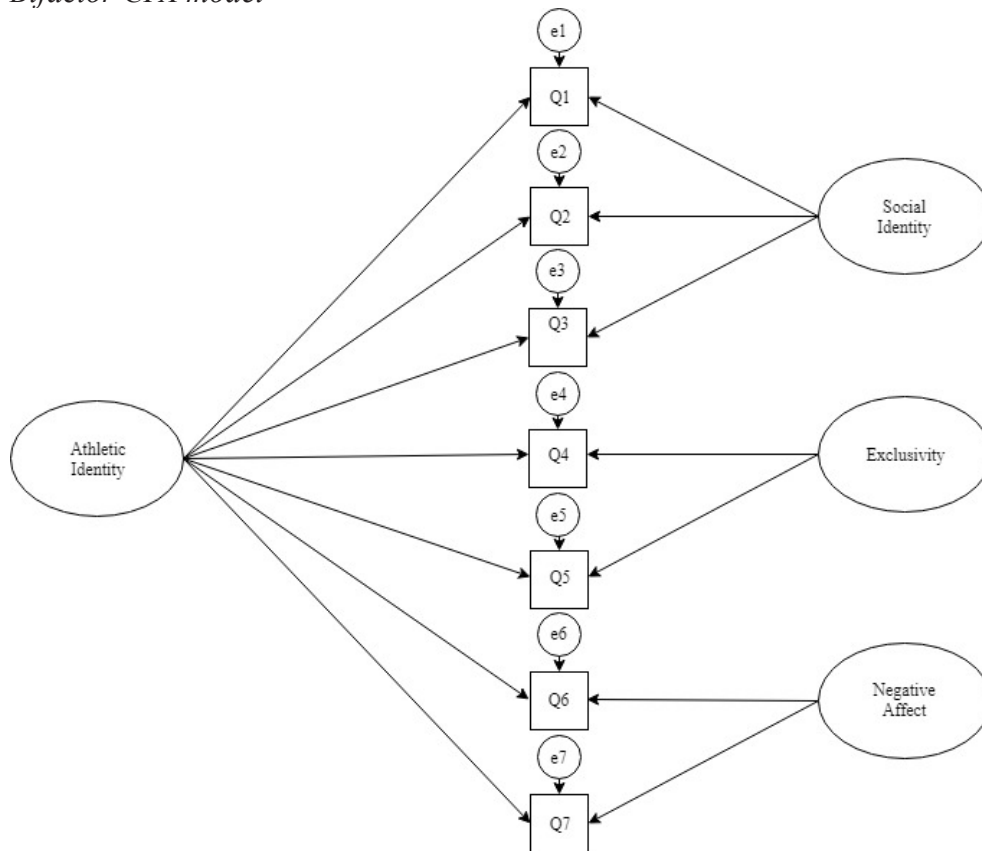
Several limitations of CFA-ICM models have been noted, such as the constraint of cross-loadings at zero unnecessarily punishing models' non-substantive cross-loadings (Hopwood & Donnellan, 2010). An alternative is Exploratory Structural Equation Modelling (ESEM; Asparouhov & Muthén, 2009), which enables all latent variables to be indicated by all items while still testing an *a priori* model and providing fit indices. Consequently, we conducted ESEM to test a three-factor and bifactor structure of the AIMS.

All analyses used the robust maximum likelihood (MLR) estimator to guard against departure from multivariate normality. Model fit was examined by broadly employing Hu and Bentler's (1999) recommendations of comparative fit index (CFI) and Tucker-Lewis index (TLI) of close to .95 for incremental indices, standardised root-mean-square residual (SRMR) close to .08 and root-mean-square error of approximation (RMSEA) of close to .05. However, these were not considered as golden rules (Marsh et al., 2004; Perry et al., 2015). Standardized factor loadings were interpreted using previously recommended norms of 0.32 (poor), 0.45 (fair), 0.55 (good), 0.63 (very good), and 0.71 (excellent; Comrey & Lee, 1992; Tabachnick & Fidell, 2007, Yong & Pearce, 2013).

Results

Preliminary Analyses

Descriptive statistics are presented in Table 2. Preliminary analyses Q-Q plots found no outliers and there was no missing data. Both univariate skewness (< 2) and kurtosis (< 3) indicated limited deviation from normality. Omega estimates supported the internal consistency of the single-factor model ($\omega = 0.75$, 95% CI = 0.68, 0.81). The limited number of items in the multidimensional scale inevitably leads to lower internal consistency estimates using omega (Table 2). Consequently, we also have presented mean inter-item correlations, which largely are supportive of internal consistency but are lower than expected for the social identity subscale.

