# ATHLETIC IDENTITY MEDIATES THE RELATIONSHIP BETWEEN MOTOR SKILL PROFICIENCY AND PHYSICAL ACTIVITY LEVEL AMONG ADOLESCENTS

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## ABSTRACT

*This study investigated the relationships between motor skill proficiency, athletic identity, and physical activity level among adolescents. Understanding these relationships will help design strategies that motivate adolescents to be physically active across the lifespan. Ninety students, aged 11-14 years, from a middle school in Texas completed the Athletic Identity Measurement Scale and the Physical Activity Questionnaire to gauge athletic identity and physical activity level, respectively. To assess motor skill proficiency, the Movement Assessment Battery for Children - Second Edition was administered. The bootstrapping method by Preacher and Hayes (2004) was used to analyze simple mediation. The results revealed that athletic identity mediates the relationship between motor skill proficiency and physical activity level. Motor proficient individuals exhibited a stronger perception of themselves as "athletes", which then influenced higher engagement in physical activity. In order to increase physical activity, it is important to improve motor skillfulness, which appears to be the driver to the development of positive self-perception and ultimately physical activity.*
*Keywords: Athletic identity, motor skill proficiency, physical activity, adolescents, mediation.*

## 1. INTRODUCTION

The lack of physical activity is one of the main factors associated with obesity and it has been a serious concern in recent years (Ogden & Carroll, 2010). In the United States, approximately 17% of children and adolescents aged 2-19 years are obese.

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Alarmingly, this rate has almost tripled since 1980. In addition, during the vulnerable periods of puberty and adolescence, a clear decline in physical activity and sport participation is a major concern (Davison, Schmatz, & Downs, 2010; Nader, Bradley, Houts, McRitchie, & O'Brien, 2008; Troiano et al., 2008). The social and emotional upheavals accompanying rapid morphological changes could impact sport and exercise activity (Bradley, McRitchie, Houts, Nader, & O'Brien, 2011). In many cases, withdrawal and attrition from sport and exercise ensue (Caspersen, Pereira, & Curran, 2000). As a result, the National Association for Sport and Physical Education and the American Heart Association (2012) are in the forefront of promoting physical education programs to improve well-being and reduce obesity across lifespan. However, in order to obtain these goals, equipping children and adolescents with the necessary skills and cultivating positive attitudes toward participating in exercise, games and sports are imperative.

"Self-perceptions" greatly influence a person's behavior (Horn, 2004). People act, consciously or unconsciously, in accordance to their perception of themselves – their skills, abilities, and competencies. One form of self-perception is role identity, which explains that an individual's identity is anchored on a particular role and the meanings and expectations associated with that role (Stets & Burke, 2000). Having a particular role identity entails the individual to fulfill the expectations of the role. In sports and physical activity context, the perception of one's self as having the role of an athlete (i.e., athletic identity, AI) would necessitate the individual to engage in sports since doing so would represent and preserve the meanings and expectations of the role of an athlete. Essentially, the behaviors the individual engages in will perpetuate the prevailing belief system (e.g., self-perception).

The athletic identity literature (using Athletic Identity Measurement Scale, Brewer *et al.*, 1993) was initially limited to studies in sport context such as its association with athletic performance and commitment to sport (Horton & Mack, 2000), effects on termination of sport career (Lally, 2007), and dealing with injury (Green & Weinberg, 2001). Anderson (2004) constructed and validated another assessment tool (i.e., Athletic Identity Questionnaire) which expanded the athletic identity (AI) concept to encompass physical activity and exercise.

Anderson, Masse, and Hergenroeder (2007) found positive associations between AI and self-reported physical activity (PA). Conversely, a negative association was found between AI and inactivity. In other words, the higher the AI scores, the greater the reports of being active; and the lower it is, the greater the probability of being inactive. This was further supported by a subsequent study (Anderson, Masse, Zhang, Coleman, & Chang, 2009), which related athletic identity to physical activity and sports team participation.

