EXPLORING THE RELATIONSHIP BETWEEN VARSITY SPORTS PARTICIPATION AND COLLEGE STEM DECLARATION

by

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ABSTRACT

MORGAN AVERETTE. Exploring the Relationship between Varsity Sports Participation and College STEM Declaration. (Under the direction of DR. MARTHA CECILIA BOTTIA)

This study investigates the association between high school interscholastic sports participation and college STEM declaration. Prior research indicates that student athletes generally perform better academically and are more likely to attend college. Higher academic performance has been identified as an important factor that helps predict students' participation in STEM majors. The objective of this thesis is to examine if there is a significant relationship between varsity sports participation and college STEM declaration, as well as if gender and race are potential moderators in the relationship. Results from binary logistic models show that there is no evidence of a significant relationship between varsity sports participation and college STEM declaration for the full sample. Once gender was included as a moderator, a significant relationship between varsity sports participation and higher odds of majoring in STEM emerged, specifically for female students who played varsity individual sports in high school.

DEDICATION

My thesis is dedicated to the victims and families impacted by the tragic events on April 30, 2019. May we never forget the lives lost and impacted on that tragic day, nor the resilience and strength of the victims and their families, as well as the greater campus community.

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INTRODUCTION

Many children dream of becoming athletes when they grow up. For some, the thought of playing and succeeding on the biggest stage, whether that is the Olympics, the Super Bowl, or the World Series is enough of an incentive to dedicate their lives to sports. Despite dreams of playing in front of cheering audiences, not many individuals reach their goal of becoming professional athletes. According to the U.S. Bureau of Labor Statistics (2018), approximately 11,800 individuals were employed as athletes and sports competitors in 2016.

Narratives of well-paid and influential athletes are ubiquitous in the world of sports media. In 2017, 23-time Grand Slam winner Serena Williams received $27 million from earnings and endorsements (Badenhausen 2017). FIFA Women's World Cup winner and two-time Olympian gold medalist Alex Morgan earned $3.5 million from salary and endorsements. On the other hand, male athletes such as Green Bay Packers quarterback Aaron Rodgers and three-time NBA champion Stephen Curry will make around $30-40 million in annual salary over the next four years (Corry 2018; Sportrac 2018). Rodgers' and Curry's annual salaries greatly exceed the median salaries in their respective sports, which are $1 million in the NFL and $3.8 million in the NBA (Sporting Intelligence 2017). However, most athletes make far less than Serena Williams, Alex Morgan, Aaron Rodgers, and Stephen Curry. The median income for athletes and sports competitors is $51,370 (U.S. Bureau of Labor Statistics 2018). As a result, half of all athletes earn less than $51,730.

Although professional athletes that play in major sports leagues such as the NBA, NFL, MLS, and WNBA earn greater incomes than the median income for all athletes in the U.S., they are also generally people of color (Lapchick 2016; Sporting Intelligence 2017; U.S. Bureau of Labor Statistics 2018). People of color make up more than 40 percent of all athletes in the MLB, more than 50 percent of all athletes in the MLS, and more than 70 percent of athletes in the NBA, WNBA, and NFL (Lapchick 2016). However, in each of these leagues, there are only several hundred to a thousand available job opportunities in any given year (Davis 2014; Sporting Intelligence 2017; MLB 2019).

While becoming a professional athlete is seen as a path towards social mobility, having a science, technology, engineering or mathematics (STEM) degree is another viable path towards upward mobility. According to Noonan (2017), over 9 million people worked in STEM occupations in 2015. On average, workers in STEM occupations earned $10-11 more per hour than those in non-STEM occupations regardless of their educational attainment. Furthermore, STEM workers with bachelor’s degrees or higher earned around and in excess of $40 per hour.

Previous research has examined the potential barriers and predictors to choosing STEM majors. It is generally known that women and people of color are less likely to intend to major in STEM fields than men and Whites (Higher Education Research Institute 2014). Women and people of color are less likely to attain bachelor’s degrees in STEM, despite the former making up most college graduates (National Science Foundation 2016). There are a variety of reasons for these differential outcomes. These reasons include the lack of diverse representation of high school STEM teachers, the racial composition of a school, pedagogical practices, and perceived social isolation from classmates because of demographic characteristics such as race, gender, and social class (Stearns et al. 2016; Bottia et al. 2018). While the catapults and barriers to choosing

STEM majors are well known, there remains a gap in the literature in addressing STEM outcomes for specific student subgroups. One of those subgroups are high school student athletes. Previous research has found that sports participation is associated with better academic outcomes (Broh 2002; Pearson, Chrissy, and Riegle-Crumb 2009). Sports participation has also been found to have a stronger association with academic outcomes compared to other extracurricular activities such as drama club, music club, and student government.

While there has been much research on student athletes and their academic outcomes, there is an absence of research connecting STEM literature and sport participation literature. Some literature suggests that female student athletes may stand to benefit more in science compared to female nonathletes, male athletes, and male nonathletes (Hanson and Krauss 1998; Hanson and Krauss 1999; Pearson et al. 2009).

Although there are obstacles for individuals obtaining a STEM degree, the financial rewards upon college graduation are consistently greater than those associated with the average athlete. Academic and athletic interests, goals, and choices of high school students underline their academic decisions prior to and during college. While sports participation and obtaining a degree in a STEM field are both pathways for social mobility, there are far more individuals earning STEM degrees and working in STEM fields than there are professional athletes in the United States (Higher Education Research Institute 2014; Noonan 2017). Given these findings, I examine if varsity sports participation in high school is significantly related to students' declaring a STEM major in college. Additionally, because athletes in major sports leagues are generally people of color vying for a limited number of professional opportunities, and due to the underrepresentation of people of color and women in STEM majors and fields, I also examine gender and race as potential moderators for the relationship between varsity sports participation and college STEM declaration.

Although perceptions about the odds of becoming a professional athlete and other considerations can have either positive or negative long-term economic and academic consequences, there may be an advantage for individuals who participate in varsity sports compared to junior varsity athletes and nonathletes. Consequently, exploring the relationship between sports participation and STEM outcomes can possibly have policy implications for encouraging an interest in STEM for student athletes' in high school, as well as their declaration in STEM majors in college.

The first section of the study explores two theoretical frameworks, Identity Theory and Social Cognitive Career Theory. Identity Theory (Burke and Stets 2009) is crucial to understanding the dual roles of being an athlete and a student. The Identity Theory framework is also beneficial for understanding if there is a conflict between the athlete and student role. Social Cognitive Career Theory examines the broader context by analyzing students' STEM participation and how that context is developed through a combination of factors such as demographic information and opportunity structures. The second section summarizes literature related to sports participation, STEM, gender, and race, and introduces the hypotheses to be tested. The third section describes the dataset, variables, research question, and quantitative methodology used for the project. The fourth section presents findings and discusses whether the data lend support to the hypotheses proposed. Lastly, the final section elaborates on the project's significance, as well as future possibilities for research.

THEORETICAL BACKGROUND

Theoretical Framework

The study analyzes the association between high school interscholastic sports participation and declaring a STEM major in college. The theoretical frameworks of Social Cognitive Career Theory and Identity Theory are incorporated to examine the potential relationship. Identity Theory (Burke and Stets 2009) considers the internal perspective of individuals and how they perceive meanings in relation to their self-standard. The maintenance of an identity is fundamental, regardless of the type of identity. Although previous research has examined the student athlete identity and its association with academic performance and major selection, most research has primarily focused on college student athletes. Social Cognitive Career Theory considers both an internal and external perspective as to why individuals are drawn to and eventually pursue careers in a given field (Hackett 2013).

Social Cognitive Career Theory

Social Cognitive Career Theory provides a theoretical basis to examine how individual and contextual-level characteristics influence students' career choices (Hackett 2013). Therefore, the utilization of Social Cognitive Career Theory should contribute to understanding how and if the experience of being a high school athlete is just one of many significant factors that are associated with college STEM declaration.

Social Cognitive Career Theory assumes that a variety of factors such as personal inputs, background context, and learning experiences influence self-efficacy and outcome expectations (Hackett 2013). Self-efficacy and outcome expectations directly influences an individual's interests, goals, and choices. Lastly, the framework of Social Cognitive

Career Theory examines how person inputs, environmental context, self-efficacy, and outcome expectations influence career interests, goals, and outcomes (Hackett 2013).

Social Cognitive Career Theory states that personal inputs relate to demographic characteristics such as race and gender. Background context consists of environmental factors such as socioeconomic status, family upbringing, and educational opportunity structures. Examples of educational opportunity structures, with respect to this study and the choice of a STEM major, include access to interscholastic sports, access to high quality STEM courses, access to educational resources, and opportunities to learn non-STEM subjects (Bottia et al. 2018). According to Hackett (2013), person inputs and background context can influence one another, and can also influence learning experiences, self-efficacy, and outcome expectations. Additionally, learning experiences can also affect self-efficacy and outcome expectations.

Self-efficacy, which is the sense of competence an individual has towards a given task or domain, influences outcome expectations, as well as interests, goals, and actions (Lent, Brown, and Hackett 2002; Hackett 2013). Outcome expectations, which are influenced by self-efficacy, are perceptions about the consequences of performance outcomes (Lent et al. 2002; Hackett 2013). For example, a backup quarterback on a football team may expect to become a starter if they dedicate most of their time to learning the coach’s playbook, working out, and practicing with other teammates. Together, self-efficacy and outcome expectations mediate the relationship between person inputs, background context, learning experiences, and an individual’s interests, goals, and choices (Byars-Winston et al. 2010). According to Lent et al. (2002), interests are activities that an individual is invested in. Goals are developed from interests and reflect an individual's intentions to take part in an activity. Choices reflect the actions of an individual. Interests, goals, and choices can be affected by person inputs, as well as self-efficacy and outcome expectations.

Identity Theory

According to Burke and Stets (2009), it is paramount to understand the social structure and thus how it can impede and create opportunities. Stets and Serpe (2013) define identity as a set of meanings related to the roles, groups, and traits people occupy in society. The social structural program of Identity Theory focuses on role identities and how roles are influenced by society and enacted by individuals (Burke and Stets 2012). Roles are expectations attached to social positions, such as a parent or a student (Burke and Stets 2009). When individuals embody roles, they internalize role expectations. These expectations are then reflected in an individual's behavior.

An important consideration of Stryker's Identity Theory is that individuals can have multiple identities (Stets and Serpe 2013). Each identity is associated with its own feedback loop that consist of input perceptions, an identity standard, and a shared output between the identities. In such a scenario, the identity standards of multiple identities can either share or not share meanings. However, if a discrepancy exists within any of the identities, the discrepancy affects the behavior for that given identity and possibly affects the input perceptions for that identity and others. To lessen a discrepancy, an individual would either change their behavior to get their perceptions aligned with their self-standard or devalue one identity in favor of a more salient one.

For example, the expectations of the student role may directly conflict with and strain the expectations of the athlete role for a student athlete, especially if the former includes the challenge to practice and performance that comes with dedicating time to schoolwork or challenges to scholarship that come from dedication to practice and performance. In this situation, a student athlete would evaluate whether to enact behaviors associated with one role over the other, to influence how others perceive them and minimize the discrepancy between these perceptions and their self-standards.

While Identity Theory accounts for understanding meanings of the self within the social structure and how these meanings are related to individuals' choices, Social Cognitive Career Theory provides a theoretical basis to examine why and how students make specific career choices. Therefore, the combination of Identity Theory and Social Cognitive Career Theory should generate greater understanding of the dichotomy between being a student and an athlete, as well as an individual's career choices.

For the study, I compare varsity athletes and individuals who do not participate in varsity sports to examine if there are any differences in the likelihood of college STEM declaration. Social Cognitive Career Theory is used to identify the factors, such as standardized math test scores, coursetaking in STEM, and socioeconomic status, that can influence whether an individual declares a STEM major. Identity Theory can provide individual context, in terms of the interplay between being a student and an athlete, and whether one of these roles is more salient than the other when incorporating a racial, gender, and intersectional lens. Social Cognitive Career Theory can help explain the relationship between varsity sports participation and college STEM declaration by further identifying if interactions between varsity sports participation and gender, as well as other measures such as race and gender are significant predictors of STEM declaration. Gender and race are evaluated as moderators to examine if there are any gender, racial, or gender by racial disparities in STEM declaration amongst varsity athletes and individuals that do not play varsity sports.

LITERATURE REVIEW

Sports Participation and Academic Outcomes

High school is the last time most athletes play sports at a competitive level (NCAA 2018a). During the 2016-2017 school year, nearly eight million students participated in high school sports (NFHS 2017). For the same year, approximately 490,000 college students participated in NCAA-championship sports across all three NCAA divisions (Irick 2017). In addition, the number of collegiate athletes who reach the professional level is even lower. Only one percent of men and women college basketball players reach the NBA and WNBA (NCAA 2018a). Additionally, 19 percent of men's college basketball players and 5 percent of women's college basketball players reach professional basketball leagues across the globe. Although the prospects of a professional career in sports are low, high school and college sports participation is not without its share of benefits.

According to Barber, Stone, and Eccles (2005), involvement in extracurricular activities, including sports, is associated with a variety of outcomes. Some key benefits of extracurricular activity involvement include a greater attachment to school, academic achievement, and educational attainment. Broh (2002) examined if sports participation and extracurricular participation are associated with greater academic achievement. Sports participation was compared against involvement in music, drama, student government, yearbook, and vocational clubs. Broh (2002) found that sports participation was positively and significantly associated with high school students' math grades. Although the association was due to the greater amount of academically inclined students playing sports, the association remained positive and significant when controls were accounted for. In a similar study, Eccles and Barber (1999) found that in 10th grade, extracurriculars such as prosocial activities, performance arts, sports, school involvement, and academic clubs were significantly and positively associated with liking school. Although the greatest differential was for students involved in performance arts, athletes were significantly more likely to enjoy school than nonathletes in 10^{th} and 12^{th} grade (Eccles and Barber 1999).

Fejgin (1994) also found that sports participation had the greatest association amongst all extracurricular activities for a variety of outcomes such as educational aspirations, grades, and self-concept. Generally, student athletes have better academic achievement, greater educational aspirations, and a higher self-concept than nonathletes.

Although educational aspirations, self-concept, and locus of control were explained by a greater degree of variance than grades (Fejgin 1994), higher grades are another benefit of sports participation. Fox et al. (2010) examined the relationship between sports participation and academic performance for middle school and high school students. Their study found that athletes had higher grade point averages than nonathletes. Although there are mixed findings, regarding the degree of significance between the grades of athletes and nonathletes (Sobeski 2015), the grade point average differential between high school athletes and nonathletes is well established in prior literature (Fejgin 1994; Whitley 1999; Eccles and Barber 1999; Broh 2002; Barber et al. 2005; Lumpkin and Favor 2012).

Another aspect of academic performance is standardized exams. Much like grades, standardized exams are another measure of academic performance, which can predict future academic achievement, as well as college entrance. This is especially the case for athletes, who according to several studies (Sobeski 2015; Lumpkin and Favor 2012; Dormer 2017) perform better on standardized exams than nonathletes. At the local level, Sobeski (2015) found significant differences in SAT math scores for a sample of female athletes and female nonathletes at a South Carolina high school. At the state-level, Lumpkin and Favor (2012) found that Kansas high school athletes generally outperformed nonathletes on the composite ACT and its several subsections, except for English and Reading. For state standardized exams, high school student athletes in Pennsylvania scored significantly higher on the state's standardized biology exam than nonathletes (Dormer 2017). For Division I collegiate athletes, the ACT is one of several significant predictors of academic performance (Gaston-Gayles 2004). Although there is research that claims that student athletes perform better on standardized exams than nonathletes, the findings for such outcomes become decidedly mixed, as it does for grades, when incorporating background characteristics such as gender, race, and socioeconomic status.

Sports Type, Academic Outcomes, and College Matriculation

In the context of college matriculation, some research claims that collegiate athletes have lower high school GPA's and standardized exam scores than nonathletes (Sanders and Hildenbrand 2010; Bowen and Levin 2003; Knobler 2008). However, a key problem with such findings is that the emphasis on lower GPA's and standardized exam scores is generally limited to athletes in high-profile sports such as football and basketball, and is not representative of all athletes. For example, Eitle and Eitle (2002) found that team sports, such as football and basketball participation, was negatively associated with math achievement, with the latter being significantly so with and without controls. When evaluating the effects from other team sports participation, which was defined as sports other than basketball and football, there was a positive but nonsignificant association with math achievement (Eitle and Eitle 2002). Contrarily, when grades were evaluated as the outcome of interest, there was a significant and positive association for other team sports with and without controls, and only for basketball with controls.

