Investigating the Role of Support in Athletes' and Non-Athletes' Academic Achievement: An SEM Approach

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April, 2017

Paper presented at the annual meeting of the
American Educational Research Association
San Antonio, TX.

Citation:

Nickodem, K., Van Boekel, M., Vue, K., Rodriguez, M.C., Palma Zamora, J.R., Kang, Y., & Jang, Y. (2017, April). *Investigating the role of support in athletes' and non-athletes' academic achievement: An SEM approach.* Paper presented at the annual meeting of the American Educational Research Association, San Antonio, TX.

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Abstract

Sports participation has been associated with a variety of positive developmental outcomes for youth. However, the associations are often subject to selection bias and have not provided pathways examining how sports participation leads to positive developmental outcomes. Using propensity score matching and structural equation modeling, results suggest that athletes report higher perceptions of support, positive identity, commitment to learning, and academic achievement than non-athletes. Additionally, a pathway of environmental support promoting developmental assets which in turn lead to higher achievement was found to be plausible. Although the mean perceptions of support, assets, and reported achievement differed for athletes and non-athletes, the pathway leading to a positive developmental outcome did not.

BACKGROUND

The Positive Youth Development (PYD) framework highlights the strengths and competencies of youth and the supportive factors in surrounding environments that foster positive outcomes (Benson, Scales, Hamilton, & Sesma, 2006). Within the PYD framework there is a growing body of research on the role sports participation plays in building youths' relationships with supportive adults and improving developmental skills. However, there is a dearth of knowledge elucidating pathways by which environmental supports and youth characteristics lead to positive developmental outcomes. The present study utilizes propensity score matching (PSM) and structural equation modeling (SEM) to test a possible pathway for adults and communities to enhance the developmental assets of high school athletes and non-athletes and their academic achievement.

One component that sets PYD apart from some other developmental frameworks is the emphasis on individual and context interactions (Masten, 2014). Participation in sports is an integral context for development for many youth (Aud, KewalRamani, & Frohlich, 2011). Family support has a positive influence on athletes' attitudes and behaviors (Beets, Cardinal, & Alderman, 2010). Youth who perceived their parents as supportive were more likely to participate in sports which was associated with elevated alertness, happiness, and willingness to take on new challenges (Fraser-Thomas, Côte, & Deakin, 2005). Similarly, when youth perceive their sports team as caring and supportive they also tend to report higher levels of commitment and emotional self-efficacy (Fry & Gano-Overway, 2010; Gano-Overway et al., 2009). Numerous researchers have correlated sports participation with academic achievement including links to grades, school engagement (Wang & Eccles, 2012), choosing more demanding coursework (Pearson, Crissey, & Riegle-Crumb, 2009), and college enrollment (Snyder & Spreitzer, 1990). It is becoming clear that youth, and particularly athletes, who are in supportive environments tend to have higher positive outcomes academically, emotionally, and in personal development.

What these studies often lack, however, is (a) experimental control and (b) pathways for how participating in sports or receiving support leads to positive outcomes. Participation in sports is self-selected and randomly assigning students to participate would be unethical. Studies relating sports participation and positive outcomes tend to be correlational and subject to selection bias (Dwyer, Sallis, Blizzard, Lazarus, & Dean, 2001; Farb & Matjasko, 2012). PSM offers an avenue to reduce selection bias and simulate a quasi-experimental design (Austin, 2011; Titus, 2007). Utilizing PSM, Van Boekel et al., (2016) found athletes had significantly higher perceptions of family support, teacher and community support, and school safety as well as higher GPAs than non-athletes. Furthermore, using a quasi-experimental design strengthens the inferences for identifying possible pathways by which sports enhance youth development. The inability to distinguish pathways is of concern to policy-makers, schools, sport organizations, coaches, and parents (Fraser-Thomas, et al., 2005). For instance, how should activities and programs be structured to ensure positive development?

Using PSM and SEM we evaluate a model of PYD whereby support factors lead to higher developmental assets in high school youth which then lead to higher academic achievement with three hypotheses:

1. Perceptions of teacher/school support (TSS), general support (SUP), and empowerment (EM) positively predict youth's commitment to learning (CTL) and positive identity (PI).
2. Supports (TSS, SUP, and EM) and youth's CTL and PI positively predict their academic achievement (GPA).
3. The strength of the relationships between supports with CTL and PI and their relationships with GPA will differ for athletes and non-athletes.