Clearly, athletic identity (AI) has a great potential in contributing to long-term participation in physical activity. Developing positive self-perceptions related to the physical self such as AI may be an effective strategy toward sports/physical activity adherence and obesity intervention across the lifespan. However, the question about the mechanisms in acquiring and developing AI still remains. Does motor skill proficiency drive the development of AI, or does a simple identification of oneself as an athlete significantly impact PA regardless of actual motor skill levels?

It is essential for young children to be equipped with proficient fundamental motor skills (FMS) as they proceed through elementary and middle school. These skills are necessary to participate in games, sports or exercise (Clark & Metcalfe, 2002; Stodden *et al.*, 2008). Typically, FMS is composed of object control (e.g., ball striking, dribbling, kicking, catching, throwing, and rolling), locomotor (e.g., running, galloping, hopping, leaping, jumping, and sliding, Ulrich, 2000), and body management skills (e.g., static and dynamic balancing, rolling, landing, bending and stretching, twisting and turning, swinging, and climbing, Broomfield, 2011). Not having the requisite tools (FMS) might be a barrier in PA participation.

Several studies support the proposition of Clark and Metcalfe (2002), Lubans *et al.* (2010), and Stodden *et al.* (2008), about the critical role of proficient FMS or MSP in physical activity participation. Positive associations between MSP and PA were found among preschool children (Fisher *et al.*, 2005; Williams *et al.*, 2008), elementary schoolchildren (Raudsepp & Pall, 2006; Wrotniak, Epstein, Dorn, Jones, & Kondilis, 2006), and adolescents (Barnett *et al.*, 2009; Okely, Booth, & Patterson, 2001). Furthermore, a meta-analysis of FMS and their associated benefits (Lubans *et al.*, 2010) presented cross-sectional and longitudinal evidence that motor skill proficiency and physical activity among children and adolescents are positively associated.

In addition, motor skills developed during childhood appear to be very important in increasing PA participation later in life. A longitudinal study (Barnett *et al.*, 2009) found that MSP, particularly object control proficiency (i.e., catching, throwing, and kicking) during childhood predicted time spent in MVPA and organized activities during adolescence.

Nonetheless, the mechanism through which MSP influences PA level is not well understood. Is there an intervening variable in the MSP-PA relationship? Can AI be that mediating factor? Since athleticism inherently requires motor skills (albeit different skill sets for different sports), hypothetically, MSP should be an essential contributor to develop AI. While data clearly shows the association between MSP and PA levels, its role may be tempered or mediated by AI.

The fundamental basis for athletic identity (AI) and the overall effect of motor skill proficiency (MSP) on physical activity (PA), accounting for the

mediating effect of AI has not been explored among young subjects particularly during the vulnerable periods of puberty and adolescence. The purpose of this study was to examine the relationship between motor skill proficiency and physical activity level, accounting for the mediating effect of athletic identity among adolescents. It was hypothesized that AI will have a mediating effect on the MSP-PA relationship. Since motor proficiency is a prerequisite for the successful participation in a host of physically demanding activities, theoretically it will influence the development of athletic identity and ultimately the cultivation of an active lifestyle.

## 2. METHODS AND MATERIALS

### 2.1 Participants

Participants for the study were adolescents ($N$=90; $M$= 45) aged 11-14 years ($M$= 12.24, $SD$= 1.02), enrolled at a middle school in Texas (Lubbock). An equal distribution of male and female subjects was recruited from PE classes; however the data were not analyzed between genders. Students who were enrolled in competitive athletics class were excluded from the study. Parental consent and child assent forms were obtained prior to data collection.

### 2.2 Instrumentation

To assess motor skill proficiency (MSP), the protocol for the Movement Assessment Battery for Children - Second Edition (MABC-2; Henderson et al., 2007) was used. The performance test of the MABC-2 comprises three sub-tests (i.e., manual dexterity, aiming and catching, and balance) which measures performance in 8 tasks (i.e., 3 tasks in manual dexterity, 2 tasks in aiming and catching, and 3 tasks in balance). The tasks are adjusted according to age band (age band 3 for 11-16 years old was used in the study).