Furthermore, the duality of being a student and an athlete, especially in a high-profile sport, can create potential differences in academic expectations, commitment, and goals not only between athletes and nonathletes, but amongst athlete subgroups (Stryker and Serpe 1982; Snyder 1985; Burke and Stets 2009; Fountain and Finley 2009; Stets and Serpe 2013; Knott 2016; Yukhymenko-Lescroart 2018; Foster and Huml 2017). Selection bias is another possible explanation for the perception of lower GPA's and standardized exam scores of collegiate athletes as described by (Sanders and Hildenbrand 2010; Bowen and Levin 2003; Knobler 2008). Collegiate athletes are a distinct group, especially when compared to former high school athletes that have matriculated into college, but do not play at the collegiate level.

Much like how local and state high school sports associations have academic eligibility standards, the NCAA has similar standards for incoming first-year student athletes. In addition to completing curriculum requirements prior to enrollment at a Division I university or college, incoming student athletes must have at least at 2.3 GPA if they want to compete during their first year of collegiate eligibility (NCAA 2018b,c). A sliding scale is used to incorporate standardized test scores as a complement to GPA. When comparing the standardized scores between athletes and nonathletes at a school in a major Division I athletics conference, nonathletes had higher scores overall (University of Tennessee Athletics Board 2009, 2011), as well as GPA's, especially compared to male athletes and athletes in high-profile sports. Because of the difference in participation level, as well as special admissions criteria (Associated Press 2009) that deemphasizes academic performance standards for athletes such as football players, it is possible that there are differences in academic performance for athletes based on the type of sports they participate in (Sanders and Hildenbrand 2010).

Overall, there are a variety of benefits from sports participation. Compared to other extracurricular activities, sports participation is associated with better academic outcomes such as higher grades, standardized test scores; greater educational aspirations and attainment than nonathletes; and positive noncognitive outcomes such as a higher self-concept and greater self-esteem (Fejgin 1994; Eccles and Barber 1999; Broh 2002; Barber et al. 2005, Fox et al. 2010). In the next section, I examine how similar factors such as grades, standardized test scores, and educational aspirations, in addition to other factors such as coursetaking and social support, influence or discourage individuals from declaring a STEM major in college.

STEM Declaration

There are a multitude of factors that influence an individual's interest, entrance and persistence in a STEM major. Some of these factors include early childhood experiences with STEM (Margolis and Fisher 2002), family and peer influence, social climate, pedagogical experiences, advanced coursetaking in STEM (Pearson et al. 2009; Bottia et al. 2015), achievement in STEM, and self-efficacy in STEM (Wang 2013). Early childhood exposure in STEM is considered an important influence because it is tied to informal and formal experiences inside and outside the classroom. While examining the educational experiences of computer science majors at Carnegie Mellon University, Margolis and Fisher (2002) found that accessibility to computers during childhood was linked in part to children having an obsessive interest in computers, which eventually influenced them to take computer courses in high school and participate in school clubs.

Family and peer context also play a role in determining STEM outcomes. Having family or peers' support or lack of support can play a major role in whether an individual is interested in or capable of majoring in STEM. In the same instance, parents made evaluations on their children's interest in computers based on whether they displayed an obsessive interest in STEM or not (Margolis and Fisher 2002). Perceptions of interest can impact the access individuals have to resources, which can create consequences in the long term. These consequences include disparities in the lack of informal experiences in STEM, which can be linked to grades, standardized test scores, advanced STEM coursetaking in high school, self-efficacy in STEM, feelings of belonging in STEM courses and fields, and involvement in STEM extracurricular activities (Margolis and Fisher 2002).

Students interested in and who eventually declare a STEM major have higher grades than students who do not declare a STEM major (Radunzel, Mattern, and Westrick 2017; Eagan et al. 2014). Additionally, Radunzel et al. (2017) also found that there was a positive and significant association between high school GPA and STEM declaration. For students who are interested in and eventually declare a STEM major, there is also a positive and significant association between ACT STEM scores and STEM declaration. Furthermore, students who scored a 26 or higher (with the highest score being a 36 on the ACT) were more likely than others to declare a STEM major in college (Radunzel et al 2017; ACT 2010).

While grades and standardized test scores are often higher for STEM declarants (Eagan et al. 2014; Radunzel et al. 2017), students that intend to declare STEM majors are also more likely to take more advanced STEM courses during high school (Chen and Weko 2009; Eagan et al. 2014; Radunzel et al. 2017). Amongst ACT exam takers, students who took calculus in high school were significantly more likely to declare a major in STEM. Similarly, Bottia et al. (2015) found that taking a physics course was strongly associated with an increased likelihood of intending to major in STEM and declaring a STEM major. Above all, taking physics is important because it is considered an advanced science course, which is sometimes optional depending on the number of required science credits in a school or school district. Taking an optional course not only adds to the number of years of taking a science course in high school, but it also may be associated with an interest in STEM.

Wang (2013) examined the factors that influence students to intend to major in STEM. They found that 10^{th} grade math achievement and attitudes significantly and positively affected 12^{th} grade math-self-efficacy, exposure to math and science, and 12^{th} grade math achievement. Additionally, intent to major in STEM was significantly and positively influenced by 12^{th} grade math self-efficacy. The effect was consistent across demographic groups. This was also the case for high school exposure to math and science on intent to major in STEM.

Bottia et al. (2015) analyzed secondary school learning experiences in STEM and how they are related to the racial and gender disparities in postsecondary STEM involvement. Learning experiences are important because they can provide inspiration, reinforcement, and preparation for students seeking to major in STEM in college, as well as career goals. Learning experiences can also be negative and can act as a deterrent for students. Bottia et al. (2015) also found support for the positive association for intent to major in STEM and the odds of declaring a STEM major.

When examining the intentions of high school graduates, (Radunzel, Mattern, and Westrick 2016) found that nearly half of students were interested in majoring in STEM. However, once high school graduates entered college, differences between intention and declaration emerged. Chen and Weko (2009) evaluated the major choices of students from the 1996-2001 Beginning Postsecondary Students Longitudinal Study and the Educational Longitudinal Study of 2002. The authors found that 23 percent of students from the Beginning Postsecondary Longitudinal Study majored in STEM compared to 15 percent of high school graduates in college during the second follow-up of the ELS 2002 study. Similarly, Chen and Ho (2012) found that 30 percent of students from the 2004-2009 Beginning Postsecondary Study were in STEM majors. Overall, despite the rate of STEM intention, STEM declaration amongst incoming and undergraduate students was often lower in comparison (ACT 2014; Radunzel et al. 2017). The discrepancy between STEM intention and declaration can emerge for a variety of reasons, but it is worth noting that there are differences that exist between demographic groups.

In summary, there are a multitude of factors that can influence an individual’s STEM intention and declaration. Amongst these factors are standardized exam scores, advanced coursetaking in STEM, and participation in STEM extracurricular activities.

Given the importance of these factors, I examine if gender and race moderate a potential relationship between varsity sports participation and college STEM declaration.

Gender and STEM

Within society, gendered expectations can work to reinforce social identities (Leaper and Friedman 2007). For instance, individuals utilize their agency and significant others such as parents, peers, and teachers influence those individuals (Kramer 2005). A consequence of these gendered expectations is that boys are more likely to perpetuate in-group norms and behaviors that are often limited when compared to girls (Bigler, Brown and Markell 2001; Leaper 1994). In addition, because males possess high-status and power in patriarchal societies, masculine traits such as competitiveness are valued more than feminine traits. The preference for masculine traits can be beneficial to girls who adopt such traits. However, the adoption of feminine traits is not beneficial for boys.

In the domain of STEM, gendered expectations often play out much to the benefit of men. In 2014, approximately 40 percent of men intended to major in STEM compared to 30 percent of women (Higher Education Research Institute 2014). According to Chen and Weko (2009), more men enter STEM than women. Furthermore, a third of all male undergraduates enter STEM compared to a seventh of all women.

Shapiro and Sax (2011) note that precollege experiences, social environment and pedagogy in college STEM courses, connections with teachers, and peer influences are the most common factors for women becoming interested in and entering STEM. Starting from an early age, women lack the same experiences in STEM as men because their interest is perceived differently by their parents when compared to men (Margolis and Fisher 2002). Furthermore, if parents have lowered expectations of their daughters' academic abilities and goals, as well as different perceptions of their daughters' interest in STEM compared to their sons', that may steer these students away from STEM (Vetter 1996; Margolis and Fisher 2002).

According to Sax (1994), women are also less confident about their mathematic abilities. As a result, women may leave or avoid STEM because of a lack of self-efficacy in STEM (Brainard and Carlin 1998; Margolis and Fisher 2002; Hill et al. 2010). The competitive environment in STEM college classes can also be a deterrent for women entering or persisting in STEM (Strenta et al. 1994; Margolis and Fisher 2002).

However, although gendered expectations can serve to disadvantage women in masculine domains such as STEM, women perform comparably to men, if not better than men when grades are concerned (Shettle et al. 2007; Riegle-Crumb et al. 2012). Additionally, women are significantly more likely than men to take advanced STEM courses (Tyson et al. 2007; Riegle-Crumb et al. 2012). Doing so, has previously been found to be positively and significantly associated with STEM intention and declaration (Bottia et al. 2015; Radunzel et al. 2017).

Gender, Sports Participation, and STEM

Title IX of the U.S. Civil Rights Act brought about drastic changes for women in the United States. With the enactment of Title IX in 1972, sex discrimination in educational programs and activities was outlawed for any educational institutions that received federal funding (U.S. Department of Education 2015). In relation to sports participation, at the time of the enactment of Title IX approximately seven percent of high school athletes were women (NFHS 2013). In 2017, that number has increased to 43 percent (NFHS 2018).

While it is generally known that sports participation is associated with improved academic outcomes, another extension is the possible benefits that sports participation gives to females in domains previously considered as masculine, such as STEM. Hanson and Krauss (1999) explored this with a study focused on eighth graders from the base year of the National Educational Longitudinal Study of 1988. They used a critical feminist framework to explore if women's sports participation was positively associated with science attainment. Their argument rested on the fact that if women participate in sports, they acquire benefits, such as self-efficacy, that allow them to enter and possibly persist in science. Furthermore, they sought to examine if there are racial and class differences amongst women when it comes to sports participation influencing science attainment. The results indicated that sports participation was associated positively with science achievement for women. However, the effects of sports participation were lower for the 1988 NELS cohort of female athletes than for the 1980 cohort of female athletes.

According to Hanson and Krauss (1999), sports participation in eighth grade varsity sports raised female athletes' math achievement score by .01 standard deviations and their science achievement score by .06 standard deviations in eighth grade. By their sophomore year in high school, there is a significantly negative association between sports participation in eighth grade on math achievement, but also a significantly positive association with science achievement

However, by a female athlete's senior year of high school, there is a negative, but nonsignificant association between eighth grade varsity sports participation and STEM achievement (Hanson and Krauss 1999). In relation to sport type, there was a positive and significant association for other team sports participation and math achievement, as well as for individual sport participation and STEM (math and science) achievement in 10^{th} grade. In contrast, there was a negative association between cheerleading and drill team participation and science achievement in 10^{th} grade.

An earlier study by Hanson and Krauss (1998), explored the potential influence of sports participation on science achievement, access, and attitudes for female and male athletes in the 1980s. They found that sports participation had a significantly negative effect on the science achievement for men during 10^{th} grade, but not during 12^{th} grade. Additionally, sports participation had a negative and significant effect on science attitudes for women in 10^{th} grade, which remained negative during 12^{th} grade. However, when evaluating sport by level, varsity sports participation had a significant and positive effect on science attitudes for women. Lastly, Hanson and Krauss (1998) also found that sports participation had a positive significant effect on women's access to science during 10^{th} grade. Although sports participation in 12^{th} grade generally had a negative effect on science access for women, varsity sports participation had a positive significant effect on science access.

Pearson et al. (2009) examined if sport participation was associated with advanced course selection for men and women. They found that female athletes and male athletes were more likely to take physics because of a higher academic orientation, attachment to their school, and greater social-psychological resources. GPA was also strongly associated with physics coursetaking for both male and female athletes, however, this was more so the case for female athletes. Female athletes were approximately twice as likely to take physics compared to female nonathletes when accounting for initial science placement, background factors, academic orientation, school integration, and social-psychological resources. Conversely, male athletes were significantly more likely to take physics than male nonathletes. However, the difference between male athletes and nonathletes diminished to non-significance in models with additional controls. Pearson et al.'s (2009) results suggest that girls may benefit from sports participation. Additionally, the benefit from sports participation is associated with a greater likelihood of taking advanced courses in science and foreign language.

Although women are less likely to enter STEM than men, the reasons for this are not based solely on grades and standardized test scores (Riegle-Crumb et al. 2012). Some research has found that women have comparable, if not greater levels of STEM achievement, in terms of grades, when compared to men (Shettle et al. 2007; Riegle-Crumb et al. 2012). Additionally, women are just as likely to take advanced STEM courses compared to men (Tyson et al. 2007; Riegle-Crumb et al. 2012), although slight differences exist between female and male athletes (Pearson et al. 2009). Hanson and Krauss (1999) posited that the associated masculine traits such as competitiveness, independence, and confidence from participation in sports might provide a benefit to women who enter science. Such a benefit may matter, especially when considering the similar rates of persistence for men and women in STEM (Ma 2011; King 2016), and the significantly greater odds of college graduation for interscholastic female athletes when compared to female nonathletes (Troutman and Darfur 2007). Given the results of previous research, I hypothesize that gender is an important moderator for the relationship between being a varsity athlete and declaring a STEM major in college.

Race and STEM

Similarly, another type of social identity, race and ethnicity, likely functions as a moderator in the relationship between varsity sports participation and college STEM declaration. Outcomes stratified by race and ethnicity also permeate into the domain of STEM. When comparing STEM intention rates, half of all Asian students intended to major in STEM (Higher Education Research Institute 2014). Overall, Asian students had the highest STEM intention rates when compared to Latino, White, Black, and Native American students. Similarly, when Chen and Weko (2009) examined STEM declaration rates from the 1996-2001 Beginning Postsecondary Study, they found that half of all Asian students entered STEM. However, when comparing the STEM intention rates found by Higher Education Research Institute (2014), STEM declaration rates for every racial and ethnic group, excluding Asians, were 10 to 25 percent lower. Furthermore, just as there are differences between STEM intention and declaration overall and when incorporating gender, there are differences when race and ethnicity is the focus (Chen and Weko 2009; Chen and Ho 2012; Radunzel et al. 2016). The factors influencing STEM intention and declaration are often similar for people of color as they are for women, albeit to varying degrees (Margolis and Fisher 2002; Pearson et al. 2009; Wang 2013; Bottia et al. 2015; MacPhee, Farro, and Canetto 2013; Tyson et al. 2007).

Race, Sports Participation, and STEM

Just as there are gender differences between STEM intention and declaration overall, there are differences when race and ethnicity are introduced into the relationships (Chen and Weko 2009; Chen and Ho 2012; Radunzel et al. 2016). Despite a plethora of research examining racial differences in STEM outcomes (Margolis and Fisher 2002;

Pearson et al. 2009; Chen and Weko 2009; Wang 2013; MacPhee et al. 2013; Higher Education Research Institute 2014; Bottia et al. 2015; Tyson et al. 2007), previous research has not generally focused explicitly on racial differences amongst student athletes' academic outcomes (Braddock 1981; Eitzen and Purdy 1986). As noted by Sabo, Melnick, and Vanfossen (1993), much of the previous research that focuses on racial differences is centered on male athletes and nonathletes from different racial backgrounds and does not include female athletes and nonathletes. However, there is some research that indicates differences amongst racial groups when it comes to sports participation and academic outcomes. Melnick, Sabo, and Vanfossen (1992) found that sports participation was generally not associated with a significant difference in grades for Black and Latino athletes. These findings are greatly at odds with research that has generally found a positive association between sports participation and grades (Fejgin 1994; Whitley 1999; Broh 2002; Lumpkin and Favor 2012; Shifrer et al 2015).

