Comparison of Academic and Behavioral Performance between Athletes and Non-athletes

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ABSTRACT

International Journal of Exercise Science 7(1) : 3-13, 2014. The Toronto Charter for Physical Activity (2010) and several national physical activity plans advocate sports participation as an important part of population targeted physical activity for youth. Emerging research evidence also suggests that sports participation during adolescents is linked to significant positive correlations with academic and behavioral performance. The purpose of this study was to compare academic and behavioral performance between male and female public school athletes (Total N=11,139; 38% Female) and non-athletes (Total N=23,891; 52% Female) in a convenient, ethnicity diverse, sample (grades 7 -12) from the state of Texas (USA). We examined the passing rates of individual athletes and non-athletes on standardized tests (Texas Assessment of Knowledge and Skills, TAKS) for math, language arts, reading, writing, science, and social studies. We also examined the percentage of athletes and non-athletes for being "at risk," for dropping out of school and for the total average number of disciplinary actions. Chi-Square statistical analyses comparing athletes to non-athletes showed that athletes scored significantly better ($p<0.05$) on all standardized tests compared to non-athletes (passing rate ranges ranged from 77.1% to 92.9% versus 27.7% to 66.5% respectively). Athletes were at lower risk for dropout compared to non-athletes (35.6% versus 49.24%; $p<0.05$), and they had fewer disciplinary actions (mean of 0.85 per athletes per year versus 1.23 for non-athletes; ANOVA, $p<0.05$). Our results support the research findings of others that participation in school sports is positively correlated to better academic and behavioral performances for athletes compared to non-athletes.

KEY WORDS: Youth, sports, physical activity, academic outcomes, school health policy

INTRODUCTION

The Toronto Charter for Physical Activity (2010) and several national physical activity plans (USA, Norway, Scotland, and the U.K.) advocate sports participation as an important part of population targeted physical activity for adolescents (2, 3).

Physical activity participation such as playing organized school sports has been promoted as a way to reduce the prevalence of overweight and obesity among adolescents, a public health challenge that continues to move in the wrong direction (25). According to the World Health Organization (2012), globally six percent of deaths are attributed to

physical inactivity and physical inactivity is the 4th leading attributable cause of global deaths. (9, 30). Numerous physical health benefits such as chronic disease prevention, healthy weight maintenance, stronger bones and muscles have been reported for adolescents who participate regularly in physical activity, however many adolescents continue to not meet physical activity recommendations (8, 19, 23, 24).

Emerging research evidence suggests that physical activity including organized sports participation is correlated positively to academic success and positive behaviors in middle school and high school students and that athletes perform better than non-athletes on cognitive performance tests (1, 5-13, 16 – 18, 21, 28). In states like Texas (USA), students prior to 2011 were required to take and pass the Texas Assessment of Knowledge and Skills (TAKS) as part of state legislation (20). Texas students who were fitter based on FITNESSGRAM® scores, performed better on TAKS than low fit students (27). While there are no published data that show athletes perform better than non-athletes on the FITNESSGRAM®, athletes in Texas public schools are allowed to engage in practice eight hours per week (plus competition time), which exceeds the one hour per day recommended U.S guidelines for daily physical activity in adolescents (22, 23).

Additionally, the vast majority of the scientific evidence indicates that being physically active (like playing sports) during the school day does not negatively affect academic success or progress (8, 25), although currently there is no consistent evidence that higher physical activity levels lead to increased intelligence scores (8, 14). Unfortunately, the interpretation of previous studies that have shown positive

academic outcomes associated with regular physical activity participation by adolescents in schools based on measures from organized sports, physical education, or physical fitness performance measures are inconclusive (8, 25). Study limitations like differences in design, small sample sizes with limited ethnic diversity, lack of control for confounding variables, and self-reported versus individually measured performance have not allowed a clear understanding of how sports participation affects academic outcomes and adolescent behaviors.