The Athletic Identity Measurement Scale (AIMS, a 7-item questionnaire) was used to assess AI, where each item was scored via a seven-point Likert scale. Higher scores indicate stronger athletic identity. The total AIMS scores were also compared with the normative data, specific to gender and athlete status (i.e., athletes and non-athletes).

The Physical Activity Questionnaire (PAQ, Kowalski *et al.*, 2004) measured self-reported PA levels. A 7-day recall questionnaire (age-appropriate version) was self-administered and designed to measure moderate to vigorous physical activity in daily life.

## 2.3 Procedures

Protocol details were discussed with each participant individually. Thereafter, consent and assent were obtained according to procedures approved by the Texas Tech University Institutional Review Board. Surveys using AIMS and PAQ were conducted in a quiet, isolated setting during the allotted period for Physical Education classes.

 The MABC-2 testing was conducted one subject at a time in a private setting within the school premises. Prior to being tested, participants were led through a 5 to 10-minute warm-up. Video records of each individual's performance were kept for subsequent analyses. All participants were assigned a number to protect their identities.

 Other indices such as height and weight were measured on the same day the participant completed the MABC-2. Properly calibrated stadiometer and weighing scale were used to measure height and weight, respectively.

## 2.4 Data Analysis

The bootstrapping method advocated by Preacher and Hayes (2004) was utilized to analyze simple mediation, i.e., if AI has a significant mediating effect in the relationship between MSP and PA level. The proposed model identifies AI as a third variable that significantly impacts the MSP-PA relationship. Directionally, MSP affects AI (the mediator), and AI affects PA level (see Figure 1).

 In this model (see Figure 1a), path *c* represents the *total effect* of MSP to PA level whereas path *c'* on Figure 1b indicates the *direct effect* of MSP to PA level. Having controlled for the mediating effect of AI, *c'* represents the magnitude of influence on PA levels that is attributable to MSP. In Figure 1b, path *a* shows the effect of MSP on AI (proposed mediator) whereas path *b* represents the effect of the mediator (AI) on PA level. These paths were measured with unstandardized regression coefficients. The indirect (mediating) effect corresponds to the product of the paths (regression coefficients, *ab*) between MSP and PA level via AI. Proponents of mediation analyses posit that a statistically significant indirect effect (*ab*) is the only requirement for mediation to occur (Rucker, Preacher, Tormala, & Petty, 2011; Zhao, Lynch, & Chen, 2010). Significant indirect effects can occur (suggesting mediation) despite non-significant total effect and direct effect.

## 3. RESULTS

Means and standard deviations for the three variables (MSP, AI, and PA level) are presented in Table 1.

**Table 1: Mean scores of all participants on MSP, AI, and PA**

| Variable | N | Mean (max score) | SD |
|---|---|---|---|
| 1. Motor skill proficiency (MSP) | 90 | 8.92(19) | 2.57 |
| 2. Athletic identity (AI) | 90 | 29.16(49) | 8.20 |
| 3. Physical activity level (PA) | 90 | 2.80(5) | 0.62 |

With respect to MSP, the overall mean of unconvertedMABC-2 total score is 73.54, which corresponds to an overall MABC-2 standard score of 8.92 (see Table 1). This profile for the "average" middle-school child would place this sample at the 37th percentile. This MABC-2 total score is 4.46 units away from the 50th percentile (MABC-2 total score of 78-81). Two-thirds of the subjects (66%) scored below the 50th percentile in the MABC-2 performance test.

The overall AI mean score is 29.16. Based on percentile ranks which are different per gender (Brewer & Cornelius, 2001), girls are on the 75th percentile while boys are on the 60th percentile. This indicates a relatively high athletic identity of the participants.

Finally, assessment of PA level resulted in a mean PAQ score of 2.80 (highest possible score is 5). The PAQ scores of 2.93 for girls and 2.68 for boys are close to the identified cut-off points based on an English sample, $\geq 2.9$ for boys and $\geq 2.7$ for girls (Voss & Sandercock, 2013).