When considering the context of STEM achievement, Yeung (2015) found that sports participation has a significant negative effect on STEM exam scores for students from every racial group when compared to Whites, except for Asians. Given that there were five cognitive exam types available for the High School and Beyond Survey, which consisted of three STEM exams, only Black students experienced a negative effect from sports participation on all three STEM exams. Furthermore, Black athletes scored significantly lower on all three STEM exams than White athletes. The lack of a positive relationship between sports participation and STEM achievement was further compounded by the fact that the general group of Black students performed better than Black athletes on the math exams (Yeung 2015). When compared to White students, Black students still experienced a negative and significant effect when concerning STEM achievement on exams. However, there was still a significant and negative relationship between sports participation and STEM achievement for Native Americans and Hispanic students. Generally, racial and ethnic subgroups outperformed their athlete subgroups on STEM exams.

Intersectionality, Sports Participation, and STEM

Generally, previous literature has found that student athletes tend to perform better academically, have greater educational aspirations, such as attending college, and a higher self-concept than their nonathlete counterparts (Fejgin 1994; Fox et al. 2010; Barber et al. 2005; Eccles and Barber 1999). However, while sports participation is seen as a positive because of these outcomes, the general question of whether sports participation is beneficial for individuals from different and intersecting social backgrounds remains unanswered in a definitive way.

Hanson and Krauss (1999) examined how prior sport participation influenced achievement in math and science. While they found that sports participation was positively associated with science achievement for women, they found racial differences in this relationship. They report that sports participation was positively associated for White and Latina women, while there was not much of a benefit from sports participation on science achievement for Black women.

Pearson et al. (2009) examined if sports participation was associated advanced coursetaking. While they examined this association for all student athletes and then by gender, they posited that there would be differences in the relationship between sports participation and advanced coursetaking when accounting for gender and race.

Additionally, while the authors found support for student athletes being more likely to take advanced courses and women having a greater likelihood to take physics than men, they also found a different outcome for Black and Asian female athletes. Black female athletes were equally as likely to take physics as Black female nonathletes, when accounting for academic performance, social-psychological resources, and other controls. Additionally, Asian female athletes were less likely to take Physics than Asian female nonathletes. The opposite was true for male athletes and physics coursetaking. Black male athletes and Asian athletes were more likely to take physics than their nonathlete counterparts. However, the difference for both groups were not significant.

Eitle and Eitle (2002) examined the role of cultural capital, social background, and race and whether any of these variables influence participation in sports such as basketball, football, and other sports. The authors explored if there were racial and sport differences in academic achievement. Furthermore, they found a negative relationship between sports participation and standardized test scores. The results applied to White and Black male athletes, but were stronger for Black male athletes. However, in the context of grades, there was a positive relationship for sports participation and grades for Black male athletes who played football and basketball. The positive relationship did not exist for Black male athletes that played other sports that were not football or basketball.

A latter study by Eitle (2005) surveyed the association between sports participation and academic achievement, but with race and gender as moderators. Eitle (2005) discovered there were significant racial differences for math, science, reading, and history achievement scores. When examining types of sports participation, it was discovered that baseball or softball participation had a significant and negative effect on math achievement scores for Black women, but not for White women. Additionally, other team sports participation had a negative effect on reading achievement for Black female women but not Black men. While Black men did not experience a negative effect from sports participation on reading scores, they did however have a negative association between sports participation and STEM scores. In contrast, White male athletes did not experience a negative effect from sports participation on math and science scores. Generally, there were not any significant gender differences for White students. However, there were significant gender differences for Black students.

Although previous research highlights intersectional differences in academic outcomes for student athletes, intersectional differences can also manifest beyond the high school context when educational attainment and aspirations are considered. Shifrer et al. (2015) found that the likelihood of sports participation increased significantly only for Black and White women during the 1980s when they came from high socioeconomic backgrounds, relative to White men and all other subgroups. In contrast, the opposite relationship was true for Black men. Black men were more likely than White men to participate in sports when they came from lower socioeconomic backgrounds, especially during the 1990s. When Shifrer et al. (2015) factored race and gender into sports participation, White women were more likely to participate in sports than women of color. While there has been an increase in the number of sports participants amongst men and women, as well as for every racial group since the 1980s, White women experienced the greatest increase in percentage relative to all demographic groups.

Research about sports participation and college enrollment indicates race and gender variations in effects. According to Shifrer et al. (2015), sports participation was positively and significantly associated with four-year college enrollment. As was the case with sports participation and academic outcomes, White women experienced the greatest gains amongst all racial and gender subgroups when it came to enrollment at four-year postsecondary institutions. While Hispanic female athletes were the only female subgroup that was more likely to enroll in four-year postsecondary institutions during the 1980s, both White and Hispanic female athletes were about 20 percent more likely to enroll in four-year postsecondary institutions than their nonathlete counterparts during the 2000s. When considering the increases in college enrollment from the 1980s to the 2000s, White female and Hispanic female athletes experienced slightly greater, but not significant, odds of enrolling in four-year postsecondary institutions than White male athletes. While it can be argued that Black female athletes have experienced greater gains in enrollment at four-year postsecondary institutions, especially considering they were significantly less likely to enroll at four-year postsecondary institutions in the 1980s compared to White male athletes, they are still less likely to enroll in four-year postsecondary institutions relative to White male athletes. However, the differences between Black female athletes and White male athletes' odds of four-year college enrollment may be dwindling as time progresses.

In contrast, the association between sports participation and four-year college enrollment has become increasingly negative and significant for Black men (Shifrer et al. 2015). While Black male athletes were five percent less likely to enroll in four-year postsecondary institutions during the 1980s, when compared to White men, they were 12 percent less likely to do so during the 2000s. The difference between White and Black male athletes' four-year college enrollment from the 1980s is comparable to previous research. Braddock (1981) found a positive and significant association between sports participation and college enrollment for Black and White males, with a slight difference in favor of White males. However, the differential for four-year college enrollment between Black male athletes and nonathletes, which peaked at 19 percent during the 1980s, has decreased to 6 percent in the 2000s (Shifrer et al. 2015).

When considering the four-year college enrollment outcomes of various demographic groups, it is evident that White men and White women are the beneficiaries (Shifrer et al. 2015). While Black men and women do benefit from sports participation and are still likely to attend four-year colleges and universities, especially when compared to Black nonathletes, they are less likely to enroll in these schools than White and Hispanic individuals. Coupled with the evidence, the differential in four-year enrollment seems to be widening between Black female athletes and nonathletes over time but contracting for Black men. These trends for Black individuals are occurring even as the differentials between some groups such as White men and Hispanic men are trending downward.

Given the previous research examining sports participation and academic outcomes, this literature review explored whether the academic outcomes of student athletes varied by race and gender. Generally, academic outcomes did vary by race and gender, as well as factors such as social class. In the context of advanced coursetaking in science, Black and Asian women benefitted the least from sports participation compared to the overall group of female athletes (Pearson et al. 2009). Additionally, White women generally benefited more from sports participation, when related to science achievement, while Black women benefitted the least (Hanson and Krauss 1999). A similar result was found in a study that examined the likelihood of four-year college enrollment amongst racial and gender subgroups (Shifrer et al. 2015). Out of all subgroups, White women benefitted the most from sports participation, in terms of having an increased number of athletes and enrollment into four-year colleges. Despite some groups experiencing increased enrollment into four-year colleges, there was a decreasing influence from sports participation on four-year college enrollment for men. However, the decreasing influence of sport's role on four-year college enrollment is more so significant for Black men, especially in recent decades.

HYPOTHESES

For the study, I compare varsity athletes against individuals who do not participate in varsity sports to examine if there are differences between the groups' likelihood of declaring a STEM major in college. As seen in Figure 1, I expect that gender, race, as well as gender by race, act as potential moderators in the relationship between varsity sports participation and STEM declaration because of the influential role gender and race have on an individual's intention and STEM declaration in college.

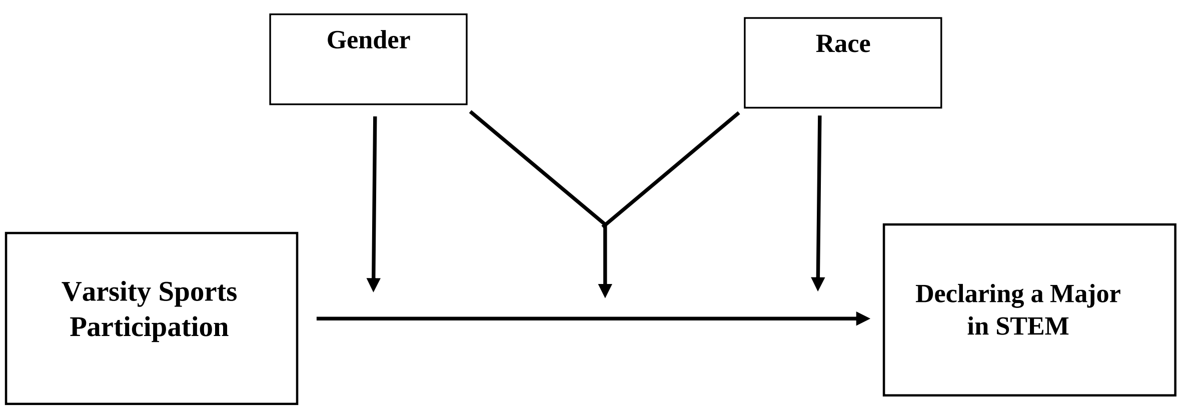

Figure 1. Heuristic Model

My research questions and hypotheses are as follows:

First Question: Is there a significant relationship between varsity sports participation and declaring a STEM major in college?

Previous research indicates that student athletes have greater academic achievement, STEM attainment, and educational aspirations than nonathletes (Fejgin 1994; Whitley 1999; Broh 2002; Pearson et al. 2009; Fox et al. 2010; Lumpkin and Favor 2012; Shifrer et al. 2015; Sobeski 2015; Dormer 2017). However, it is possible that the relationship between varsity sports participation and STEM declaration may vary based on the type of sport played and to a degree, the level of commitment a student has to sport and the profile of the sport (Eitle and Eitle 2002; Sanders and Hildenbrand 2010). Given these considerations, I posit that there is a significant relationship between varsity sports participation and STEM declaration.

H_1: Varsity athletes will have a significantly greater likelihood of declaring a STEM major in college than students who do not play any varsity sports.

Second Question: Does gender moderate the relationship between varsity sports participation and likelihood of declaring a STEM major in college?

Previous research indicates that there is a significant and positive association between sports participation and STEM achievement, as well as STEM attainment for women when compared to men (Hanson and Krauss 1998, 1999; Tyson et al. 2007; Shettle et al. 2007; Pearson et al. 2009; Riegle-Crumb et al. 2012). Given these considerations, I posit that there is a significant relationship between varsity sports participation and STEM declaration when gender is a moderator.

H_2: The relationship between being a varsity athlete and the likelihood of declaring a STEM major in college will be significant and stronger for female students compared to male students.

Third Question: Does race moderate the relationship between varsity sports participation and the likelihood of declaring a STEM major in college?

Prior studies indicate that there are racial disparities for various STEM outcomes (Margolis and Fisher 2002; Tyson et al. 2007; Pearson et al. 2009; Wang 2013; MacPhee, et al. 2013; Higher Education Research Institute 2014; Bottia et al. 2015). While there is less research examining racial disparities in STEM for student athletes, the research that does exist suggests that White athletes have significantly greater STEM achievement than other racial and ethnic groups (Yeung 2015). Given these considerations, I posit that there is a significant relationship between varsity sports participation and STEM declaration when race is a moderator.

H_3: Among White students, the relationship between being a varsity athlete and the likelihood of declaring a STEM major in college will be significant and stronger than for Black students.

Fourth Question: Does the intersection of a student's gender and race moderate the relationship between varsity sports participation and the likelihood of declaring a STEM major in college?

Previous research indicates that White women had the greatest benefit from sports participation and STEM achievement, STEM coursetaking, and college enrollment (Hanson and Krauss 1999, Pearson et al. 2009; Shifrer et al. 2015), when compared to Black women and other racial and gender subgroups. Furthermore, (Eitle and Eitle 2002; Eitle 2005) generally found negative associations between sports participation and STEM achievement for Black male and female students when compared to their White counterparts. Given the differential outcomes in STEM achievement, STEM coursetaking, and college enrollment based on race and gender, I posit that there will be a significant relationship between varsity sports participation and STEM declaration when gender and race are considered together as moderators.

H_{4a}: The relationship between being a varsity athlete and declaring a STEM major in college will be significant and stronger for White female varsity athletes than for Black female varsity athletes.

H_{4b}. The relationship between being a varsity athlete and declaring a STEM major in college will be significant and stronger for White male varsity athletes than for Black male varsity athletes.

METHODS

Data and Sample

Data from the Education Longitudinal Study of 2002 from the National Center for Education Statistics are used for this study. The dataset includes information from student, parent, teacher, and school administrator questionnaires (Ingels et al. 2004). The data from the student questionnaire is compatible with data from the other questionnaires. As a result, data from different questionnaires can be included together. Student level data were divided into seven categories. The seven categories were (1) background information, which included race, ethnicity, and several other variables; (2) school experiences, which included extracurricular activities and attitudes toward school; (3) plans for the future, which included plans for standardized tests and career plans; (4) non-English language use; (5) money and work; (6) family, which included family background and student perceptions; and (7) beliefs and opinions about the self.

Data for school administrators consist of information about (1) school characteristics, such as school type, (2) student characteristics, such as the percentage of students that receive free or reduced-price lunch, (3) teaching staff characteristics, (4) school policies and programs, (5) technology, and (6) school governance and climate (Ingels et al. 2004). Student level data about social background and school experiences were used for the purposes of the study. Additionally, administrator level data that focused on school characteristics and student characteristics were also used for the study.

The sample of students in the ELS 2002 is not a simple random sample. Rather, the sample is a stratified two-stage design (Institute of Education Sciences n.d.a). Seven hundred and fifty schools were selected first, followed by a selection of sophomores from each of those schools. The nationally representative longitudinal dataset follows a sample of 10th grade students from Spring 2002 to 2012. There are three follow-up and two transcript studies from Spring 2002 to 2012. The timeframe of focus is from Spring 2002, which is the base year of the study, to Spring 2006. The latter period is the second follow-up, which takes place two years post-high school graduation. For the initial base year study there was a sample of 16,200 students. (Institute of Education Sciences n.d.a).

However, for the purposes of analysis, the full sample is reduced to approximately 6,400 students and 650 schools. The reason for the reductions, is a result of missing data for the dependent variable used for the study, declaration of a college major by Spring 2006. Of the original sample of 16,200, only 6,400 students had declared a major. Thus, the final analytic sample when accounting for individual and high school-level control variables was approximately 5,000 students and 650 schools.

To evaluate the analytic sample, a series of binary logistic regression models were utilized. The key primary independent variable for the study is varsity sports participation in 10^{th} grade. General varsity sports participation in 10^{th} grade is measured by (1) any participation in varsity sports, (2) varsity individual sports participation, (3) varsity other team sports participation, and (4) varsity basketball participation. While the 10^{th} grade varsity sports participation models included 10th grade measures, they also included additional measures from the first and second follow-up. Because of the inclusion of variables over multiple timeframes of the dataset, a panel weight is used for general varsity sports participation and sports type models to ensure that members are counted in the waves of the survey in which they participated in (Institute of Education Sciences n.d.b). Furthermore, panel weights are used to account for the probability of selection in each wave. For the analytic sample and binary logistic regression models, panel weights were multiplied by the group that is being evaluated in the study. Because the binary logistic regression models examine high school sophomores, the 10th grade cohort tag is multiplied against the second follow-up and base year panel weight to account for and weight only 10th grade students. Panel weights were also normalized. The purpose of the panel weights is to ensure the sample remains representative.

Dependent Variable

The research questions explore whether varsity sports participation is associated with declaring a STEM major in college. Thus, the outcome for declaring a STEM major in college is whether a student declared a major in non-STEM (0) or STEM in college (1). The designation of whether a student declared a major in STEM was based on whether a discipline is recognized by the National Science Foundation (NSF) as a STEM field (National Science Foundation n.d.; Big Ten Academic Alliance 2014). Declaration of a major in STEM is measured during the second follow-up of ELS 2002, which occurs two years post-high school.