The purpose of this study was to further investigate and compare the academic and behavioral performance between male and female public school athletes and non-athletes in a large ethnically diverse population that included individual data reports. The hypotheses we tested were: 1) There are no significant differences in risk for dropping out of school between athletes and non-athletes. 2) There are no significant differences in disciplinary actions during the school year between athletes and non-athletes. 3) There are no significant differences in passing rates on academic tests like the TAKS between athletes and non-athletes.

METHODS

Participants
A total of 35,030 (N=11,139 athletes and 23,891 non-athletes; N = 16,673 girls and 18,357 boys) in grades 7 -12 were included in the study. All data were collected from a convenient sample of Texas school districts (N=7) that were recruited with the help of leaders from the Texas High School Coaches Association (THSCA) and the Texas High School Education Foundation (THSEF). The grade levels and

demographics of the athletes and non-athletes are presented in Table 1.

Table 1. Demographic Data.

	Athlete		Non-Athlete	
	N	Percent	N	Percent
Gender				
Male	6,840	37.3%	11,517	62.7%
Female	4,299	25.8%	12,374	74.2%
Grade				
7	1,840	32.6%	3,800	67.4%
8	1,694	30.2%	3,908	69.8%
9	2,707	36.5%	4,710	63.5%
10	2,126	34.0%	4,131	66.0%
11	1,660	29.9%	3,887	70.1%
12	1,112	24.3%	3,455	75.7%
Ethnicity				
Native American	111	29.6%	264	70.4%
Asian	451	38.1%	734	61.9%
Black	2,884	32.2%	6,085	67.8%
Hispanic	3,158	24.6%	9,683	75.4%
White	4,535	38.9%	7,125	61.1%

Data files from each school district were transferred to the researchers via password protected electronic media. Individual informed consent was not necessary since the data is collected annually and mandated by the State of Texas and is available through the Freedom of Information Act. Data for the study were analyzed retrospectively, and IRB approval from Texas State University (#2010R6869) was granted.

Protocol
In the spring of 2011 the investigators (through the leadership at the THSCA and the THSEF recruited a convenient sample of school districts (N=12) to participate in the study. Individual student data (student ID code, general demographics, TAKS scores, "at risk" for dropout status, and disciplinary actions) organized by the institutional technologist (IT) from each school district were submitted to the investigators. The data included all information for the 2010 school year. Student TAKS scores included the achievement of the minimum standard by subject and grade (meets standard) as well as achievement of the commendable levels (meets desirable standards for the majority of students set by the Texas Education Agency – at least the 90th percentile) (20). Students were classified as athletes by each district's IT, if they participated in at least one of the 20 plus University Scholastic League (UIL, state governing body) sponsored sports during the school year and as a non-athlete if they did not participate.

Once data quality analyses were finished, complete information from 7 districts was selected for use in the study for subsequent data analyses. To determine regular physical activity levels between athletes and non-athletes the following assumptions were made regarding observations that athletes (adolescents) are more physically active than their general population counterpart: It was estimated that athletes were physically active at moderate- to vigorous- intensities for a minimum of 8 hours per week outside the school day (state practice rule limitations), which exceed the national guidelines for adolescents of 60 minutes of daily moderate – to vigorous intensities (19, 23). Many athletes also are active in Texas as part of physical education classes that are taught

by teacher/coaches as well. Assumptions for non-athletes were based on the Centers for Disease Control and Prevention (CDC) Youth Behavior Risk Surveillance System (YRBS) 2011 data for high school youth in Texas, which showed that 42.4% did not play on sports teams, 16.4 % did not participate in at least 60 minutes of physical activity on any day, and only 55.5% were active at least 60 minutes per day for less than 5 days (26).