Table 2

Descriptive statistics and internal consistency estimates

Variable	Mean	SD	Min	Max	Skew	Kurt	Omega	MIIC
Social Identity	16.64	2.27	9.00	21.00	-0.52	0.47	.44 (.31, .53)	.23
Exclusivity	11.61	2.18	2.00	14.00	-1.12	1.36	.77 (.70, .83)	.63
Negative Affect	12.19	1.97	4.00	14.00	-1.36	2.16	.50 (.32, .65)	.33
Total Athletic Identity	40.44	5.09	17.00	49.00	-1.07	1.87	.75 (.68, .81)	.29

Note. MIIC = mean inter-item correlation.

Main Analyses

The single-factor model presented good fit to the data (Table 3, row 1), although the RMSEA was a little high, which is common in short, heavily-constrained models. Two items demonstrated an excellent loading (Q4 and Q5, both exclusivity), four were fair (Q2, Q3 from social identity and Q6, Q7 negative affectivity), and one was poor (Q1 from social identity), but all were statistically significant ($p < 0.001$). The three-factor solution fitted the data marginally better (Table 3, row 2).

Table 3

Model fit for single-factor, 3-factor, and bifactor models

Model	c^2	*df*	CFI	TLI	SRMR	RMSEA (90% CI)
Single-factor	32.39	14	.941	.911	.047	.071 (.039, .104)
3-factor CFA-ICM	24.22	11	.958	.918	.037	.068 (.031, .105)
Bifactor CFA-ICM	100.11	11	.745	.513	.528	.177 (.146, .210)

*Statistically significant at $p < .001$.

Note: CFI = Comparative Fit Index; TLI = Tucker Lewis Index; SRMR = Standardised Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation

Standardized parameter estimates highlighted two excellent loadings (Q4 and Q5, both exclusivity factor), three good loadings (Q6 and Q7 from negative affectivity and Q2 from social identity), and two poor loadings (Q1 and Q3, both social identity factor; Table 4).

Table 4

Standardized factor loadings for the 3-factor CFA-ICM with 95% confidence intervals

Item	Social Identity	Exclusivity	Negative Affect	R^2
1	.43 (.18, .69)			.19
2	.61 (.34, .87)			.37
3	.44 (.25, .63)			.19
4		.81 (.70, .92)		.65
5		.78 (.68, .89)		.61
6			.56 (.35, .77)	.31
7			.59 (.38, .80)	.35

As a measure of influence in explaining variance, R^2 indicated that two items (Q1 and Q3) from the social identity scale were weaker than other items, though still statistically significant contributors. The correlation matrix supports the potential for a bifactor model, as all factors were strongly, positively correlated (Table 5).

Table 5

Factor correlations for the 3-factor model taken from the CFA-ICM

Variable	1	2	3
1. Social Identity	-		
2. Exclusivity	.87	-	
3. Negative Affect	.66	.68	-

Note. All correlations statistically significant at $p < .001$.

Bifactor models constrained all factor correlations to zero and set the metric at one for all factor variances. The bifactor CFA yielded a sub-optimal fit (Table 4, row 3). Generally, where factor loadings are stronger on their sub-trait than general factor, there is support for a multidimensional model. That is, factor loadings typically would be higher on social identity, exclusivity, and negative affect than on the general, total AI factor. If factor loadings on the general factor are greater (loadings on total AI typically larger than they are on a subscale), a unidimensional model may be more appropriate. Here, we found that loadings on the general factor were stronger on five on the seven items (Table 6). Indeed, sub-trait loadings for two of the social identity items (Q1 and 2) were negative when the general factor was present. This likely is a result of the very high correlation between social identity and exclusivity, meaning that when attempting to fit a model where they both contribute to a general factor in addition to their own factor, much of the variance is shared and they have insufficient unique variance to support divergence between them. Overall, the bifactor model was not supported, suggesting that the single-factor and the three-factor could be considered appropriate, but not both at the same time.

Table 6

Standardized factor loadings for the bifactor CFA

Item	General factor	Social Identity	Exclusivity	Negative Affect	R^2
1	.80 (.75, .85)	-.18 (-.33, -.03)			.68
2	.74 (.62, .86)	-.19 (-.35, -.03)			.58
3	.56 (.36, .75)	.68 (.59, .76)			.77
4	.72 (.59, .84)		.30 (.12, .48)		.61
5	.70 (.56, .83)		.69 (.60, .78)		.96
6	.45 (.26, .64)			.78 (.68, .88)	.82
7	.50 (.32, .68)			.21 (.04, .39)	.29

Finally, we examined a three-factor and a three-bifactor model using ESEM. However, both models were deemed inadmissible, as they generated a negative chi-square. Without adding atheoretical constraints to the model, convergence only could be achieved through many iterations, generating Heywood cases and meaningless factors. Consequently, the three-factor model was not supported using ESEM.