Key Independent Variables

Varsity sports participation is the *primary independent variable* in the study. Varsity sports participation, accounts for whether a student participates in varsity sports or not. Sport participation in 10th grade was initially coded as did not participate, junior varsity participation, varsity participation, varsity captain, student reports no sports program, nonrespondent, survey component legitimate skip, and missing. Because of the presence of nonrespondents, survey component legitimate skips and missing data, each of these categories were coded as missing and then excluded from analysis. A dummy variable was created for varsity sports participation in 10th grade, after accounting for missing cases. Varsity sports participation and varsity captain were coded as (1). In contrast, junior varsity participation, did not participate, and student reports no sports program at school were coded as (0) for did not participate in varsity sports in 10th grade. The reference category for varsity sports participation in 10th grade are students who did not participate in varsity sports in 10th grade.

I used the general varsity sports participation in 10th grade measure over a combined measure for general varsity sports participation in 10th grade and sports participation in 12th grade. I chose the general varsity sports participation in 10th grade measure over the combined general varsity sports participation in 10th grade and sports participation in 12th grade measure because the former allowed for analysis of varsity sports participation and not just sports participation. Sports participation in 10th grade was defined as participation in junior varsity and varsity sports, as well as participation in varsity sports as a captain.

A weakness of the combined 10th grade varsity sports participation and 12th grade sports participation measure is that while it measured sports participation longitudinally or at two points in time, those measurements may have not been equivalent. As it was coded, 10th grade students were able to select whether they participated in varsity sports or other levels of sport such as junior varsity. In contrast, the 12th grade sports measure did not have comparable categories of different levels of sports participation. Instead, the measure only captured whether students participated in sports or not during their senior year. Students who participated in varsity sports in 10th grade and sports in 12th grade may not have participated in varsity for the latter. While it can possibly be assumed that most 12th grade athletes are varsity athletes, there is not much evidence within the ELS 2002 dataset or elsewhere to justify such an assumption. Although there was a lower proportion of students who participated in varsity sports in 10th grade and sport in 12th grade than individuals who participated in varsity sports during 10th grade, there is a possibility that more students are being accounted for in the former group because of the lack of a specific level for varsity participation in the 12th grade variable.

The general varsity sports participation in 10th grade measure is particularly useful because it allows for comparison across various types of varsity sports participation in 10th grade. Previous research has found that athletes have higher levels of perseverance, positivity, resilience, self-esteem, and self-efficacy than nonathletes (Laborde, Guillen, and Mosley 2016). Additionally, these authors also found that *individual* sport athletes had greater levels of perseverance, positivity, resilience, self-esteem, and self-efficacy than team sport athletes. Prior research has also found differences in STEM achievement by sport type (Eitle and Eitle 2002). Given the availability of alternative varsity sports measures in 10th grade, I utilized three different measures of varsity sports participation, in addition to evaluating varsity sports participation as an aggregate category. The three additional varsity sports measures that were used in the study are varsity basketball, varsity individual sports, and varsity other team sports participation. In addition to analyzing these three additional varsity sports measures, I evaluated if each are significantly associated with declaring a STEM major.

Although other team sports was not defined in detail in the ELS 2002 dataset, other team sports can be best understood as team sports without an explicit category. Team sports such as basketball, cheerleading, football, baseball, softball, and soccer are all defined as their own measures in the ELS codebook. Even though other team sports and individual sports are not defined in detail, they can best be understood and assumed as a collection of sports that were not explicitly classified as 10^{th} grade varsity sports measures. In some aspect, sports like volleyball and lacrosse can be assumed to be other team sports because of their collective orientation (Nemeth n.d.; Hamilton n.d.a). In team sports, a team of individuals always competes against another team of individuals. Sports such as swimming and golf can also be assumed to be individual sports, despite individuals being a part of a school team (Hamilton n.d.b). Students who participate in individual sports are part of a broader team, but they primarily compete as individuals against individuals from other teams, unless an event dictates full team participation. However, there is a degree of uncertainty over whether sports such as wrestling, tennis, and cross-country are individual or other team sports because they can fit into either category depending on the context (Hamilton n.d.a). For example, a cross country runner competes in events as an individual, but the combined individual efforts of a cross country team determine if the team wins a meet (NCHSAA 2018).

Basketball, individual sports, and other team sports were chosen for analysis primarily because they were the most gender-balanced sports in the sample, when compared to other sports such as baseball, softball, and football. The relative gender equitability of basketball, individual sports, and other team sports made it easier to test if gender moderated the relationship between varsity sports participation, or type of varsity sports participation in this case, and STEM declaration. Additionally, the amount of varsity athletes that played varsity individual and other team sports available greatly surpassed the amounts for sports such as baseball, softball, soccer, basketball, and football. The greater numbers of varsity athletes available allowed for a greater degree of evaluation for the research questions.

The coding strategy for the three sports type variables in 10th grade used in the study (basketball, other team sports and individual sports) are different than it is for the general varsity sports participation measure. While the general varsity sports participation measure is dichotomous, each of the three sports type measures are categorical and consist of three categories.

Varsity Individual Sports participation in 10^{th} grade was coded as (1) for students who participated in varsity individual sports, (2) for students who participated in varsity team sports or sports that were not individual sports, and (3) for students who did not participate in any varsity sport.

Varsity Other Team Sports participation was coded as (1) for students who participated in varsity other team sports; (2) for students who participated in varsity individual sports or popular team sports such as basketball, football, soccer, basketball, baseball, softball, and cheerleading; and (3) for students who did not participate in any varsity sport.

Varsity Basketball participation in 10^{th} grade was coded as (1) for students who participated in varsity basketball, (2) for students who participated in varsity sports (team or individual) other than varsity basketball, and (3) for students who did not participate in any varsity sport.

Similar to the general varsity sports participation measure, students who did not play any varsity sport in 10^{th} grade was the reference category for each of the three varsity sport type measures.

Moderator variables

Gender and race are the two *moderator variables* used in the study. Gender in 10th grade is a categorical variable that was initially coded as male, female, nonrespondent, and survey component legitimate skip. When recoding the variable, nonrespondents and legitimate skips were tagged as missing data and excluded from analysis. One dummy variable was coded to flag if a student was male or female. Male was coded as (0) and female was coded as (1). Male is the reference category for gender during the analysis.

Race in 10th grade is a categorical variable that was initially coded as American Indian, Alaska Native, or Native American; Asian, Hawaiian, or Pacific Islander; Black or African American; Hispanic, no race specified; Hispanic race specified; More than one race, non-Hispanic; White; nonrespondent; and survey component legitimate skip. However, when recoding the data, nonrespondents and skips were tagged as missing and excluded from analysis. Both Hispanic categories, no race specified and race specified, were combined into one Hispanic variable because the race specified option was not applicable to other categories. Furthermore, the Hispanic race specified category was an option in which individuals could claim a racial category in addition to their Hispanic ethnic background. However, that was the extent of the Hispanic race specified category. Each of the racial and ethnic groups were made into six dummy variables for analysis, which categorized whether an individual identified as a member of a racial or ethnic group (1) or another racial or ethnic group (0). White is the reference category for race during the analysis.

Other Control Variables

Based on previous studies that report important variables related to students choosing STEM as a major, I included the following individual-level controls for this study: socioeconomic status, previous academic achievement and exposure (10th grade math standardized test score, math and science coursetaking, participation in a math and science fair). The school-level controls are the percentage of 10th graders that received free or reduced-price lunch, type of school sector, and region of where the school is located.

One of the primary differences between student athletes and nonathletes is socioeconomic status (Fejgin 1994; Videon 2002; Shifrer et al. 2015). It is well established within sociological literature that high socioeconomic status is positively associated with postsecondary aspirations, matriculation, and outcomes (Shifrer et al. 2015). Similarly, when Shifrer et al. (2015) examined the association between sports participation and four-year college enrollment from the 1980s to the 2000s, as well as any differences in college enrollment based on race and gender, they found support that a higher socioeconomic status is positively associated with sports participation. Fejgin (1994) and Videon (2002) found that students from high socioeconomic backgrounds were more likely to participate in sports than students from low socioeconomic backgrounds. Students from private and suburban, as well as smaller schools, are also significantly more likely to participate in sport than those in public, urban, and larger schools (Fejgin 1994; Videon 2002). Greater participation in sports for higher SES individuals is likely the result of a greater degree of influence from family, as well as greater access to resources to play sport (Messner 1990; Eitle and Eitle 2002).

I included socioeconomic status as a control variable, given that sports participation is associated with coming from a higher socioeconomic background, which is also associated with being more likely to go to college (Messner 1990; Fejgin 1994; Eitle and Eitle 2002; Videon 2002; Shifrer et al. 2015). Socioeconomic status for 10th graders was a composite variable that was initially coded into quartiles. The first quartile was the lowest quartile, which was followed by the second, third, and fourth quartile. Nonrespondent, survey component legitimate skip, and missing cases were coded as missing and excluded from analysis. Each of the remaining categories were categorized as three dummy variables. The lowest quartile was coded as lower class, the second and third quartile was recoded as middle class, and the highest quartile was recoded as upper class. Students from middle class backgrounds are the reference category during the analysis.

According to Margolis and Fisher (2002), early childhood experiences in STEM can influence future opportunities to engage in STEM activities inside and outside of school. Consequently, these informal and formal STEM experiences can eventually lead an individual to declare a STEM major in college. Given the role of early childhood experiences and extracurricular activities in influencing STEM intention and declaration, I have included a measure for participation in STEM extracurricular activity during high school. The participation in math and science fair in 10th grade measure was originally coded as no, yes, nonrespondent, multiple response, not administered, abbreviated interview or breakoff, survey component legitimate skip, and missing. Nonrespondent, multiple response, not administered, abbreviated interview or breakoff, survey component legitimate skip, and missing cases were coded into its own category and then excluded from analysis. Afterwards, a dummy variable was created for analysis. Participation in math and science fair in 10th grade was (1), while (0) was did not participate in math and science fair in 10th grade. Did not participate in math and science fair in 10th grade is used as the reference category during the analysis.

Standardized exam scores are considered an important predictor for STEM declaration (Radunzel et al. 2017). When considering a standardized test measure, I evaluated three variables: recent SAT math exam score, highest entrance exam score in terms of SAT, and math standardized test score in 10^{th} grade. The recent SAT math score measure had nearly 10,000 missing cases, which mirrored the amount of missing cases for the outcome. The highest entrance exam score measure had fewer missing cases than the recent SAT score variable, primarily because it converted ACT scores into SAT scores. In contrast, the 10^{th} grade math standardized test score measure had less than a thousand missing cases. The math standardized test score in 10^{th} grade is a cognitive test that assessed students' achievement in math. A similar test was implemented in the first follow-up when students were in 12^{th} grade. Given the amount of missing data for the SAT Math measure and the use of cognitive tests as standardized exam measures in previous research (Yeung 2015), I chose the 10^{th} grade math standardized test score measure. math standardized test score in 10th grade is a continuous interval-ratio variable. As mentioned prior, there are several hundred missing observations for the variable. Missing observations were excluded from analysis.

Previous research has identified the important role of STEM coursetaking as a predictor of STEM intention and STEM declaration (Chen and Weko 2009; Pearson et al. 2009; Eagan et al. 2014; Bottia et al. 2015; Radunzel et al. 2017). Given the positive association between STEM coursetaking and STEM outcomes, I included science and math coursetaking measures for analysis. Science coursetaking was initially coded as No science, Primary Physical Science, Secondary Physical Science and Basic Biology, General Biology, Chemistry 1 or Physics 1, Chemistry 1 and Physics 1, Chemistry 2 or Physics 2 or Advanced Biology, Chemistry and Physics and level 7, and nonrespondent. The nonrespondent category was categorized as missing and excluded from analysis. Afterwards, the science coursetaking variable was separated into two dummy variables: basic science and advanced science. For each of these dummy variables, (1) represented the number of cases in which a respondent took basic or advanced science courses. Contrarily, (0) represented the number of cases that were not in any of those categories. No science, Primary Physical Science, Secondary Physical Science and Basic Biology, General Biology, and Chemistry 1 or Physics 1 were coded as basic science. Lastly, Chemistry 1 and Physics 1, Chemistry 2 or Physics 2 or Advanced Biology, and Chemistry and Physics and level 7 were coded as advanced science. Basic science coursetaking is the reference category during the analysis.

Math coursetaking was initially coded as No math, Non-academic, Low academic, Middle academic, Middle academic II, Advanced I, Advanced II/Pre-calculus, Advanced III/Calculus, and nonrespondent. The nonrespondent category was categorized as missing and excluded from analysis. After accounting for missing cases, the math coursetaking variable was separated into two dummy variables: basic math and advanced math. For each of these dummy variables, (1) represented the number of cases in which a respondent took basic or advanced math. In contrast, (0) represented the number of cases that were not in any of those categories. No math, Non-academic, Low academic, Middle academic, and Middle academic II were recoded into basic math. Lastly, Advanced I, Advanced II/Pre-calculus, and Advanced III/ Calculus were recoded into advanced math. Basic math coursetaking is the reference category during the analysis.

School-level controls were included, not only because they were common measures used in previous research that has examined sports participation and educational outcomes (Broh 2002; Troutman and Darfur 2007; Glennie and Stearns 2012), but because they matter in the application of Social Cognitive Career Theory. The schools that students attend influence their educational outcomes in terms of the opportunities they have to play sports, take advanced STEM courses, and opportunities to learn non-STEM subjects (Bottia et al. 2018).

One important school-level measure, at least when considering STEM outcomes, is the sociodemographic context of a school. Sociodemographic considerations, such as the percentage of minority students in a school and the percentage of students that receive free or reduced-price lunch, can reflect the amount of opportunity that exists for students to learn (Robinson 2003; Bottia et al. 2018). Given the importance of a school's sociodemographic context, I have included a school-level measure for socioeconomic status. The percentage of students who received free or reduced-price lunch in 10th grade is a continuous interval-ratio variable. There are approximately 1,500 missing cases for the free or reduced-price lunch measure. Missing observations were excluded from analysis.

Students from private and Catholic schools are more likely to participate in sport than those who do not attend private and Catholic schools (Fejgin 1994; Videon 2002). Because of the significant differences in sports participation when considering school sector, I included school sector as one of the several school-level variables used during data analysis. School sector was originally coded as Catholic, private, and public. The type of school sector variable was separated into three dummy variables: Catholic, private, and public. For each of these dummy variables, (1) represented the number of cases in which a respondent attended a catholic, private, or public-school, while (0) was the number of cases that were not in those categories. Public was the reference category for school sector during the analysis. There were no missing cases for the original school sector variable.

According to Fejgin (1994), students from suburban schools are also significantly more likely to participate in sport than students who come from urban schools. Because of the association between urbanicity and sports participation, I included urbanicity as a variable for data analysis. Urbanicity was originally coded with the nominal categories of urban, rural, and suburban. There were not any missing cases for the original urbanicity variable. The urbanicity variable was separated into three dummy variables: urban, rural, and suburban. For each of these dummy variables, (1) represented the number of cases in which a respondent lived in either an urban, rural, or suburban area. Contrarily, (0) represented the number of cases that were not in any of those categories. Suburban was the reference category during the analysis.

Lastly, Videon (2002) found that students from the Midwest and Northeast are significantly more likely to participate in sport than students from the South. Given these findings, the region of a school was included as a control variable for data analysis. Region was originally coded with the nominal categories of Northeast, Midwest, South, and West. There were not any missing cases for the original region variable. The region variable was separated into four dummy variables: Northeast, Midwest, South, and West. For each of these dummy variables, (1) represented the number of cases in which a respondent lived in either the Northeast, Midwest, South, and West. Contrarily, (0) represented the number of cases that were not in any of those categories. South was the reference category during the analysis.