**Figure 1: Simple mediation design showing unstandardized regression coefficients indicating total (c), direct (c'), and indirect effects (ab). Adapted from "SPSS and SAS procedures for estimating indirect effects in simple mediation models," by Preacher, and Hayes.**



a) Direct Pathway

b) Indirect (Mediated) Pathway
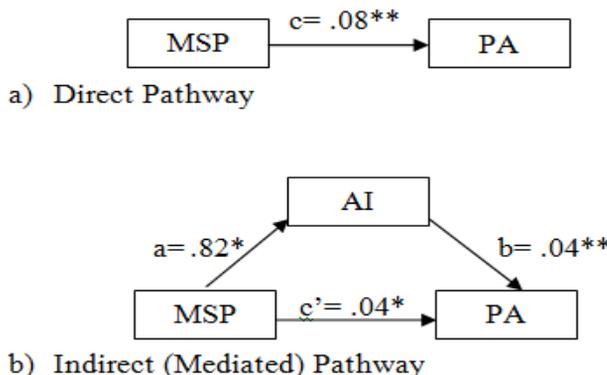
*p< .05
**p< .01

## Relationships between Variables

Pearson correlation analyses indicated a significant but weak relationship between MSP and PA level ($r = 0.31$, $p < 0.01$) and MSP and AI ($r = 0.26$, $p = 0.01$). The strongest correlation was found between AI and PA level, $r = 0.53$, $p < 0.01$.

## Mediation Analysis

Figure 1 illustrates that the individual paths (*a, b, c, c'*) measured by regression coefficients are all statistically significant. Overall, MSP significantly predicts PA (total effect: *c* path = 0.08; see Figure 1a). MSP also predicts the mediator AI (*a* path) which then predicts PA level (*b* path); see Figure 1b.

In the mediation analysis, the assessment of the 'indirect effect' is the primary interest. The significant *a* and *b* paths (0.82*0.04) led to a significant indirect or mediating effect (*ab* = 0.03). The bootstrapping method revealed that AI mediates the relationship between MSP and PA level (indirect effect = 0.03, 95% CI [0.01, 0.06]). See Table 2 for the indirect effect (*ab*).

**Table 2: Bootstrapped point estimates and bias-corrected and accelerated (BCa) confidence intervals (CI) and adjusted $R^2$**

| Point Estimate (*ab*) | SE | 95% CI LL | UL | Adjusted $R^2$ |
|---|---|---|---|---|
| 0.03 | 0.01 | 0.01 | 0.06 | 0.30 |

CI = confidence intervals; SE = standard error; LL = lower limit; UL = upper limit

Rucker *et al.* (2011) and Zhao *et al.* (2010) posit that the only requirement for mediation is a significant indirect effect (*ab*). Since the point estimate (indirect effect) is between the lower (0.01) and upper bounds (0.06) of the 95% confidence intervals (see Table 2), the indirect effect (*ab*) is considered statistically significant. The adjusted $R^2$ value (see Table 2) indicates that 30% of the variance in the outcome variable (i.e., PA) was explained by the mediation model, $R^2 = 0.30$, $F(2, 87) = 20.24$, $p < 0.01$.

## 4. DISCUSSION

The results show that all individual paths in the mediation model were significant: MSP predicts PA (path *c*, total effect of MSP on PA), MSP predicts AI (path *a*), AI predicts MSP (path *b*), and MSP still predicts PA upon inclusion of AI (mediator) in the mediation model (direct effect of MSP on PA, path *c'*). The significant

indirect (mediating) effect of AI highlights how a perception-based construct operates and mediates between MSP and PA.

The significant total and direct effects of MSP to PA supports the positive association between MSP and PA previously reported among adolescents (Barnett *et al.*, 2009; Lubans *et al.*, 2010; Okely *et al.*, 2001). This finding implies that skillfulness influences higher PA level and conversely, lack of proficiency in motor skills influences low levels of PA. As Welk (1999) stated, "Youth who are physically fit and skilled are more likely to seek out opportunities to be active and will most likely persist, whereas children with poor fitness and skills are less likely to achieve the same level of success" (p. 14).