METHODS

Instrument

Data for this study come from the 2013 Minnesota Student Survey (MSS) administered to students throughout Minnesota in grades 5, 8, 9 and 11 to monitor trends in students' behaviors and thoughts related to academics, school climate, out-of-school activities, violence and safety, health, positive and risky behaviors, and family environment.

Participants

A total of 59,454 students in 9th and 11th grade answered the necessary MSS items for inclusion in the PSM. Students who responded to the question "During a typical week, how often do you participate on a school sports team outside of the regular school day?" with at least 1-2 times per week were classified as athletes whereas those who participated less than once a week were classified as non-athletes, consistent with previous research (Linver, Roth, & Brooks-Gunn, 2009). The sample comprised of 50% athletes (*n* = 29,900) and 50% non-athletes (*n* = 29,554). Additional demographics are in Table 1. The PSM procedure matched 24,340 athlete and non-athlete pairs for a final sample of 48,680 youth for the SEM analyses. Demographics for the SEM sample are also in Table 1.

Measures

The items on the MSS used for the latent variables for EM and PI were derived from the Developmental Assets Profile (DAP) (Search Institute, 2016) based on the developmental asset framework and referenced in over 17,000 peer-reviewed journal articles (Benson & Scales, 2011). Research documenting the quality of the scales can be found in Benson, Leffert, Scales, & Blyth (1998) and Leffert, et al. (1998). Measures of TSS, SUP, and CTL employed items closely related to similar measures in the DAP, for example, CTL composed of seven items, such as "How often do you care about doing well in school?" GPA was youth's self-reported grade point average on a 4-point scale.

Analysis

Propensity score matching. The first step was to create propensity scores based on the likelihood a youth participated in sports given the covariates age, grade, special education status, free or reduced lunch status, gender, race/ethnicity, and educational aspiration. These variables were chosen based on their positive association with the latent variables and participation in sports (Fejgin, 2001; O'Connor & Jose, 2012; Van Boekel et al, 2016). A multilevel modeling framework was used to account for between school differences in the type and frequency of sports offered. The predicted values from the multilevel model were the propensity scores. Using the 'nearest neighbor' method in the *MatchIt* package (Ho, Imai, King, & Stuart, 2013) in R (R Core Team, 2016) athletes were matched on a one-to-one basis with a non-athlete who had the closest possible propensity score. The matched pairs became the sample used in the SEM analyses.

Structural equation modeling. SEM analyses used LISREL 8.8 (Jöreskog, & Sorbom, (2008). The first step determined if the MSS items loaded onto the latent variables (the measurement model) as hypothesized for both athletes and non-athletes. The measurement model was then fit to athletes and non-athletes simultaneously first with loadings allowed to vary between athletes and non-athletes (the unconstrained model) and then with loadings constrained to be equal between the two groups (the constrained model). Given that both models were a good fit for the data, the more parsimonious constrained model was selected as the final measurement model. The associations between the latent variables (the structural model) were then added to the measurement model. Once again an unconstrained and constrained model was fit to the data and their results compared. Finally, a latent means model was run to examine mean difference between athletes' and non-athletes' on the six latent variables.

RESULTS

The PSM reduced the difference between athletes and non-athletes for each covariate with the differences in the matched sample being less than 10% of a standard deviation (Table 1), which is interpreted as a meaningful match (Austin, Grootendorst, & Anderson, 2007). The athlete and non-athlete groups used in the SEM analyses could be considered equivalent regarding individual and school differences on the covariates.

Standardized root mean squared residual (SRMR), comparative fit index (CFI), and root means squared error of approximation (RMSEA) were used to assess model fit for the SEM analyses. Good model fit should have an SRMR $\leq .08$, CFI $\geq .95$, and RMSEA $\leq .06$ (Hu & Bentler, 1999). The SRMR and CFI for both the constrained and unconstrained measurement models suggested they were a good fit for the data with RMSEA implying moderate-to-good fit (Table 2). The equivalency of the conditional and unconditional measurement models on the fit criteria suggested the more parsimonious constrained model was the better model. We concluded that the latent variables of SUP, EM, TSS, PI, CTL, and GPA were measured similarly for athletes and non-athletes by the items on the MSS. For the structural model, the SRMR and CFI again indicated both the constrained and unconstrained models were a good fit for the data whereas RMSEA suggested moderate-to-good fit. Given the model fit similarity, the more parsimonious constrained model was again concluded to be the better model. This implied that the nature of the relationship between contextual supports and youth's CTL and PI and the relationship between the supports, youth's CTL and PI, and their GPA was similar for athletes and non-athletes. The latent means model found that athletes had higher means than non-athletes on all six latent variables with effect sizes ranging from 0.13 to 0.38 (Table 3).