Analytic Strategy

For the study, I utilize binary logistic regression models for the 10th grade cohort of the ELS 2002 because the dependent variable is dichotomous (Statistics Solutions 2012). For this study, STEM declaration is measured as (1) for declaring a STEM major and (0) for declaring a non-STEM major. Given the dichotomous orientation of the dependent variable, linear regression cannot be used. Instead of operating under the assumption that probability is a linear function of the independent variables that are included in models, binary logistic regression assumes that the log odds is a linear function of independent variables (Cao 2018). Log odds and odds ratios are understood as the likelihood of an event occurring divided by the likelihood of an event not occurring (ReStore 2011; Cao 2018). According to Grace-Martin (n.d.), the inclusion, exclusion, or recategorization of independent variables can either increase or decrease the log odds or odds ratios for independent variables. However, it is worth noting that a linear relationship is not required between the outcome and predictor variables (Statistics Solutions 2019). Some additional assumptions of binary logistic regression include the requirement of independent observations, negligible to moderate correlation between independent variables, and a large sample size (Statistics Solutions 2019).

Although assumptions about a linear relationship between the dependent and independent variables, normally distributed errors, and the homoscedasticity of error terms are not applicable to binary logistic regression models (Park 2013; Statistics Solutions 2019), one assumption that is violated, at least because of the design of the ELS 2002 dataset, is the independence of observations. Unequal weights, clustering, and stratification must be accounted for because the ELS 2002 is a longitudinal dataset with a stratified two-stage design (Ingels et al. 2004). Failing to account for unequal weights by not applying and normalizing a panel weight variable could result in inaccurate and biased parameter estimates (Leite n.d.). Additionally, not accounting for the design of complex survey data, such as clustering and stratification, can similarly lead to inaccurate and underestimated standard errors (Ingels et al. 2004; Hahs-Vaughn 2005; Leite n.d.; Institute of Education Sciences n.d.b). The lack of attention given to underestimated standard errors may result in Type I errors or false positives.

As a result of considering the complex design of the ELS 2002 data, I used the SURVEYLOGISTIC procedure in SAS. When compared to the LOGISTIC procedure, SURVEYLOGISTIC is much more appropriate for handling datasets such as the ELS 2002 precisely because it is a longitudinal survey dataset (SAS n.d). The procedure is relevant given that the ELS 2002 data is not a simple random sample (Ingels et al. 2004). Since I used the SURVEYLOGISTIC procedure, I was able to use the Taylor Series linearization method. The Taylor Series linearization method is the default variance estimation method of SURVEYLOGISTIC (SAS n.d.). In addition to taking nonlinear statistics into account, the linearization method required me to account for clustering and stratification. The Taylor Series linearization method is one of several variance estimation techniques recommended for complex survey data (Ingels et al. 2004; Hahs-Vaughn 2005; Institute of Education Sciences n.d.b).

In addition to using the SURVEYLOGISTIC procedure in SAS, I created a domain indicator variable (Lewis 2010) to account for the students who either declared or specified a major or not, as well as students who did not specify a major. Although I analyzed the former group that explicitly declared or did not declare a college major, it was appropriate to separate the two groups by domain to compare the means of both groups.

To address the first research question, I used sports participation dummy variables to compare differences in STEM declaration between varsity athletes and individuals who do not play varsity sports. Differences between both groups are evaluated from models 1, 4, 7, and 10 in Table 3 which consist of a varsity sports measure independently; models 2, 3, 5, 6, 8, 9, 11 and 12 in Table 3, which consist of individual-level and school-level controls; and models 13 to 28 in Tables 4, 5, and 6, which consist of interactions.

For the second research question, the female and varsity sports participation dummy variables are interacted to evaluate potential STEM declaration differences between male and female varsity athletes. The results for the gender and varsity sports interactions are presented in models 13 to 16 in Table 4. Importantly, only Black and White individuals were included in the analysis for Tables 5 and 6 because of sample size limitations for other racial and ethnic groups. For the third research question, race is interacted with varsity sports participation dummy variables to examine any STEM declaration differences across racial and ethnic groups. The results for the race and varsity sports interactions are presented in models 17 to 20 in Table 5. For the fourth research question, a male and female subsample was created to evaluate intersectional (gender and racial/ethnic) differences in STEM declaration. In each of the subsamples in Table 6, race was interacted with varsity sports participation dummy variables. White students are the reference racial group for the male and female subsamples. The results for the female subsample with the accompanying race and varsity sports interactions are presented in models 21, 23, 25, and 27 in Table 6. The results for the male subsample are presented in models 22, 24, 26, and 28 in Table 6.

RESULTS

Descriptive Statistics

Table 1 represents the descriptive statistics for the full and analytic sample. There are similar proportions for all the variables in both the full and analytic sample. For the dependent variable, more than 20 percent of students in both samples declared a STEM major in college. In both the full and analytic sample, more than 40 percent of students participate in varsity sports during 10^{th} grade.

The majority of students in both samples are women (57 percent). Additionally, both samples are predominantly White (69 percent in the full sample and 70 percent in the analytic sample). Although there is a slight degree of difference in the proportion of White students in both samples, the proportions for Native American, Black, Asian, Latino, and Multiracial students are comparable. Middle class students make up nearly half of both samples of students who have taken advanced science courses. Almost 70 percent of the full and analytic sample has taken advanced math courses, while almost 20 percent of students in both samples have participated in a math and science fair during high school.

There were also similar proportions in the full and analytic sample for high school-level variables. Students in the full and analytic sample attended schools with comparable percentages of 10^{th} graders who received free or reduced-price lunch. Almost 90 percent of students attended public schools, although there was a statistical difference between students who attended public schools in both samples when conducting a two-sample t-test. Lastly, more than a third of students in both samples attended high school in the South, which was the region with the greatest share of students in both samples.

Table 1. Descriptive Statistics of Full and Analytic Samples

	Total Sample			Analytic Sample		
Variable	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**
Dependent Variable						
Declared a STEM major	6399	0.205	0.412	5092	0.209	0.407
Individual Level Variables						
Varsity Sports Participation in 10th grade	5863	0.416	0.498	5092	0.418	0.495
Varsity Individual Sports Participation in 10th grade	5714	0.117	0.324	4964	0.115	0.319
Varsity Team Sports Participation in 10th grade	5714	0.291	0.459	4964	0.295	0.457
Varsity Other Team Sports Participation in 10th grade	5698	0.182	0.391	4946	0.184	0.389
Varsity Individual or Popular Team Sports Participation in 10th grade	5698	0.229	0.425	4946	0.230	0.423
Varsity Basketball Participation in 10th grade	5742	0.072	0.261	4985	0.073	0.262
Varsity Non-Basketball Participation in 10th grade	5742	0.338	0.479	4985	0.338	0.475
Male	6173	0.434	0.500	5092	0.433	0.497
Female	6173	0.566	0.500	5092	0.567	0.497
Native American	6155	0.005	0.069	5092	0.005	0.071
Asian	6155	0.050	0.220	5092	0.047	0.213
Black	6155	0.114	0.321	5092	0.115	0.319
Latino	6155	0.105	0.309	5092	0.102	0.303
Multiracial	6155	0.037	0.191	5092	0.035	0.184
White	6155	0.689	0.467	5092	0.697	0.461
Lower Class	6155	0.139	0.349	5092	0.136	0.344
Middle Class	6155	0.482	0.504	5092	0.487	0.501
Upper Class	6155	0.378	0.490	5092	0.377	0.486
Math test standardized score in 10th grade	6381	54.373	9.085	5092	54.641	9.037
Basic Science	5998	0.540	0.508	5092	0.538	0.500
Basic Math	5998	0.348	0.486	5092	0.340	0.475
Advanced Science	5998	0.460	0.508	5092	0.462	0.500
Advanced Math	5998	0.652	0.486	5092	0.660	0.475
Participated in Science/math fair	5878	0.160	0.371	5092	0.158	0.366
High School Level Variables						
Percent of 10th graders receive or free reduced-price lunch	5919	20.842	22.207	5092	20.857	21.682
Catholic	6399	0.068	0.256	5092	0.076	0.266
Private	6399	0.049	0.328	5092	0.053	0.336
Public	6399	0.883	0.221	5092	0.871	0.224
Urban	6399	0.290	0.463	5092	0.290	0.455
Suburban	6399	0.517	0.510	5092	0.511	0.501
Rural	6399	0.193	0.403	5092	0.198	0.400
Northeast	6399	0.226	0.427	5092	0.217	0.413
Midwest	6399	0.247	0.440	5092	0.252	0.435
South	6399	0.341	0.484	5092	0.349	0.478
West	6399	0.186	0.397	5092	0.183	0.387

The results in Table 2 display descriptive statistics as partitioned by participation in varsity sports, varsity individual sports, varsity basketball, varsity other team sports, and lack of participation in varsity sports. In Table 2, the proportion of varsity individual sport athletes who declared a STEM major was 26 percent. Amongst varsity athletes and individuals who did not play varsity sport, the group of individual sport athletes had the greatest proportion of students who declared a STEM major in college. Additionally, the proportion of varsity individual sport athletes who declared a STEM major differed from other groups of varsity athletes. Twenty-one percent of the group of athletes across every varsity sport and other team sports declared a STEM major. The group of varsity basketball players had the lowest proportion of students who declared a STEM major (17 percent). Approximately 21 percent of individuals that did not play any varsity sport declared a major in STEM.

When comparing the demographics of varsity athletes and individuals who do not play varsity sport in Table 2, there is a slightly greater proportion of male students among the group of varsity individual sport athletes (52 percent) than female students (48 percent). Every varsity sport measure, outside of varsity individual sports, including the aggregate for varsity sports, consisted of a greater share of women than men. Despite the greater proportion of women who played varsity sports, varsity basketball, and varsity other team sports, there was also a greater proportion of women who did not participate in any varsity sport, as well as a slightly lower proportion of men amongst varsity basketball participants and individuals who did not participate in any varsity sport.

Generally, the proportion of athletes for each of the varsity sports participation measures is 70 to 80 percent White. Varsity basketball has the lowest proportion of White

Table 2. Descriptive Statistics by Varsity Sports Participation Type and Nonparticipation

	Participated in Varsity Individual Sports (n=601)	Participated in Varsity Sports (n=2157)	Did not participate in Varity Sports (n=2935)	Participated in Varsity Basketball (n=359)	Participated in Varsity Other Team Sports (n=896)
Variable	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**
Dependent Variable					
Declared a STEM major	0.259	0.214	0.205	0.165	0.213
Individual Level Variables					
Male	0.524	0.457	0.416	0.399	0.439
Female	0.476	0.543	0.584	0.601	0.561
Native American	0.006	0.005	0.005	0.002	0.006
Asian	0.043	0.027	0.117	0.017	0.025
Black	0.068	0.110	0.061	0.186	0.093
Latino	0.063	0.068	0.126	0.049	0.078
Multiracial	0.035	0.032	0.037	0.023	0.035
White	0.785	0.757	0.653	0.723	0.764
Lower Class	0.055	0.105	0.159	0.143	0.097
Middle Class	0.461	0.467	0.501	0.477	0.459
Upper Class	0.485	0.428	0.340	0.380	0.444
Math test standardized score in 10th grade	57.071	55.432	54.072	53.870	55.808
Basic Science	0.459	0.501	0.565	0.625	0.477
Basic Math	0.262	0.309	0.362	0.371	0.313
Advanced Science	0.541	0.499	0.435	0.375	0.523
Advanced Math	0.738	0.691	0.638	0.629	0.687
Participated in Science/math fair	0.215	0.189	0.136	0.240	0.176
High School Level Variables					
Percent of 10th graders recieve/free reduced-price	17.385	19.177	22.064	23.824	18.197
Catholic	0.096	0.081	0.073	0.056	0.085
Private	0.078	0.078	0.035	0.109	0.066
Public	0.826	0.841	0.892	0.835	0.849
Urban	0.269	0.276	0.301	0.196	0.280
Suburban	0.535	0.492	0.525	0.420	0.500
Rural	0.196	0.232	0.174	0.384	0.220
Northeast	0.214	0.220	0.214	0.145	0.269
Midwest	0.264	0.255	0.250	0.357	0.227
South	0.332	0.360	0.340	0.350	0.326
West	0.190	0.165	0.196	0.149	0.178

athletes (72 percent) when compared to all varsity sports, varsity individual sports, and varsity other team sports. Varsity athletes also tend to come from higher socioeconomic backgrounds. In Table 2, approximately 40 to 50 percent of athletes across each varsity sport measure came from a higher socioeconomic background. This is consistent with prior research (Fejgin 1994; Videon 2002). In comparison, approximately 65 to 70 percent of individuals who did not play any varsity sport came from lower- and middle-class backgrounds.

Generally, athletes across varsity sports measures typically had greater levels of prior STEM achievement (math standardized test score in 10^{th} grade) than individuals who did not play varsity sports. Differences in academic and STEM achievement between athletes and nonathletes is also consistent with previous research (Fejgin 1994; Eccles and Barber 1999; Broh 2002; Fox et al. 2010) The greatest difference in math standardized test scores was between varsity individual sport athletes and students who did not play varsity sports. Varsity individual sport athletes had math standardized test scores that were almost three points higher than students who did not play varsity sports. On average, varsity individual sport athletes earned 57 points on the math standardized test. In comparison, students who did not participate in varsity sports earned 54 points on the same exam. However, varsity basketball was the exception to the trend of varsity athletes having greater levels of prior STEM achievement than individuals who did not participate in varsity sport. In Table 2, individuals who did not play any varsity sport had greater levels of prior STEM achievement than varsity basketball players.

In addition to prior STEM achievement, athletes for three of the four varsity sports measures (general varsity sports, varsity individual sports, varsity other team sports) had a greater proportion of students in advanced STEM courses when compared to students who did not play any varsity sport, except for varsity basketball. There was a lower proportion of varsity basketball players who took advanced STEM courses than students who did not participate in varsity sports. Lastly, athletes across varsity sports measures had a greater proportion of people who participated in a math and science fair than individuals who had not participated in any varsity sport. Specifically, 24 percent of all varsity basketball players participated in a math and science fair during high school compared to 14 percent of individuals who did not play varsity sports.

For high school-level variables, athletes across varsity sports measures in Table 2 generally attended schools with lower percentages of 10th graders on free or reduced-price lunch. However, varsity basketball players were an exception to the trend. Varsity basketball players generally attended schools with a greater percentage of students who receive free or reduced-price lunch, especially when compared to all varsity sport, varsity individual sport, and varsity other team sport athletes. Similarly, students who did not play any varsity sports also attended schools with a greater percentage of 10th grade students who receive free or reduced-price lunch.

As seen in Table 2, more than 80 percent of athletes across varsity sports measures attended public schools. Approximately 90 percent of individuals who did not participate in any varsity sport attended public schools. Additionally, the proportion of athletes who attended private and Catholic schools was generally greater when compared to students who did not play any varsity sport. Athletes across each varsity sports measure and individuals who did not participate in any varsity sport generally attended schools in suburban and urban areas.

However, varsity basketball players had a smaller proportion of students who attended suburban schools (42 percent) than all varsity individual sport athletes (54 percent), varsity other team sport athletes (50 percent), and all varsity athletes (49 percent), and a greater proportion of students that attended rural schools (38 percent). Approximately 20 percent of varsity individual sport, varsity other team sport, and all varsity athletes attended rural schools. Lastly, more than a third of varsity athletes and individuals who did not play any varsity sport attended high school in the South. The lowest share of varsity athletes and individuals who did not play varsity sport attended high school in the West.

Varsity Sports Participation and STEM Declaration

Binary logistic regressions are used to answer the four research questions. The first research question focused on whether there was a significant difference in declaring a STEM major in college between students who participate in varsity sports versus those who did not participate. I ran a series of three models for the four different varsity sport participation measures to evaluate whether there was a significant relationship between being a high school varsity athlete and declaring a STEM major in college. The first model for each varsity sports measure included only the key independent variable as a predictor of STEM declaration. The second model for each varsity sports measure included the key independent variable and a set of individual-level controls, such as socioeconomic status, advanced math coursetaking, and participation in a math and science fair, as predictors of STEM declaration. The last model for each varsity sports measure included the key independent variable, a set of individual-level controls, plus school-level controls, such as the region a school was located in and type of school, to predict STEM declaration.