Statistical Analysis
Since the data for the study were collected from a convenient sample, quasi-experimental design techniques were used to determine differences between group data. Group comparisons to determine differences between athletes and non-athletes scores for the various study variables utilized chi-square or ANOVA techniques found in SPSS version 15 depending on the variables value scale. Data for the at-risk status of the student was scored nominally as either at risk or not at risk of dropping out of school therefore chi-square analyses were used to determine significant differences between athletes and non-athletes as well as differences among ethnicities between the two groups. Scores for the TAKS test components were scored as either meeting or not meeting the mastery level of the minimum component therefore chi-square analyses were used to determine significant differences between athletes and non-athletes for the overall mastery of the test as well as its separate components and commendable achievement levels. Finally, disciplinary actions were scored as the number of times within a year the student was disciplined by a faculty member or administrator; therefore a oneway ANOVA was used to compare groups (athletes vs non-athletes) by disciplinary actions to determine significant differences. For all analyses an *a priori* probability level was set at $p < 0.05$ to determine significant differences between the groups.

RESULTS

The results of the chi-square analyses comparing athletes and non-athletes for at-risk status, TAKS components, and TAKS commendable levels are presented in Table 2.

Chi-square analysis for the comparison of at-risk status between athletes (n=11,139) and non-athletes (n=23,891) resulted in a significant difference between the groups with a $\chi^2 = 686.2$; $p<0.05$. Representation of the differences is presented in Figure 1 with fewer athletes (35.2%) classified at-risk of dropping out of school compared to the non-athletes (52.3%).
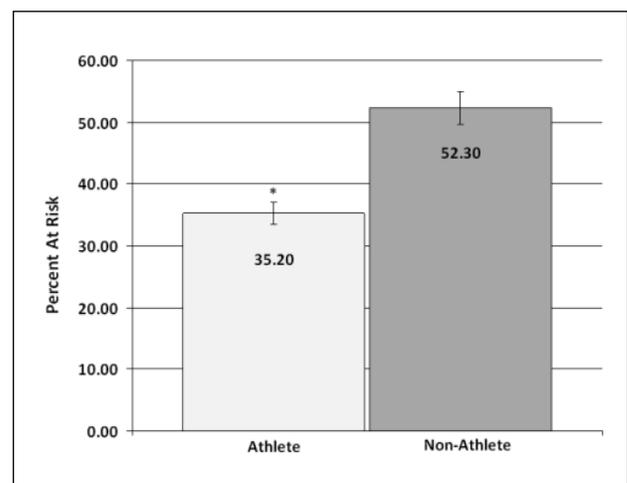

Figure 1. At-risk comparison between athlete and non-athletes. * Significant difference at $p<0.05$.

Further examination of the at-risk data found significant decline in the at-risk factor among athletes from each ethnic group except for Native Americans. Figure 2 is a graphical representation of these data.

Table 2. Chi-Square Analyses Comparing Athlete to Non-Athlete

	Athlete		Non-Athlete	
	N	Percent	N	Percent
At Risk of Dropping Out of School	2,943	35.0%*	9,382	52.3%
TAKS Test Components				
Math	9,635	86.5%*	15,959	66.8%
English/Language Arts	9,735	87.4%*	14,287	59.8%
Reading	10,348	92.9%*	14,645	61.3%
Writing	8,588	77.1%*	6,618	27.7%
Science	9,167	82.3%*	11,324	47.4%
Social Studies	10,014	89.9%*	13,546	56.7%
TAKS Test Commendable Level				
Math	2,918	26.2%*	3,440	14.4%
English/Language Arts	3,208	28.8%*	3,775	15.8%
Reading	3,810	34.2%*	4,420	18.5%
Writing	2,952	26.5%*	1,935	8.1%
Science	2,607	23.4%*	2,222	9.3%
Social Studies	4,489	40.3%*	5,328	22.3%

* Significant difference at $p<0.05$

When compared to their non-athletic counterparts Asian athletes were at a lower risk than Asian non-athletes (24.2% vs 41.1%; $\chi 2 = 32.18$; $p < 0.05$).