The measurement model (Figure 1) and structural model (Figure 2) indicated that contextual support was largely predictive of youth's CTL and PI. However, unexpectedly youth's perception of SUP was not predictive of PI (0.01, t = 0.50). EM positively predicted both PI (0.82, t = 92.27) and CTL (0.28, t = 61.35) and TSS predicted CTL (0.37, t = 68.00). Although the strengths of each pathway does not have intuitive meaning, the variation in the outcomes explained by the model, as indicated by R^2, clarifies the model's efficacy. The model explained 71% of the variation in youth's PI, 44% of the variation in youth's CTL, and 29% of the variation in youth's self-reported GPA.

DISCUSSION

Results supported the hypothesis that youth who feel they are in safe and supportive school, home, and community environments tend to also report more positive identity and greater commitment to learning. Furthermore, youth who have high support, positive identity, and commitment to learning tend to have higher academic achievement. Results, however, did not support the hypothesis that the strength in these relationships would differ for athletes and non-athletes. Rather, the findings suggested that a pathway for improving academic achievement via supportive environments building a youth's sense of positive identity and commitment to learn is possible for both athletes and non-athletes. As with previous research, we found that athletes, on average, reported higher levels of support, developmental assets, and academic achievement than non-athletes. Since athletes and non-athletes share the same developmental pathway, the higher level of support athletes tend to perceive (e.g., Van Boekel et al, 2016) sets them on a pathway that is likely to also lead to higher levels of self-efficacy (e.g., Gano-

Overway et al., 2009) and academic achievement (e.g., Pearson, et al., 2009). Sports teams provide a possible context for positive youth development to occur by offering the opportunity for youth to connect with a caring adult, foster relationships with peers that build social competence, and become more engaged with their school (Fraser-Thomas et al., 2005). The similar developmental pathway for non-athletes suggests they may find an analogous experience through other activities at school, such as band or theater, or outside of school, such as a church youth group, but on average report lower levels of support.

From the perspective of schools, which are held accountable for student achievement, the findings suggest that 29% of the variation in student GPA can be explained by the proposed pathways. This is far from insignificant and reflects that there are ways for schools to improve achievement outside of making strictly academic changes. Finding ways to encourage teachers and other staff members to take interest in students on a personal level and taking steps to improve the safety and security of school environment is a worthwhile investment.

Numerous developmental supports and skills have been identified and their associations with positive outcomes well documented, but there is little knowledge of their causal pathway. The present study sought to close this gap in knowledge by investigating the feasibility of a pathway for environmental supports to predict youth's positive identity and commitment to learning which in turn would predict youth's academic achievement. Through the use of PSM and SEM, the study found the pathway to be plausible for both athletes and non-athletes.

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Table 1

Athlete and Non-Athlete Group Comparisons

Covariate	Athletes *M*	Athletes *SD*	Non-Athletes *M*	Non-Athletes *SD*	Pre-match Standardized Difference (%)	Post-match Standardized Difference (%)	Post-match Sample *M*
Age	15.54	1.11	15.61	1.13	-5.93	-3.07	15.57
Eleventh Grade	0.46	0.50	0.50	0.50	-8.52	-2.32	0.49
SPED[a]	0.17	0.37	0.30	0.46	-30.74	-4.75	0.21
FRL[a]	0.05	0.22	0.11	0.31	-21.22	-3.04	0.07
Gender[b]	0.48	0.50	0.54	0.50	-10.95	-3.12	0.52
American Indian	0.01	0.08	0.01	0.10	-4.48	-0.95	0.01
Asian	0.03	0.18	0.07	0.26	-19.17	-2.39	0.04
Black	0.03	0.18	0.04	0.20	-5.28	-0.34	0.04
Latino	0.04	0.20	0.07	0.25	-10.76	-0.10	0.05
Multiracial	0.06	0.23	0.07	0.26	-7.30	-1.07	0.07
Caucasian	0.83	0.38	0.73	0.44	24.20	2.74	0.79
Dropout/GED	0.01	0.09	0.01	0.11	-5.08	-1.10	0.01
Post-secondary education	0.92	0.28	0.83	0.38	25.83	3.52	0.89
Enter workforce	0.06	0.24	0.12	0.32	-20.11	-2.99	0.08
Other aspiration	0.02	0.13	0.04	0.19	-14.20	-1.30	0.02
n	29,900		29,554				48,680