In general, results in Table 3 indicate that being a varsity athlete in high school is not significantly related with having greater odds of declaring a STEM major in college. Only models 4 (varsity individual sports) and 10 (varsity basketball) in Table 3 had a significant positive result. In model 4, varsity individual sport athletes had nearly 40 percent greater odds of declaring a STEM major than individuals who did not play varsity sports. In contrast, varsity team sport athletes had significantly lower odds of declaring a STEM major than individuals who did not play varsity sports. In model 10, varsity athletes who did not play basketball had significantly greater STEM declaration odds than individuals who did not play any varsity sport. However, these results in model 10 were significant at the 0.10 level, which is greater than conventional standards for statistical significance. Additionally, models 4 and 10 did not control for other important individual and high-school-level variables when predicting students' odds of STEM declaration.

When examining the results for the other independent variables in models 1 to 12, several measures were consistently significant across models. Being Black was associated with significantly greater odds of STEM declaration when compared to White students. On average, Black students were almost twice as likely to declare a STEM major when the models consisted solely of individual-level controls, as seen in models 2, 5, 8, and 11. Those odds decrease slightly but remained significant in models with school-level controls, as seen in models 3,6, 9, and 12. Prior academic achievement (measured as math standardized test score in 10^{th} grade) was also consistently significant

Table 3. Binary Logistic Models Predicting Students' Odds of Declaring a STEM Major in College, By Type of Sport Participation

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Intercept	0.253***	0.068***	0.038***	0.273***	0.068***	0.039***	0.258***	0.059***	0.033***	0.242***	0.065***	0.036***
	(0.050)	(0.367)	(0.380)	(0.049)	(0.379)	(0.388)	(0.047)	(0.405)	(0.416)	(0.077)	(0.382)	(0.391)
Individual Level Variables												
Female		0.292***	0.291***		0.291***	0.290***		0.290***	0.290***		0.285***	0.284***
		(0.089)	(0.090)		(0.090)	(0.091)		(0.091)	(0.093)		(0.090)	(0.091)
Varsity Sports Participation in 10th grade	1.044	0.958	0.978									
	(0.079)	(0.092)	(0.090)									
Varsity Individual Sports Participation in 10th grade				1.358**	1.127	1.142						
				(0.074)	(0.085)	(0.087)						
Varsity Team Sports Participation in 10th grade				0.955*	0.911	0.933						
				(0.066)	(0.075)	(0.073)						
Varsity Other Team Sports Participation in 10th grade							1.014	0.953	0.993			
							(0.074)	(0.077)	(0.078)			
Varsity Individual or Popular Team Sports Participation in 10th grade							1.071	0.969	0.972			
							(0.069)	(0.075)	(0.074)			
Varsity Basketball Participation in 10th grade										0.800	0.847	0.758
										(0.147)	(0.171)	(0.167)
Varsity Non-Basketball Participation in 10th grade										1.110†	0.992	1.040
										(0.085)	(0.098)	(0.098)
Native American		0.614	0.528		0.654	0.567		0.287	0.236		0.615	0.534
		(0.609)	(0.643)		(0.598)	(0.636)		(0.896)	(0.919)		(0.609)	(0.629)
Asian		1.527†	1.564*		1.510	1.574*		1.488†	1.536*		1.561†	1.621*
		(0.165)	(0.171)		(0.164)	(0.171)		(0.208)	(0.213)		(0.166)	(0.169)
Black		1.928**	1.774**		1.929**	1.823**		1.885**	1.743**		1.997**	1.880**
		(0.170)	(0.179)		(0.171)	(0.178)		(0.215)	(0.221)		(0.173)	(0.179)
Latino		1.245	1.052		1.254	1.073		1.187	1.000		1.275	1.102
		(0.177)	(0.182)		(0.177)	(0.182)		(0.221)	(0.224)		(0.178)	(0.181)
Mulitracial		1.071	1.029		1.012	0.976		1.060	1.018		1.044	0.998
		(0.212)	(0.217)		(0.215)	(0.220)		(0.252)	(0.257)		(0.217)	(0.220)
Lower Class		1.062	1.057		1.062	1.047		1.073	1.079		1.029	1.032
		(0.142)	(0.138)		(0.140)	(0.137)		(0.144)	(0.140)		(0.143)	(0.140)
Upper Class		0.937	1.021		0.948	1.036		0.964	1.049		0.934	1.023
		(0.099)	(0.095)		(0.099)	(0.095)		(0.101)	(0.098)		(0.100)	(0.096)
Math standardized test score in 10th grade		1.025***	1.031***		1.026***	1.031***		1.025***	1.031***		1.026***	1.032***
		(0.006)	(0.006)		(0.007)	(0.006)		(0.007)	(0.006)		(0.006)	(0.006)
Advanced Science		1.818***	1.825***		1.819***	1.811***		1.784***	1.790***		1.843***	1.827***
		(0.100)	(0.094)		(0.100)	(0.095)		(0.101)	(0.095)		(0.102)	(0.096)
Advanced Math		1.456**	1.462**		1.442**	1.455**		1.471**	1.477**		1.420**	1.432**
		(0.122)	(0.120)		(0.123)	(0.121)		(0.124)	(0.122)		(0.124)	(0.123)
Participated in Math/ Science Fair		1.189	1.109		1.142	1.089		1.170	1.088		1.163	1.098
		(0.113)	(0.117)		(0.116)	(0.119)		(0.115)	(0.120)		(0.115)	(0.120)
High School Level Variables												
Percent of 10th graders received free or reduced-price lunch			1.008***			1.008**			1.008**			1.007**
			(0.002)			(0.003)			(0.003)			(0.003)
Catholic			0.846			0.823†			0.851			0.831
			(0.125)			(0.118)			(0.126)			(0.124)
Private			0.764*			0.801†			0.779†			0.763*
			(0.134)			(0.132)			(0.131)			(0.138)
Urban			0.985			0.990			1.002			0.982
			(0.106)			(0.109)			(0.107)			(0.110)
Rural			1.182			1.192			1.189			1.234†
			(0.116)			(0.116)			(0.115)			(0.116)
Northeast			0.811†			0.809†			0.804†			0.797†
			(0.120)			(0.124)			(0.122)			(0.125)
Midwest			1.131			1.149			1.145			1.121
			(0.107)			(0.108)			(0.110)			(0.110)
West			1.031			1.007			1.024			1.016
			(0.148)			(0.152)			(0.151)			(0.154)
AIC	6078.3	5169.4	4686.5	5909.8	5030.5	4573.9	5908.0	5039.5	4562.7	5957.2	5052.3	4579.9
SC	6091.6	5262.0	4830.3	5929.8	5129.2	4723.6	5927.9	5138.3	4712.3	5977.2	5151.1	4729.8
-2 Log L	6074.3	5141.4	4642.5	5903.8	5000.5	4527.9	5902.0	5009.5	4516.7	5951.2	5022.3	4533.9
Sample Size	5863	5487	5092	5714	5348	4964	5698	5336	4946	5742	5373	4985
Schools	735	711	649	734	709	647	734	710	648	735	710	648

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '†' 0.1 ' ' 1

across models 1 to 12. Students with higher math standardized test scores had greater odds of declaring a STEM major in college. The same result applied for advanced science coursetaking. Students that took advanced science courses had 80 percent greater odds of declaring a STEM major in college than students who did not take advanced science courses. To a lesser extent, albeit still positive and significant, students who took advanced math courses had 50 percent greater odds of declaring a STEM major than those students who did not take advanced math courses. Regarding the school-level control variables, the percentage of 10^{th} grade students who receive free or reduced-price lunch was significant across models. Students from schools with a higher percentage of 10^{th} grade students who received free or reduced-price lunch had significantly greater odds of declaring a STEM major in college than students from schools with a lower percentage of 10^{th} grade students who received free or reduced-price lunch.

Other important results include: Being Asian (versus being White) was significant at the 0.10 level, for all varsity sports participation measures when individual-level controls were applied, as seen in models 2, 8, and 11. Furthermore, these results were suggestive of a relationship. Being Asian was also positive and significant for all varsity sports participation measures when individual-level and school-level variables were included (see models 3, 6, 9, and 12 in Table 3).

At the school-level, attending a private school was associated with having a significantly lower likelihood of declaring a STEM major, as seen in models 3 and 12 (but only when individual and school-level controls are included and when sports participation is measured as a general measure of varsity sports participation and varsity basketball participation). However, in models 6 and 9, the relationship became significant at the 0.10 level, although it was still negative. Students who attended schools in the Northeast had 20 percent lower odds of declaring a major in STEM than students who went to schools in the South. However, these results were suggestive of a relationship between attending school in the Northeast and college STEM declaration, and were significant at the 0.10 level. Model 6 in Table 3 also shows that students who went to Catholic schools had nearly 20 percent lower odds of declaring a STEM major (the result was significant at the 0.10 level) when compared to public school students, only when varsity sports participation was measured as "varsity *individual* sports participation". Lastly, when sports participation is measured exclusively as varsity basketball participation, models show a significant and positive relationship at the 0.10 level between attending a school in a rural area and having higher odds of STEM declaration in college.

Gender, Varsity Sports Participation, and STEM Declaration

The second research question focused on whether the relationship between varsity sports participation in high school and STEM declaration in college was moderated by a student's gender. In other words, if the relationship between high school varsity sports participation and college STEM declaration varied if a student was a female or a male. Table 4 presents results of four different models: models 13, 14, 15, and 16, that utilize the four different measures for varsity sport participation (general varsity sports, varsity individual sports, varsity other team sports, and varsity basketball respectively), and which include interactions between gender and sports participation to evaluate the role of gender as a moderator. These models include the key independent variable, plus other individual and school-level controls, as well as gender and varsity sports interactions.

Generally, the results in Table 4 indicate that the relationship between being a varsity athlete in high school and students' odds of declaring a STEM major in college, does not significantly differ depending on a student's gender. The only model with a significant result for the interaction between gender and varsity sports participation was model 14, presented in Table 4, when sports participation is measured as varsity individual sports participation. In this model, the interaction between gender and varsity individual sports participation is significant at the 0.10 level, showing that the odds of STEM declaration differed based on whether a man or a woman played varsity individual sports. Importantly, the coefficient for female students across models 13 to 16, which in this case measures the relationship between female students who do NOT participate in any form of varsity individual or team sports, showed significantly lower odds of STEM declaration when compared to their male counterparts. However, the non-significance of the interaction term between varsity sports and gender in models 13, 15, and 16 suggests that this effect is mainly due to gender influence.

In Table 4, several control variables were consistently significant across the gender and varsity sports interaction models. As seen in models 13 to 16, Black students had significantly greater odds of STEM declaration when compared to White students. Furthermore, Black students had 70 to 90 percent greater odds of declaring a STEM major than White students. Similarly, Asian students had significantly greater odds of STEM declaration than White students. Prior STEM achievement (measured as math standardized test score in 10th grade) and advanced STEM coursetaking (in math and

Table 4. Binary Logistic Models Predicting Students' Odds of Declaring a STEM Major in College, By Type of Sport Participation (With Gender and Varsity Sports Interaction)

	Model 13	Model 14	Model 15	Model 16
Intercept	0.039***	0.038***	0.032***	0.035***
	(0.378)	(0.397)	(0.418)	(0.394)
Individual Level Variables				
Female	0.272***	0.317***	0.300***	0.304***
	(0.119)	(0.104)	(0.101)	(0.145)
Varsity Sports Participation in 10th grade	0.919			
	(0.115)			
Varsity Individual Sports Participation in 10th grade		0.997		
		(0.105)		
Varsity Team Sports Participation in 10th grade		0.974		
		(0.093)		
Varsity Other Team Sports Participation in 10th grade			0.975	
			(0.097)	
Varsity Individual or Popular Team Sports Participation in 10th grade			0.979	
			(0.086)	
Varsity Basketball Participation in 10th grade				0.775
				(0.167)
Varsity Non-Basketball Participation in 10th grade				1.129
				(0.105)
Native American	0.528	0.584	0.235	0.534
	(0.647)	(0.643)	(0.920)	(0.633)
Asian	1.565*	1.560*	1.537*	1.625*
	(0.172)	(0.173)	(0.213)	(0.170)
Black	1.774**	1.815**	1.745**	1.884**
	(0.180)	(0.179)	(0.221)	(0.179)
Latino	1.053	1.075	1.002	1.102
	(0.182)	(0.182)	(0.225)	(0.181)
Mulitracial	1.032	0.984	1.021	1.000
	(0.218)	(0.221)	(0.257)	(0.221)
Lower Class	1.058	1.047	1.080	1.033
	(0.138)	(0.137)	(0.140)	(0.140)
Upper Class	1.018	1.029	1.046	1.021
	(0.096)	(0.096)	(0.098)	(0.096)
Math standardized test score in 10th grade	1.031***	1.032***	1.031***	1.032***
	(0.006)	(0.006)	(0.006)	(0.006)
Advanced Science	1.827***	1.809***	1.791***	1.829***
	(0.094)	(0.095)	(0.095)	(0.096)
Advanced Math	1.459**	1.450**	1.475**	1.429**
	(0.120)	(0.121)	(0.122)	(0.123)
Participated in Math/ Science Fair	1.114	1.090	1.091	1.102
	(0.117)	(0.119)	(0.120)	(0.120)
High School Level Variables				
Percent of 10th graders received or free reduced-price lunch	1.008***	1.008**	1.008**	1.007**
	(0.002)	(0.003)	(0.003)	(0.003)
Catholic	0.846	0.820†	0.852	0.831
	(0.125)	(0.118)	(0.126)	(0.123)
Private	0.765*	0.797†	0.779†	0.766†
	(0.134)	(0.131)	(0.131)	(0.138)
Urban	0.985	0.995	1.002	0.983
	(0.106)	(0.109)	(0.108)	(0.110)
Rural	1.178	1.196	1.186	1.229†
	(0.115)	(0.116)	(0.115)	(0.114)
Northeast	0.809†	0.813†	0.803†	0.795†
	(0.120)	(0.124)	(0.122)	(0.126)
Midwest	1.130	1.153	1.143	1.118
	(0.107)	(0.108)	(0.110)	(0.109)
West	1.028	0.998	1.022	1.013
	(0.149)	(0.153)	(0.152)	(0.154)
Interactions				
Female*Varsity Sports Participation	1.174			
	(0.170)			
Female*Varsity Individual Sports Participation		1.372†		
		(0.172)		
Female* Varsity Team Sports Participation		0.838		
		(0.136)		
Female*Varsity Other Team Sports Participation			1.078	
			(0.142)	
Female*Varsity Individual or Popular Team Sports Participation			1.013	
			(0.135)	
Female*Varsity Basketball Participation				1.147
				(0.270)
Female*Varsity Non-Basketball Participation				0.999
				(0.166)
AIC	4687.4	4573.5	4565.9	4582.7
SC	4837.7	4736.3	4728.6	4745.6
-2 Log L	4641.4	4523.5	4515.9	4532.7
Sample Size	5092	4964	4946	4985
Schools	649	647	648	648

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '†' 0.1 ' ' 1

science) were also associated with positive and significantly greater odds of declaring a STEM major.

When evaluating the high school-level variables, students who attended schools with a higher percentage of 10^{th} grade students who receive free or reduced-price lunch had significantly greater odds of STEM declaration. Additionally, students who attended rural schools had significantly (at the 0.10 level) greater odds of declaring a STEM major in college, only when varsity basketball participation was the key independent variable in model 16. In contrast, there were several variables associated with significant and lower odds of STEM declaration.

In models 13 to 16 in Table 4, students who attended schools in the Northeast had significantly lower odds of STEM declaration (at the 0.10 level) when compared to students from the South. Similarly, students who attended private schools also had significantly lower odds when compared students from public schools. On average, students who attended private schools had more than 20 percent lower odds of declaring a STEM major than students who attended public schools. These odds were significant for students who attended private schools in model 13, but significant at the 0.10 level in models 14, 15, and 16. Additionally, model 14 also shows that students who attended Catholic schools had a significantly lower likelihood (at the 0.10 level) of declaring a STEM major (compared to those who attended non-Catholic schools). However, this was only true when varsity individual sports participation was the way the key independent variable was operationalized.

Race, Varsity Sports Participation, and STEM Declaration

The third research question focused on whether the relationship between varsity sports participation in high school and STEM declaration in college was moderated by a student's race. I restricted my analysis in this section to only Black and White students due to sample size limitations. Black students were included in the analysis because there were more Black students in the analytic sample than students of other racial and ethnic groups, with the exception of White students. Additionally, there was a greater number of Black students who played general varsity sports, varsity other team sports, and varsity basketball than students from other racial and ethnic groups, except for White students. Because there are a greater number of White students than Black students in the analytic sample, White students are used as the reference category.