Black athletes were at a lower risk than Black non-athletes (49.9% vs 56.7%; $\chi 2 = 27.55$; $p < 0.05$). Hispanic athletes were at a lower risk than Hispanic non-athletes (43.1% vs 59.7%; $\chi 2 = 147.17$; $p < 0.05$). White athletes were at a lower risk than White non-athletes (21.5% vs 39.8%; $\chi 2 = 362.12$; $p < 0.05$). The only ethnic group that did not have a significantly lower at-risk factor for athletes compared to non-athletes were the Native American group (39.6% vs 48.98%; $\chi 2 = 1.93$; $p > 0.05$).
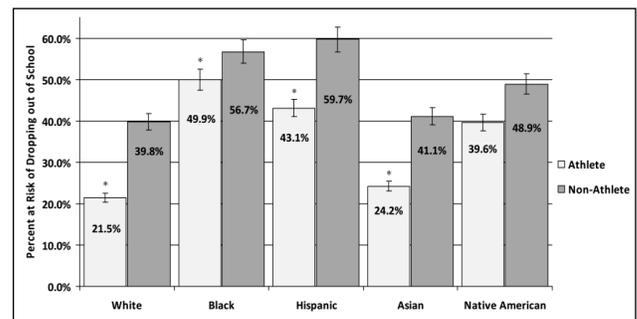

Figure 2. At-risk comparison between athletes and non-athletes of different ethnic identities. * Significant difference at $p<0.05$.

Comparison of the academic skills of the students associated with the TAKS pass rates for each of the TAKS components resulted in significantly higher pass rates for athletes compared to non-athletes. Figure 3 is a graphical representation of the TAKS component data. Athletes had

significantly higher passing rates compared to their non-athletic counterparts for the TAKS Math component ($\chi2$ = 1,390.62; p < 0.05), the TAKS English Language component ($\chi2$ = 2,239.15; p < 0.05), the TAKS Reading component ($\chi2$ = 1,732.63; p < 0.05), the TAKS Writing component ($\chi2$ = 2,447.38; p < 0.05), the TAKs Science component ($\chi2$ = 2,277.72; p < 0.05), and the TAKS Social Studies component TAKSSS ($\chi2$ = 1,799.44; p < 0.05).
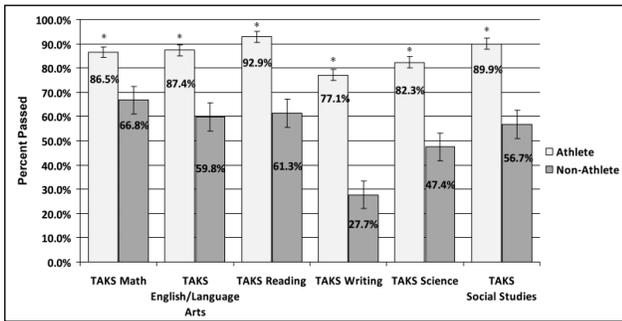

Figure 3. TAKS component pass rate comparisons between athletes and non-athletes. * Significant difference at $p<0.05$.

Furthermore, when comparing the rates of students who achieved the commendable level (highest achievement) for the TAKS academic testing, a significantly greater number of athletes achieved the commendable level for each of the TAKS components compared to their non- athletic counterparts.   Figure 4 is a graphical representation of the commendable achievement for the TAKS component data. Athletes had significantly higher commendable passing rates compared to their non-athletic counterparts for the TAKS Math component ($\chi2$ = 641.87; p < 0.05), the TAKS English Language component ($\chi2$ = 657.23; p < 0.05), the TAKS Reading component ($\chi2$ = 542.83; p < 0.05), the TAKS Writing component ($\chi2$ = 730.84; p < 0.05), the TAKs Science component ($\chi2$ = 765.90; p < 0.05), and the TAKS Social

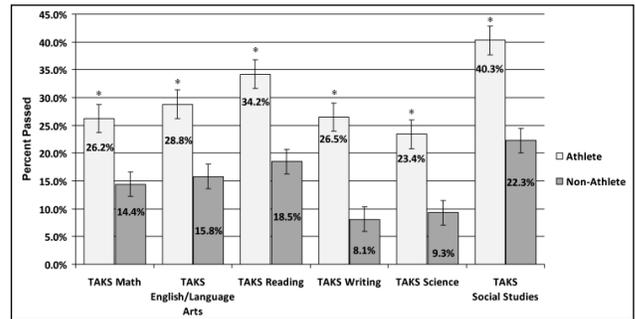Studies component TAKSSS ($\chi2$ = 573.64; p < 0.05).