The significant association between MSP and AI (path *a*) is another important finding of the study. Since MSP significantly predicts AI, it is possible that being competent with respect to motor skills facilitates stronger athletic identity. Among the factors which comprise the self-determination theory (i.e., the prominent motivation theory by Ryan & Deci, 2000), the need for competence was found to have the strongest association with exercise identity (Vlachopoulus, Kaperoni, & Moustaka, 2011; Wilson & Muon, 2008). These findings strengthen the proposed role of MSP as an important contributor toward developing AI. It is difficult to develop a self-concept related to the "athlete" role if an individual does not have the requisite level of motor skills that will make him/her successful in sport. Furthermore, the reinforcing effect of increasing skills will help maintain or strengthen that identity.

Meanwhile, the strongest association between variables was found in the AI-PA path (*b*). This finding supports a fundamental focus of the study - that self-perception greatly influences behavior. How adolescents view themselves (as having the athlete role) is positively related to how physically active they are.

It also highlights the unique contribution of this research: this study tested the role of AI among adolescents. People behave in relation to their perceived skills, abilities, and competencies (Horn, 2004). Specifically, role identities such as AI form a set of standards that guide behavior (e.g., exercise behavior). "Participants who choose to play sports and do not meet any degree of success may develop lowered perceptions of competence, self-esteem and mastery. Lowered self-perceptions have been found to result in decreased efforts and increased likelihood of withdrawing from sport and physical activity participation" (Shapiro, 2003).

This positive relationship between self-perception and PA was also found in previous studies involving role identities, specifically both AI and exercise identity (EI) (Anderson, 2004; Anderson *et al.*, 2007, 2009; Anderson & Cychosz, 1994, 1995). Anderson (2004) was the first to study AI in relation to PA but she measured AI using the AIQ which she devised. This present study extends their

results, this time using AIMS (Brewer *et al.*, 1993) to measure AI. Furthermore, it also examined its influence on PA as well as its relationship to MSP.

Since identity starts forming in late childhood (Houle *et al.*, 2010), it is essential for parents, teachers, and coaches to help mold and cultivate the identity of being "athletes" or physically active individuals among children. If children classify themselves as occupants of the "athlete" role, there will be corresponding expectations attached to that role. In this case, they will fulfill the meaning attached, which is that they will engage in sports or become more physically active. Aside from giving positive feedback, enhancing AI can be done through providing a positive sport or physical activity environment for children. Social factors such as positive reinforcement from coaches, teammates, and peers must also be considered (Stephan & Brewer, 2007). Since the AI-PA relationship was found to be the strongest in the present data set and is now empirically supported, the potential for exploiting this relationship can begin. When experimentally manipulated, will real gains toward greater activity, increased fitness and even perhaps reduced obesity ensue?

Future studies should utilize a more comprehensive motor assessment tool (looking at both process and outcome) and an objective measure of PA such as accelerometer. Also, should there be larger sample size available, a multiple mediation model to simultaneously assess possible mediating effects of other variables such as EI, perceived competence, self-efficacy, health-related fitness, and PA disinclination, might provide a better explanation of the relationship between MSP and PA.

## 5. CONCLUSIONS

The data demonstrated a good fit with the mediation model and confirm the proposed dynamics between MSP, AI, and PA among adolescents. It is evident that motor proficient individuals are more likely to have stronger perception of themselves as "athletes" which further influences their engagement in high physical activity levels. Conversely, less skilled individuals (i.e., low MSP) are less likely to view themselves as "athletes" or active individuals. Extending that, those who score low on MSP, may perceive PA participation as a challenging task, thereby choose not to engage or persist in PA. This model is congruent to the one advocated by Stodden *et al.* (2008) and Barnett *et al.* (2008). While both studies proposed perceived competence as the mediator, the present study investigated AI as the mediator. Nevertheless, perceived competence and AI were closely related. A study by Shapiro (2003) confirmed the positive relationship between perceived competence and AI suggesting that developing a sense of competence is an essential component of identity formation (e.g., athletic identity). Thus, there is a

growing literature confirming the mutually reinforcing roles of skills, perception, and physical activity levels.

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