Essentially, the third research question examines if the relationship between high school varsity sports participation and college STEM declaration varied if a student was Black or White. Table 5 presents results of four different models: models 17, 18, 19, and 20. In these models, I utilize the four different measures for varsity sports participation (general varsity sports, varsity individual sports, varsity other team sports, and varsity basketball, respectively) and I include interactions between race (Black versus White) and varsity sports participation to evaluate the role of race as a moderator. These models include the key independent variable, plus other individual and school-level controls, as well as race and varsity sports interactions.

The results in Table 5 indicate that the relationship between being a varsity athlete in high school and a student's odds of declaring a STEM major in college, does not significantly differ depending on a student's race (if a student is Black or White). The

Table 5. Binary Logistic Models Predicting Students' Odds of Declaring a STEM Major in College, By Type of Sport Participation (With Race and Varsity Sports Interaction)

	Model 17	Model 18	Model 19	Model 20
Intercept	0.038***	0.041***	0.040***	0.039***
	(0.425)	(0.439)	(0.431)	(0.437)
Individual Level Variables				
Female	0.273***	0.272***	0.270***	0.268***
	(0.102)	(0.104)	(0.103)	(0.103)
Varsity Sports Participation in 10th grade	1.034			
	(0.126)			
Varsity Individual Sports Participation in 10th grade		1.172		
		(0.169)		
Varsity Team Sports Participation in 10th grade		0.917		
		(0.120)		
Varsity Other Team Sports Participation in 10th grade			1.071	
			(0.118)	
Varsity Individual or Popular Team Sports Participation in 10th grade			0.956	
			(0.105)	
Varsity Basketball Participation in 10th grade				0.835
				(0.154)
Varisty Non-Basketball Participation in 10th grade				1.172
				(0.105)
Black	1.284*	1.387**	1.346**	1.367**
	(0.102)	(0.108)	(0.093)	(0.106)
Lower Class	0.941	0.902	0.995	0.902
	(0.170)	(0.166)	(0.171)	(0.170)
Upper Class	1.057	1.067	1.088	1.059
	(0.106)	(0.106)	(0.108)	(0.108)
Math standardized test score in 10th grade	1.032***	1.032***	1.031***	1.032***
	(0.007)	(0.007)	(0.007)	(0.007)
Advanced Science	1.982***	1.994***	1.969***	2.019***
	(0.110)	(0.110)	(0.110)	(0.110)
Advanced Math	1.491**	1.497**	1.545**	1.476**
	(0.135)	(0.138)	(0.138)	(0.139)
Participated in Math/ Science Fair	1.149	1.139	1.138	1.137
	(0.132)	(0.135)	(0.134)	(0.134)
High School Level Variables				
Percent of 10th graders received free or reduced-price lunch	1.012***	1.011***	1.011***	1.011***
	(0.003)	(0.003)	(0.003)	(0.003)
Catholic	0.825	0.802	0.834	0.813
	(0.140)	(0.134)	(0.141)	(0.143)
Private	0.860	0.915	0.898	0.866
	(0.164)	(0.163)	(0.158)	(0.165)
Urban	0.998	0.998	1.015	0.986
	(0.126)	(0.132)	(0.128)	(0.132)
Rural	1.200	1.213	1.221	1.244†
	(0.128)	(0.129)	(0.131)	(0.127)
Northeast	0.837	0.836	0.833	0.821
	(0.140)	(0.146)	(0.143)	(0.146)
Midwest	1.177	1.202	1.191	1.178
	(0.124)	(0.126)	(0.126)	(0.125)
West	1.137	1.087	1.131	1.108
	(0.180)	(0.194)	(0.184)	(0.193)
Interactions				
Black*Varsity Sports Participation	1.085			
	(0.129)			
Black*Varsity Individual Sports Participation		1.028		
		(0.167)		
Black *Varsity Team Sports Participation		1.034		
		(0.114)		
Black*Varsity Other Team Sports Participation			1.073	
			(0.120)	
Black*Varsity Individual or Popular Team Sports Participation			0.974	
			(0.107)	
Black*Varsity Basketball Participation				0.942
				(0.151)
Black*Varsity Non-Basketball Participation				1.115
				(0.104)
AIC	3749.8	3654.4	3664.0	3671.3
SC	3868.6	3785.1	3794.7	3802.2
-2 Log L	3711.8	3612.4	3622.0	3629.3
Sample Size	3837	3734	3727	3758
Schools	610	608	610	609

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '†' 0.1 ' ' 1

interaction term between being Black and participating in varsity sports is not significant in any of the models (models 17 to model 20), which suggests that race is not moderating the relationship between varsity sports participation and STEM declaration. The coefficient for Black students across models 17 to 20, which represents Black students who do not participate in any varsity sport when considering the interaction between race and varsity sports participation, showed significantly greater odds of STEM declaration in comparison to White students who did not participate in any varsity sport in models 17 to 20. The non-significance of the interaction term between race and varsity sports participation in models 17 to 20 suggest that these effects are mainly due to the influence of race alone, and not the effect of race via sports participation.

Additionally, models also show that students with greater levels of prior STEM achievement (math standardized test score in 10th grade) and attainment (took advanced courses in science and math) had significantly greater odds of STEM declaration. Students who took advanced science courses were nearly twice as likely to declare a STEM major than students who did not take advanced science courses. In contrast, female students had significantly lower odds of STEM declaration across models 17 to 20 in Table 5.

Results of the analyses of school-level control variables are consistent with prior results. Students who attended high schools with a higher percentage of 10th grade students who received free or reduced-price lunch had significantly greater odds of STEM declaration than students who attended schools with a lower percentage of 10th grade students who received free or reduced-price lunch. Lastly, students who attended a school in a rural area (when compared to a suburban area) had significantly higher odds of STEM declaration, whenever sports participation was measured as varsity basketball participation.

Gender, Race, Varsity Sports Participation, and STEM Declaration

The fourth research question asks whether the relationship between varsity sports participation in high school and STEM declaration in college is moderated by student's gender by race cohort. Essentially, the research question examined whether the relationship between high school varsity sports participation and college STEM declaration varied if a student was Black or White for a subsample of young men and women. Table 6 presents results of eight different models. Due to the complexity of running three-way interactions, I decided to run models with race and sports interactions for a subsample of students by gender. By implementing this strategy, I was able to analyze if race moderates the relationship between varsity sports participation and STEM declaration for male and female students. Female and male subsamples were created to analyze the fourth research question. Additionally, female and male subsamples utilized four different measures for varsity sports participation (general varsity sports, varsity individual sports, varsity other team sports, and varsity basketball respectively), and include interactions between race and sports participation to evaluate the role of race and gender as moderators. These models include the key independent variable, plus other individual and school-level controls, as well as the race and varsity sports interactions for the subsamples of female and male students. In total, there were four models for the female (models 21, 23, 25, and 27) and male (models 22, 24, 26, and 28) subsamples.

Generally, the results in Table 6 indicate that, regardless of if students are men or women, the relationship between being a varsity athlete in high school and students' odds of declaring a STEM major in college, does not significantly differ by a student's race. Across models 21 to 28, the coefficient for Black students, which measures the relationship between Black students who do NOT participate in any varsity sports, generally showed significantly greater odds of STEM declaration when compared to White students that did not participate in varsity sports. In models 25 and 27, the relationship between being Black and declaring a STEM major in college was significant at the 0.10 level. The exceptions to the significance trend were models 22 and 23. In model 22, where participating in sports is operationalized as varsity sports participation, being Black does not seem to significantly influence students' odds of STEM declaration for the subsample of male students. Similarly, in model 23, where sports participation is operationalized as varsity individual sports participation, being Black does not seem to significantly influence students' odds of STEM declaration for the subsample of female students.

In Table 6, several control variables were consistently significant across the gender and sports interaction models. As seen in models 21 to 28, students (irrespective of gender), who had higher levels of prior STEM achievement (math standardized test score in 10th grade), and who took advanced science courses had significantly greater odds of STEM declaration. Female and male students had approximately twice the odds of declaring a STEM major in college if they took advanced science courses in high school compared to students who did not take advanced science courses in high school.

For high school-level control variables across models in Table 6, male and female students who attended schools with a higher percentage of 10th grade students who

Table 6. Binary Logistic Models Predicting Students' Odds of Declaring a STEM Major in College, By Type of Sport Participation (With Race and Varsity Sports Interaction)

	Model 21	Model 22	Model 23	Model 24	Model 25	Model 26	Model 27	Model 28
	Female subsample	Male subsample	Female subsample	Male subsample	Female subsample	Male subsample	Female subsample	Male subsample
Intercept	0.004***	0.046***	0.004***	0.054***	0.004***	0.050***	0.004***	0.044***
	(0.775)	(0.437)	(0.776)	(0.433)	(0.762)	(0.448)	(0.754)	(0.448)
Individual Level Variables								
Varsity Sports Participation in 10th grade	0.952	1.084						
	(0.190)	(0.159)						
Varsity Individual Sports Participation in 10th grade			0.885	1.424				
			(0.310)	(0.219)				
Varsity Team Sports Participation in 10th grade			1.032	0.843				
			(0.194)	(0.146)				
Varsity Other Team Sports Participation in 10th grade					0.986	1.088		
					(0.198)	(0.146)		
Varsity Individual or Popular Team Sports Participation in 10th grade					0.946	0.983		
					(0.172)	(0.124)		
Varsity Basketball Participation in 10th grade							0.844	0.799
							(0.203)	(0.175)
Varsity Non-Basketball Participation in 10th grade							1.098	1.249†
							(0.149)	(0.124)
Black	1.471*	1.181	1.240	1.492**	1.278†	1.365**	1.288†	1.385**
	(0.156)	(0.120)	(0.175)	(0.129)	(0.131)	(0.109)	(0.138)	(0.117)
Lower Class	1.000	0.975	0.778	1.085	1.054	1.024	0.840	1.044
	(0.308)	(0.216)	(0.316)	(0.216)	(0.314)	(0.215)	(0.310)	(0.229)
Upper Class	1.209	0.983	1.204	1.018	1.251	1.011	1.211	0.999
	(0.177)	(0.122)	(0.178)	(0.120)	(0.181)	(0.126)	(0.175)	(0.122)
Math standardized test score in 10th grade	1.035**	1.033***	1.037**	1.033***	1.035**	1.031***	1.034**	1.033***
	(0.013)	(0.008)	(0.013)	(0.008)	(0.013)	(0.008)	(0.013)	(0.008)
Advanced Science	1.996***	2.040***	2.011***	2.046***	2.004***	1.995***	2.133***	2.010***
	(0.175)	(0.121)	(0.169)	(0.122)	(0.176)	(0.122)	(0.169)	(0.123)
Advanced Math	3.227***	1.054	3.179***	1.045	3.260***	1.120	3.140***	1.060
	(0.234)	(0.150)	(0.237)	(0.153)	(0.235)	(0.155)	(0.238)	(0.153)
Participated in Math/ Science Fair	1.467*	1.018	1.499*	0.975	1.472*	1.001	1.452*	1.003
	(0.186)	(0.142)	(0.189)	(0.142)	(0.188)	(0.144)	(0.187)	(0.142)
High School Level Variables								
Percent of 10th graders receive or free reduced-price lunch	1.012**	1.012***	1.011*	1.012***	1.012*	1.011***	1.010*	1.012***
	(0.005)	(0.003)	(0.004)	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)
Catholic	0.901	0.818	0.838	0.808	0.907	0.830	0.882	0.815
	(0.264)	(0.137)	(0.252)	(0.142)	(0.264)	(0.138)	(0.269)	(0.142)
Private	1.225	0.684*	1.268	0.734†	1.273	0.707†	1.165	0.707†
	(0.215)	(0.186)	(0.219)	(0.188)	(0.218)	(0.185)	(0.220)	(0.188)
Urban	1.179	0.878	1.172	0.878	1.153	0.912	1.145	0.875
	(0.198)	(0.147)	(0.209)	(0.142)	(0.204)	(0.148)	(0.211)	(0.147)
Rural	1.046	1.284†	1.078	1.286†	1.008	1.347*	1.082	1.316†
	(0.216)	(0.138)	(0.215)	(0.137)	(0.224)	(0.140)	(0.202)	(0.141)
Northeast	0.816	0.880	0.859	0.868	0.821	0.870	0.814	0.862
	(0.254)	(0.167)	(0.253)	(0.165)	(0.261)	(0.168)	(0.257)	(0.173)
Midwest	1.089	1.251	1.154	1.259†	1.129	1.247	1.077	1.261†
	(0.205)	(0.137)	(0.208)	(0.137)	(0.207)	(0.140)	(0.199)	(0.138)
West	1.060	1.253	0.989	1.212	1.023	1.262	1.004	1.251
	(0.210)	(0.196)	(0.242)	(0.199)	(0.228)	(0.198)	(0.249)	(0.199)
Interactions								
Black Female*Varsity Sports Participation	0.833							
	(0.187)							
Black Male*Varsity Sports Participation		1.254						
		(0.163)						
Black Female*Varsity Individual Sports Participation			0.642					
			(0.309)					
Black Female*Varsity Team Sports Participation			1.244					
			(0.186)					
Black Male*Varsity Individual Sports Participation				1.426				
				(0.220)				
Black Male*Varsity Team Sports Participation				0.894				
				(0.149)				
Black Female*Varsity Other Team Sports Participation					0.891			
					(0.191)			
Black Female* Varsity Individual or Popular Team Sports Participation					0.962			
					(0.170)			
Black Male* Varsity Other Team Sports Participation						1.160		
						(0.149)		
Black Male*Varsity Individual or Popular Team Sports Participation						1.000		
						(0.122)		
Black Female*Varsity Basketball Participation							0.763	
							(0.201)	
Black Female*Varsity Non-Basketball Participation							1.090	
							(0.146)	
Black Male*Varsity Basketball Participation								1.024
								(0.170)
Black Male*Varsity Non-Basketball Participation								1.162
								(0.128)
AIC	1536.6	2196.9	1493.5	2143.3	1510.6	2143.4	1496.6	2162.7
SC	1638.9	2294.5	1606.7	2251.1	1623.8	2251.1	1609.9	2270.6
-2 Log L	1500.6	2160.9	1453.5	2103.3	1470.6	2103.4	1456.6	2122.7
Sample Size	2168	1669	2116	1618	2118	1609	2129	1629
Schools	534	511	530	508	531	510	531	510

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '†' 0.1 ' ' 1

received free or reduced-price lunch had significantly greater odds of STEM declaration than male and female students who attended schools with a lower percentage of 10^{th} grade students who received free or reduced-price lunch.

Although there was a degree of consistently significant variables despite gender, there were several variables in which significance applied for women more than men, and vice versa. Across models 21, 23, 25, and 27 in Table 6, female students who took advanced math courses in high school had approximately three times greater odds of STEM declaration when compared to female students who did not take advanced math courses. However, in models 22, 24, 26, and 28, male students did not have significantly greater odds of STEM declaration when they took advanced math courses when compared to men who did not take advanced math courses. As seen in models 21, 23, 25, and 27, female students who participated in a math and science fair had significantly greater odds of STEM declaration when compared to female students who did not participate in a math and science fair. Contrarily, in models 22, 24, 26, and 28, there is not a significant relationship among male students between participating in a math and science fair and their odds of STEM declaration.

A similar trend by gender took place when evaluating high school-level control variables. Across models 22, 24, 26, and 28 in Table 6, male students who attended private schools had significantly lower odds of STEM declaration than male students who attended public schools, although these results were significant at the 0.10 level in models 24, 26, and 28. Male students who attended rural schools had significantly greater odds of STEM declaration than male students who attended schools located in suburban areas. However, these results were significant at the 0.10 level in models 22, 24, and 28.

Lastly, models 24 and 28 show that male students who attended schools in the Midwest had significantly greater odds of STEM declaration (at the 0.10 level) than students who attended schools in the South (when the sports variable included was varsity individual sports and varsity basketball participation).

DISCUSSION

Varsity Sports Participation and STEM Declaration

Based on the results of models 1 to 12 presented in Table 3, there is not enough evidence to support the first hypothesis that states that there is a significant relationship between high school varsity sports participation and college STEM declaration. Regardless of how varsity sports participation was measured and of whether models were ran with just the key independent measure and the outcome or with additional controls, most models did not show a significant relationship between varsity sports participation and college STEM declaration. Only models 4, (varsity individual sports and varsity team sports) and 10 (varsity sports other than basketball) had a significant relationship with STEM declaration, albeit at the 0.10 level in model 10.