Figure 4. Commendable pass rates comparisons between athletes and non-athletes for TAKS components. * Significant difference at $p<0.05$.

In the final analysis, a oneway analysis of variance (ANOVA) was used to compare the number of daily average disciplinary actions reported by faculty and administrators for the students by their group identification as an athlete or non-athlete. The ANOVA revealed, as presented in Figure 5, that athletes had significantly fewer daily disciplinary actions during the school year compared to non-athletes (F112.62; $p< 0.05$).
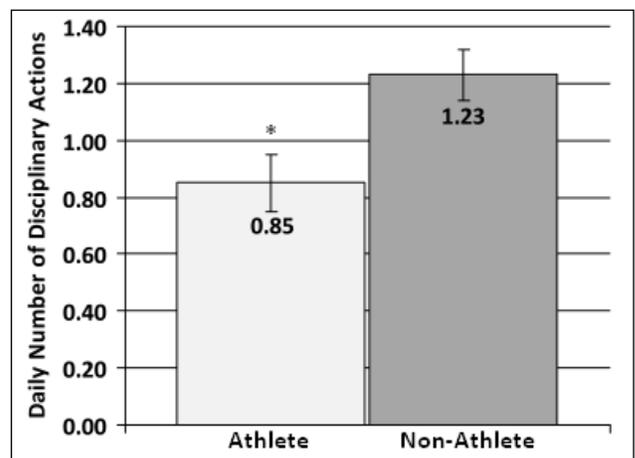

Figure 5. Comparisons of daily disciplinary actions between athletes and non-athletes during the school year. * Significant difference at $p<0.05$.

DISCUSSION

The present study is one of the larger studies ever conducted with a large ethnically diverse population of athletes and non-athletes that included individual data reports. An important finding of the study was that participation in athletics decreased the probability of students dropping out of school even when classified at higher risk for premature separation. This was true both generally and for each ethnic group, except the Native Americans. Although the Native American group was not significantly different for at-risk classification for athletes compared to non-athletes, it is likely due to the small sample size (N=375) for Native American students within this study. Lumpkin and Favor suggest that athletes drop out of high school less often than non-athletes (11). They reported that in Kansas, non-athletes were 15 times more likely to drop out of school than non-athletes in 2008-2009. They also found that athletes across all ethnic groups in their study were less likely to drop out of school than non-athletes and suggested that participating in sports may help minorities matriculate and become acculturated when related to future academic success. Our significant results indicate that non-athletes were at a 17% greater risk for dropping out than athletes for all ethnic groups except Native Americans in the study. These results are important because few previous related studies have included the ethnicity of their study populations (1).

Our results show that participating in school sports was associated with between a 6.8% to 18.3% reduction of risk for dropping out based upon the school. Howie and Pate have noted that health disparities for minorities accompany the academic achievement gaps related to youth fitness levels (8). Pate and colleagues reported that low physical activity in adolescents was associated with many negative health behaviors (15). Although reasons for leaving school before graduating may vary among individuals, the positive effects of athletic participation such as improved self confidence, self esteem and self worth, coupled with the structured atmosphere and support system associated with athletics may improve the individual's decision to remain in school and graduate (11). If participation in middle school and high school athletics can help reduce student drop out rates this would be important to school administrators with regards to improving academic outcomes based on 2001, No Child Left Behind legislation and as a way to promote positive public health messages.

The athletes in our study had significantly higher passing rates on all TAKS components than non-athletes. The percentage passing rates percentages comparing athletes to non-athletes for each of the TAKS components were as follows: Math – 19.7%; English Language – 27.6%; Reading - 31.6%, Writing - 49.4%; Science – 34.9%; and Social Studies – 33.2%. Lumpkin and Favor reported that athletes in their study also scored significantly higher than non-athletes for standardized state assessments in math, reading, history/government, writing, and science for 2006-2009. Others have found that physical activity through middle school and high school sports participation is associated with higher grade point averages and academic ability based on a variety of cognitive outcome measures (11, 16).