Note. Race/ethnicity categories were dummy coded with Caucasian as the reference group; Aspiration categories were dummy coded with Dropout/GED as the reference group. SPED = special education status; FRL = free or reduced lunch status; GED = general education development.

[a] 1 = eligible, 0 = not eligible

[b] 1 = Female, 0 = Male

Table 2

Fit Indices for Constrained and Unconstrained Measurement and Structural Models and the Latent Means Model

	Measurement		Structural		Latent Means
Fit index	Constrained	Unconstrained	Constrained	Unconstrained	
SRMR	.06 (.07)	.06 (.06)	.06 (.07)	.06 (.06)	.06 (.07)
CFI	.95	.95	.95	.95	.95
RMSEA	.07	.07	.07	.07	.07

Note. For SRMR, the first value refers to the athlete group while the one in the () is for non-athletes. CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Residual.

Table 3

Latent Variable Mean Differences Between Athletes and Non-Athletes

Latent Variable	Mean Difference	Variance	Effect size
Empowerment	0.24	0.41 (0.43)	0.37
General Support	0.15	0.15 (0.16)	0.38
Teacher/School Support	0.07	0.29 (0.29)	0.13
Positive Identity	0.23	0.38 (0.42)	0.36
Commitment to Learning	0.13	0.24 (0.26)	0.26
Grade Point Average	0.26	0.69 (0.84)	0.30

Note. Mean difference = athlete – non-athlete. Variance in () is for non-athletes.