Discussion

The aim of this study was to examine the factorial structure of the 7-item AIMS measure in elite youth soccer players. The factor structure analysis supports the use of a 7-item three-factor model and a single-factor model, but not a bifactor model, for assessing AI in academy youth soccer players.

Although a number of previous studies have not supported a unidimensional model as a good fit (Proios, 2012b; Tunckol, 2015), the current findings are in line with other studies (Brewer & Cornelius, 2001; Hagiwara, 2019; Visek et al., 2008) proposing the AIMS can be used to represent an athlete's overall AI as a single construct. Equally, the multi-dimensionality of the AIMS as measuring three aspects of AI has been supported for previous iterations of the scale in the form of the 10-item AIMS (Lamont-Mills & Christensen, 2006) and the 9-item AIMS (Ryska, 2002). With regard to this 3-factor model, the current findings add to comprehensive support from a variety of contexts (Visek et al., 2009; Proios, 2012b; Tunckol, 2015; Hagiwara, 2019). However, in contrast to previous studies, the current findings suggest that the bi-factor model with one-higher order factor with three subordinate factors is not an appropriate fit. As a result, the current findings give confidence in using either the 7-item three-factor or single-factor models with youth soccer players based in England. Given the findings of this study we recommend that researchers and practitioners working within this context use the AIMS as either a unidimensional or a multidimensional scale, but not to calculate both subscales and overall AI from the same analysis given its suboptimal fit.

Based on the existing research evidence we propose that using the AIMS as a multidimensional scale particularly may be useful as it is likely that the different aspects of athletic identity (social identity, exclusivity, and negative affectivity) may make distinctive contributions to key positive and negative outcomes. Social identity has been associated with higher levels of performance (Lamont-Millls & Christensen, 2006), achievement goal orientations (Proios, 2012a), increased problem-focussed coping (Russell et al., 2018), increased harmonious but lower obsessive passion (Martin & Horn, 2013), and lower state anxiety (Masten et al., 2006). Exclusivity has been negatively associated with athlete satisfaction (Burns et al., 2012) and positively associ-

ated with obsessive passion (Martin & Horn, 2012) and negative perceptions of aging (Phoenix et al., 2005). Theoretically, an exclusive athletic identity can be linked to the lack of exploration of other roles (i.e., identity foreclosure), which in itself is linked to increased difficulty in dealing with setbacks, deselection, and the transition out of sport (Brown & Potrac, 2009), as well as a lack of career exploration and maturity (Wylleman & Reints, 2010). This suggests that an understanding of the levels of exclusivity within players could be of particular importance for researchers and applied practitioners when using the AIMS. Negative affectivity has been associated with emotional exhaustion (Martin & Horn, 2012), lower athlete satisfaction (Burns et al., 2012), emotion-focussed coping (Russell et al., 2018), and state anxiety (Masten et al, 2006). To summarise, certain aspects of AI may be more or less related to positive and negative outcomes. Therefore, using the 3-factor model would afford researchers and applied practitioners a more nuanced means of understanding AI and its consequences, as well as offering a more adept diagnostic instrument in monitoring those players at risk of negative outcomes.

The current findings support the use and analysis of the AIMS within a youth academy context with elite soccer players. Such findings can inform future research studies in this area, specifically associated with: i) the long-term monitoring (e.g., within or across seasons) of AI to help ascertain how it may change and develop over time; ii) the administration of the AIMS alongside other associated measures of risk, such as burnout (Gustaffson et al., 2018), perfectionism (Winsley & Matos, 2011), engagement in career preparation, and readiness for the transition out of sport (Wylleman & Reints, 2010), to assess any predicative capacities between such variables in this context; iii) the influence of AI on level of performance and ultimate sporting career success (Lamont-Mills & Christensen, 2006), and iv) how AI affects players' de-selection experiences immediately and over time, including how AI changes once players are de-select-

ed. Therefore, this study has contributed to examining the validity of the AIMS and allows future research studies to adopt a more robust methodological framework within a youth academy soccer context.

Conclusion

In conclusion, the examination of AI in elite youth soccer players aged 12-18 is supported by both the 7-item three-factor and single-factor structures. As a result, researchers and practitioners should choose between using the AIMS as a unidimensional or multidimensional scale. The analysis presents no evidence to recommend that both are appropriate in the same analyses. We propose using the 7-item three-factor structure to afford researchers and practitioners a more nuanced way to understand AI and explore the contributions of the three accepted elements of AI (social identity, exclusivity, and negative affectivity). The AIMS measure is a valid, convenient, and brief instrument for the measure of AI in youth academy soccer players and these valid measures can be useful to inform future research and applied practice.

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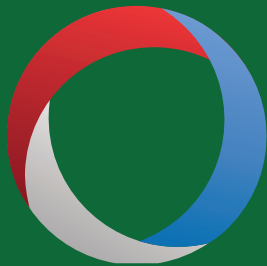
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