Our study data also supports the contention that participation in school athletics improves the probability of reaching the commendable level (at least the 90th percentile) of academic performance based on the TAKS (20). The percentage passing rates percentages comparing athletes to non-athletes for each of the TAKS components at the commendable levels were as follows: Math – 11.8%; English Language – 13%; Reading - 15.7%, Writing – 18.4%; Science – 14.1%; and Social Studies – 18%. Thus, athletes in our study not only were more likely to meet the minimal academic standards required, they also were more likely to achieve commendable levels, which are associated with post secondary educational success (20). Possible reasons for the athletes' academic success may include increased interest in school, improved motivation to succeed in order to remain eligible, and the expectation of participating at the collegiate level. Sports participation may also increase the athletes' self esteem and self worth, while at the same time increase their parents' interest in their performance both during and outside of the sport participation (29).

We found that the athletes in our study had significantly fewer disciplinary actions as compared to non-athletes. Tomporowski and colleagues reported that regular participation in physical activity (like school sports) by adolescents can help improve cognitive control and attention and other measures of mental health that have been associated with enhanced academic achievement (21). A student that is constantly facing disciplinary actions is more likely to perform poorly academically and at an increased risk for dropping out of school (6, 21).

While a large body of evidence supports a positive effect regarding participation in physical activity and academic achievement, it is difficult to determine if the effects are causal (8). This is also true with regards to school sports participation. Other factors such as student identification with school related values could encourage students to perform better academically (7). In Texas, No Pass, No Play legislation has been credited with keeping students in school so that they remain eligible to participate in extracurricular activities (22). The fact that coaches acting as mentors that strongly influence their athletes to maintain their eligibility and provide praise for success and negative feedback for failure cannot be ignored. Sports participation for school athletics has also been associated with higher levels of learned self-discipline and better time management skills (11).

Our results have implications for policymakers, school administrators, and practitioners. According to the WHO, "experience and scientific evidence show that regular participation in appropriate physical activity and sport provides people of both sexes and all ages and conditions, including persons with disabilities, with a wide range of physical, social and mental health benefits (30)." Policy makers and school administrators should encourage opportunities for students to engage in athletics at the middle school and high school levels as one way to promote positive academic performance and behaviors (1, 6, 16, 21). Practitioners should consider basic interventions that can help students become and remain physically active throughout the lifespan of education (pre K to grade 12) that allows them to acquire the basic levels of fitness, self-

esteem, and confidence to participate in school sports based on their motivational goals.

A primary strength of this study is the large and diverse ethnic sample size based on individually reported TAKS score data. Few previous related research studies have been able to evaluate individual athlete versus non-athlete academic or behavioral performance comparisons due to the reliance on aggregate data. We found that athletes versus non-athletes were at lower risk for dropping out of school, did better academically at the minimal and commendable levels for TAKs, and had fewer disciplinary actions.

The main limitations of this study are its cross-sectional design and use of a convenient sample that may limit the generalizability of our study to other populations. While a strong case can be made that the athletes in our study were significantly more active than their non-athlete counterparts, we did not have actual physical activity measures for our subjects. Our study also does not imply causal implications between participation in school sports and positive academic and behavioral outcomes.

The results of this study support the research findings of others that participation in school sports is positively correlated with better academic and behavioral performances for athletes compared to non-athletes. The improved academic and behavioral performances of athletes may imply lifelong success through increased retention in high school, the increased possibility of matriculating to college, and successful college graduation. These implications may positively impact the individuals' lifelong earning capacity and improve their quality of life and the quality of their community. Further studies are warranted to determine if there are causal associations between academic and behavioral performances between athletes and non-athletes.

ACKNOWLEDGEMENTS

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