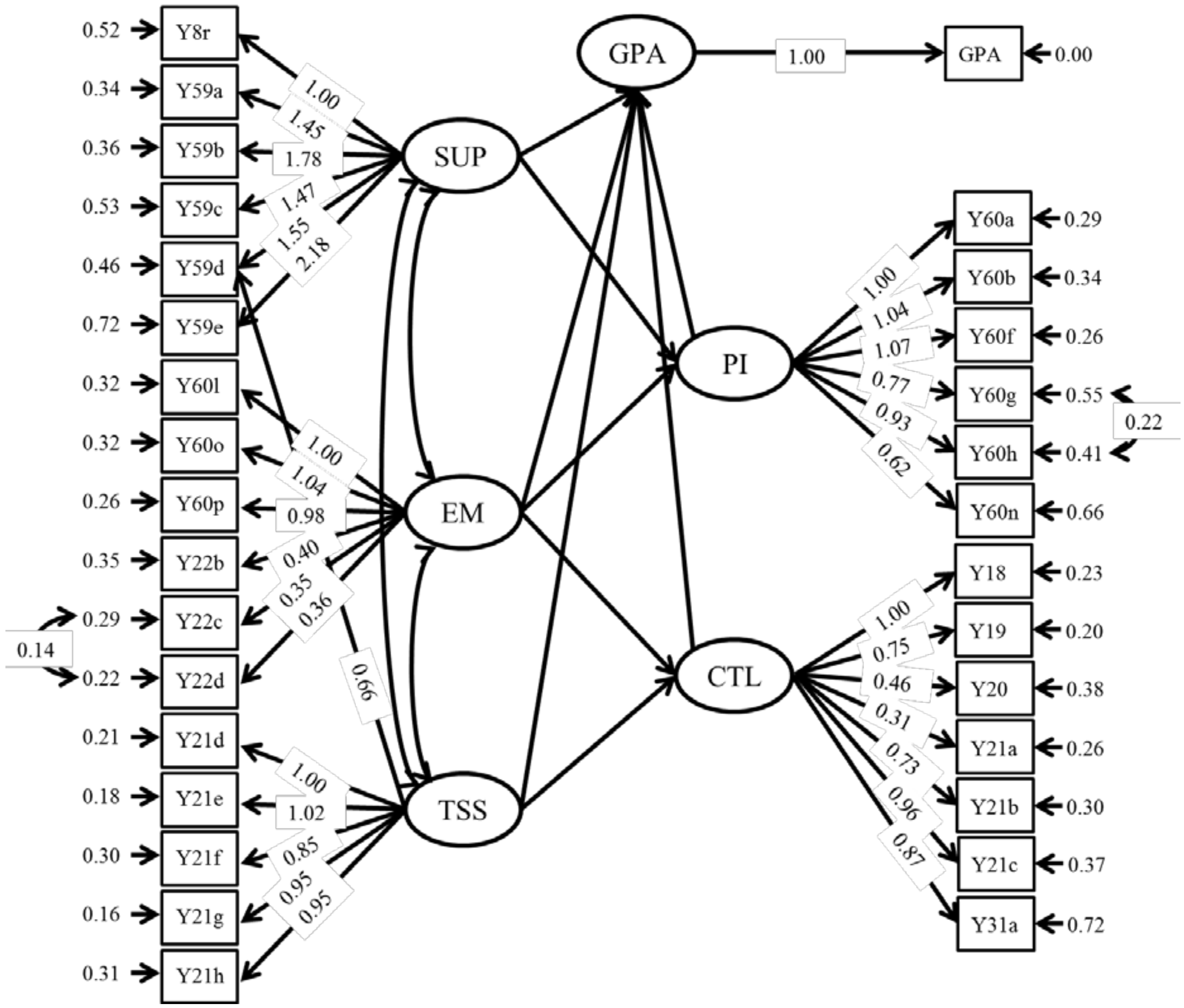

Figure 1. Constrained measurement model for athletes and non-athletes. SUP = General Support; EM = Empowerment; TSS = Teacher/School Support; PI = Positive Identity; CTL = Commitment to Learning. GPA = Grade Point Average. All coefficients are significant at $p < .001$

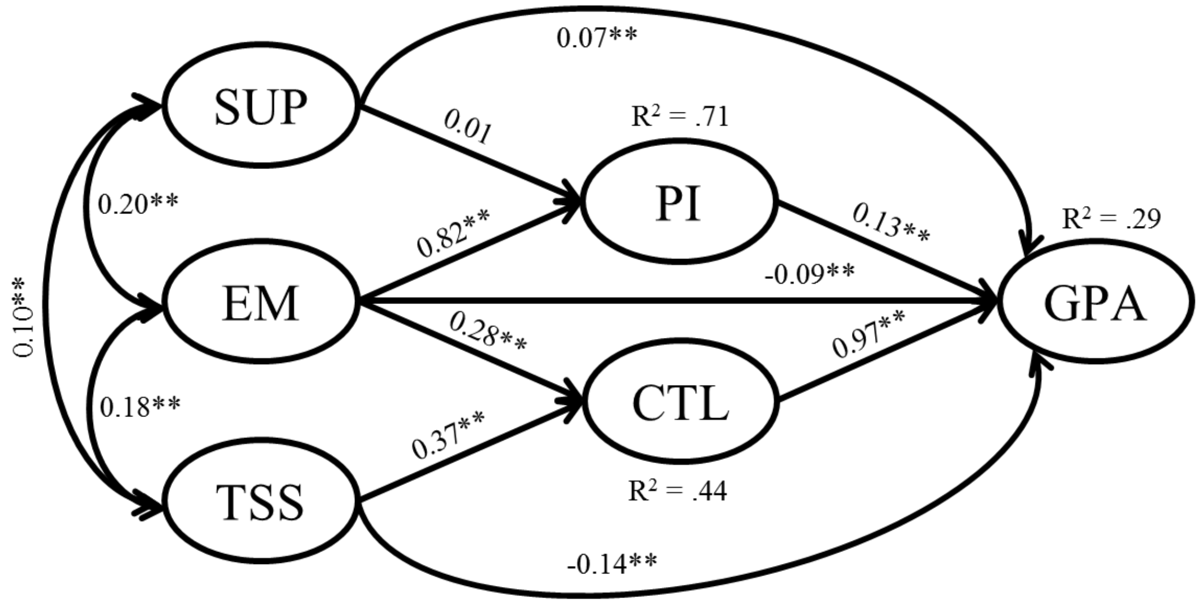

Figure 2. Constrained structural model for athletes and non-athletes. SUP = General Support; EM = Empowerment; TSS = Teacher/School Support; PI = Positive Identity; CTL = Commitment to Learning. GPA = Grade Point Average. ***p* < .001.