Even though there are differences in proportions across individual-level and school-level variables, such as advanced STEM coursetaking (math and science) and the percentage of 10th grade students who received free or reduced-price lunch, between varsity athletes and individuals who do not play varsity sport as seen in Table 2, those differences are negligible when examining STEM declaration. A potential explanation for these results may be that varsity athletes and individuals who do not play varsity sport in high school have comparable levels of student identity when not accounting for interactions between sports participation and additional factors such as gender, race, and participation in multiple varsity sports. In addition to having comparable levels of student identity, the results may also not account for the degree of commitment to a sport and that athletes can be involved in more than one sport at a time or in a school year. Previous research has found that Black female athletes who participated in multiple sports had lower GPA's than Black female athletes who participated in one sport (Singleton 2016). Additionally, at the college level, students with a greater identification with an athlete identity were significantly less likely to choose an academically rigorous major (Chen, Snyder, and Magner 2010). Given these considerations, the inclusion of more variables such as the degree of identification to sport, at the individual and school-level, may elucidate why there is not a significant relationship between varsity sports participation and college STEM declaration.

Gender, Varsity Sports Participation, and STEM Declaration

Although there was a lack of evidence to support the first hypothesis, which posited that there was a significant relationship between varsity sports participation and STEM declaration, findings from models presented in Table 4 show that there was some evidence to support the second hypothesis. The second hypothesis proposes that a student's gender moderates the relationship between varsity sports participation and college STEM declaration. While there was not a consistently significant gender and varsity sports interaction across models 13-16, there was a significant result at the 0.10 level in model 14 when varsity individual sports participation was the key independent measure. The significance of the interaction suggests that gender does moderate the relationship between varsity individual sports participation and STEM declaration. Generally, the odds of STEM declaration differed based on whether a man or a woman played varsity individual sports, rather than because of the predominant influence of gender in models 13, 15, and 16.

A potential explanation of the significant interaction at the 0.10 level for varsity individual sports and STEM declaration may be that compared to general varsity sports, varsity other team sports, and varsity basketball, women may benefit from playing sports that are not completely segregated by sex and gender, at least in an interactive sense. Although individual sports can be segregated based on sex and gender, it is not exactly unheard of for athletes that play individual sports to practice or interact with one another, especially if female and male athletes of that sport are both in-season (Santilena 2019).

For example, female and male track & field athletes may have joint practices prior to a track meet at their home stadium. Additionally, swimmers, especially elite female swimmers, may compete against male swimmers in practice for the sake of competition and to challenge themselves as athletes (Hersh 2016; Zaccardi 2016; Sweeney 2018). These opportunities to interact and share environments with men, especially in a domain that is typically perceived as masculine, can serve to benefit women and possibly provide them with a greater sense of self-efficacy. Furthermore, women who have a greater sense of self-efficacy, especially because they play a sport with near parity among men and women, may feel more assured about their overall academic ability, including in STEM, and may possibly declare a STEM major in college as a result. In contrast, women who participate in team sports such as basketball, soccer, and volleyball may experience less opportunities to interact and share spaces with men who play the same sport and thus may not have a greater degree of self-efficacy when compared to women who play individual sports. In a general sense, Laborde et al. (2016), found differences in levels of perseverance, positivity, resilience, self-esteem, and self-efficacy between individual sport athletes and team sport athletes. Consequently, women who play team sports may not be as likely to declare a STEM major because they have a lower degree of self-efficacy and thus may feel less assured about their overall academic ability, including in STEM.

Race, Varsity Sports Participation and STEM Declaration

While there is some evidence to support the second hypothesis, which posited that a student's gender moderated the relationship between varsity sports participation and STEM declaration, findings from Table 5 show that there was not any evidence to support the third hypothesis. The third hypothesis proposes that a student's race significantly moderates the relationship between varsity sports participation and college STEM declaration. Across models 17 to 20, there was not any significant interactions between race and varsity sports participation. Given the significantly greater odds of STEM declaration for Black students who did not participate in any varsity sports when compared to White students; the lack of significantly greater or lower odds for White varsity athletes when compared to White students who did not play varsity sport; and the lack of a significant interaction term between race and varsity sports participation in models 17 to 20, it is possible that the effect is mainly due to racial influence and not due to involvement or the lack of involvement in varsity sports.

A possible explanation for the lack of a significant race and varsity sports interaction could be that there is a greater degree of similarities between Black and White student athletes when it comes to individual-level characteristics, such as prior STEM achievement, advanced coursetaking in STEM, and STEM extracurricular activities, and school-level characteristics, such as the percentage of 10^{th} grade students who receive free or reduced-price lunch, than there is for Black and White students as a whole. Although Black students in Tables 3 and 4, and Black students who did not play any varsity sport in Tables 5 and 6 generally had significantly greater odds of STEM declaration than White students and White students who did not play any varsity sport, the inclusion of a race and varsity sports participation interaction did not significantly influence the STEM declaration odds for Black varsity athletes. The previous result is a common theme within sports participation literature, at least when considering academic outcomes. Generally, Black athletes experience fewer benefits from sports participation than the general group of athletes and White athletes (Melnick et al. 1992; Yeung 2015). Due to the results of the study, it is likely that there is a diminishing or negating influence for sports participation, at least when race is concerned, that does not significantly boost or differentiate Black athletes STEM declaration odds when compared to White athletes.

Gender, Race, Varsity Sports Participation, and STEM Declaration

The fourth hypothesis posited that a student's race significantly moderates the relationship between varsity sports participation and STEM declaration for male and female students. Findings of models across Table 6 did not indicate that there were significant differences in STEM declaration odds when race interacted with varsity sports participation in female and male subsamples. Given the significantly greater odds of STEM declaration for Black students who did not participate in any varsity sports when compared to White students in models 21, 24, 25, 26, 27, and 28; the infrequency of significantly greater or lower odds for White varsity athletes when compared to White students who did not play varsity sport across models 21 to 28; and the lack of a significant interaction term between race and varsity sports participation in models 21 to 28, it is possible that the effect is mainly due to racial influence and not due to involvement or the lack of involvement in varsity sports.

Limitations

One of the primary limitations of the study is the lack of measures for a student's identity. Previous research that has examined student athletes, specifically those at the college level, have used measures of identity to evaluate the type of majors that students select. Additionally, some of those studies have defined identity into two roles, student and athlete. The benefit of having identity as a measure was that previous research was able to test and examine whether identity was associated with college major choice, as well as if student and athlete identity varied by gender, race, or by type of sport played. However, a disadvantage was that previous research that has employed identity as a measure has been restricted to smaller and less representative samples. As a consequence of lacking an identity measure, I used several varsity sports participation measures instead of a general sports participation measure, which would have captured varsity and junior varsity athletes and compared them to nonathletes. The idea that varsity athletes are different and more committed to sport and possibly academics than junior varsity athletes is assumed for the study. However, due to the lack of an identity measure, the assumption of differences in identity between varsity athletes and junior varsity athletes, as well as varsity athletes and individuals who do not play varsity sport, cannot be tested.

Second, just as the ELS 2002 dataset lacked a measure for identity, it also lacked a general measure for self-efficacy. Because of its availability in the ELS 2002 dataset, 12^{th} grade math self-efficacy was considered as a potential proxy variable for self-efficacy. Although previous research has found that 12^{th} grade math self-efficacy is a significant predictor for STEM intention (Wang 2013), it was too specific of a measure in regard to student athletes. General self-efficacy may be a better measure because it relates to a person's general sense of competence and not solely a domain specific sense of competence. Ideally, a general self-efficacy measure would follow from varsity sports participation during 10th grade and capture whether a high or low sense of self-efficacy would be associated with STEM declaration in college.

Third, the study lacked a 12th grade varsity sports participation measure. The 12th grade sports variable only measured if students participated in sport, whether they participated as a captain, and if they did not participate in sport. In comparison, the original 10th grade sports participation variable had categories for if a student participated in varsity sport, junior varsity sport, whether they were a varsity captain, did not participate in sport, or did not have a sports program at their school. If the 12th grade sports participation measure included a varsity sports category, it would have been possible to create a longitudinal measure of sports participation that evaluated varsity athletes over two different time periods compared to everyone else. The inclusion of a varsity sports category for the 12th grade sports participation measure would have made a longitudinal measure including 10th grade varsity sports participation more accurate. Instead, a longitudinal measure of varsity sports participation was not included because of the ambiguity of the 12th grade sports participation measure when regarding varsity and junior varsity status.

Fourth, based on the organization of the ELS 2002 codebook, there was not much clarity on what is and is not other team sports and individual sports. Basketball, baseball, cheerleading and drill team, football, soccer, and softball are individually defined as the sports types included in the ELS 2002 dataset. A reasonable assumption can be made that other team sports and individual sports are sports without an explicit sports type measure.

However, there is a degree of ambiguity when it comes to understanding how ELS 2002 initially designated students into both the other team sports and individual sports measures. Sports such as volleyball, lacrosse, and hockey can certainly be assumed to be categorized as other team sports (Nemeth n.d.; Hamilton n.d.a). Similarly, swimming, track & field, and golf can be assumed to be individual sports (Hamilton n.d.b). The other team sports measure becomes more ambiguous when sports such as tennis, wrestling, and cross country are considered (Hamilton n.d.a). A more accurate interpretation is that individual sports are sports in which individuals compete against other individuals, regardless of if they are on a school team. Contrarily, other team sports would just be sports, similar to basketball, football, and soccer, that are played collectively.

A final limitation of the study was that it did not use multilevel modeling for data analysis. Previous research that has evaluated the long-term impacts of sports participation on academic outcomes has utilized multilevel models with random effects to account for the lack of independent observations in longitudinal data and to avoid biased standard errors (Troutman and Darfur 2007; Schmidt-Catran and Fairbrother 2016). Even though the SURVEYLOGISTIC procedure considers the complexity of the ELS 2002 dataset, the GLIMMIX procedure in SAS would have been more appropriate because of the nested nature of students in schools. The GLIMMIX procedure utilizes multilevel modeling, which accounts for the nested data such as the ELS 2002 study. The nature of the ELS 2002 dataset is nested primarily because schools were selected first and then students were selected from schools and followed over time (Hox 1998). The option of using multilevel modeling would have allowed for the simultaneous estimation of level-one data about students and level-two data about schools while accounting for clustered data (Mod-U Powerful Concepts in Social Science 2017).

In addition to utilizing multilevel models, I could have also used the Heckman sample selection model. The Heckman model is used to evaluate the level of heterogeneity or the degree of omitted variable bias and the influence it has on the dependent variable as a result (Cao 2018). For example, there may be missing cases for the original dependent variable based on college major because a portion of the respondents from the base year did not go to college or were still in high school. Additionally, even for individuals who did enter a postsecondary institution by Spring 2006, the fact they were not enrolled as long as other students who immediately enrolled after high school graduation or their status as part-time students could have affected those respondents' propensity to respond to survey questions. Previous research indicates that a greater proportion of high school completers immediately enroll into four-year postsecondary institutions than two-year post-secondary institutions (McFarland et al. 2019). Two-year postsecondary institutions have a greater proportion of part-time students, people of color, and full-time students that are 25 and older, when compared to four-year postsecondary institutions. Given these considerations, the generalizability of my analysis is limited because students who attended public high schools are underrepresented in the analytic sample and my sample is restricted to former high school sophomores who entered college and declared a college major by Spring 2006.

The number of omitted strata during data analysis was also an issue of the study. A function of this could be a consequence of the requirement that there should be two schools per stratum. For the entire sample there were 751 schools and 361 strata. When the analytic sample omitted missing cases and cases with nonpositive weights, the number of schools analyzed decreased by 100, in addition to a decrease in the number of strata. Following the inclusion of each varsity sports measure in model 1, schools and strata were not deleted but omitted from analysis, if subsequent models with additional variables had missing data. By default, SAS omitted stratum without a school. It is possible that a more sophisticated data management technique and procedure could have been used to prevent strata from being omitted.

Future Research

The results of the study suggest future opportunities for research. The current study is possibly novel in regards that it may be the first study to specifically examine the relationship between interscholastic sports participation and college STEM declaration. Future research can continue to build on the foundation established by the current study and explore potential mechanisms that explain the relationship or lack thereof between varsity sports participation and college STEM declaration. Furthermore, future research can qualitatively analyze differences between athletes who play different types of sports and further explore why female individual sport athletes have significantly different STEM declaration odds than their male counterparts.

Given that the current study did not test a theoretical mechanism that could explain the relationship between varsity sports participation and STEM declaration, future research could also be dedicated to testing a variety of theories that are possibly applicable. Previous research has examined sports participation, identity, and college major choice for college students (Knott 2016; Upthegrove, Roscigno, and Charles 1999, Chen et al. 2010; Foster and Huml 2017). However, there is a lack of research examining interscholastic sports participation, student and athlete role identities, and college major intention and interest amongst high school students. Future research should explore noncognitive mechanisms such as identity and self-esteem and examine how those mechanisms may possibly impact the STEM outcomes of interscholastic athletes.

CONCLUSION

Given that professional athletes begin their careers as children that hope to play at the highest level in their chosen sport(s) and the improbability of such hopes when compared to working in STEM fields, I was interested in exploring if there was a significant relationship between interscholastic varsity sports participation and college STEM declaration. For the study, I used Social Cognitive Career Theory to explore the relationship between varsity sports participation and college STEM declaration. Social Cognitive Career Theory predicts that individual-level and contextual-level characteristics influence a student's choice of declaring a STEM major. Prior research indicates that interscholastic sports participation is an important individual-level variable that is related to students' academic achievement, as well as STEM achievement and attainment. Academic achievement, especially STEM achievement, and STEM attainment has also been found to be related to students' odds of declaring and graduating with a STEM degree. Given these considerations, I posited that interscholastic varsity athletes would have a significantly greater likelihood of declaring a STEM major compared to individuals who did not play varsity sports because the former would have greater STEM achievement and attainment than the latter.

Results for the study generally indicated that there was not a significant relationship between three of the four measures for varsity sports participation (general varsity sports, varsity other team sports, and varsity basketball) and STEM declaration, regardless of whether gender, race, or gender and race moderated the relationship.

However, there was a significant relationship between varsity individual sports participation and STEM declaration, when measured without additional variables, as well as significant interactions when gender was interacted with varsity individual sports. Furthermore, female students who participated in varsity individual sports during high school had significantly different STEM declaration odds when compared to male students who participated in varsity individual sports.

Several policy recommendations come to mind, as a result of the study's findings. First, given that female students are underrepresented in STEM and tend to benefit from participation in varsity individual sports, interscholastic sports organizations and relevant shareholders should dedicate their efforts towards encouraging those groups to participate in such sports, as well as studying why individual sports benefit those women. Lastly, in addition to encouraging individual sports participation, interscholastic sports organizations and relevant shareholders should place a greater emphasis on examining data that includes gender and race influences on sports participation and academic outcomes. Examining data that considers the context of sports participation beyond evaluating an aggregate group of students will most likely initiate insights into more complicated relationships and potential differences within an aggregate group.

REFERENCES

ACT. 2010. “Table 155. ACT score averages and standard deviations, by sex and race/ethnicity, and percentage of ACT test takers, by selected composite score ranges and planned fields of study: Selected years, 1995 through 2010.” Retrieved May 30, 2019 (https://nces.ed.gov/programs/digest/d10/tables/dt10_155.asp).

ACT. 2014. “College choice report. Part 2: enrollment patterns.” Iowa City, IA: ACT.

Associated Press. 2009. “Report: Exemptions Benefits Athletes.” ESPN.com. December 30. Retrieved March 9, 2018 (http://www.espn.com/college-football/news/story?id=4781264).

Badenhausen, Kurt. 2017. "Serena Williams Leads the Highest-Paid Female Athletes 2017." Forbes. August 14. Retrieved October 19, 2018 (https://www.forbes.com/sites/kurtbadenhausen/2017/08/14/the-highest-paid-female-athletes-2017/#1319dc4e3d0b).

Barber, Bonnie L., Margaret R. Stone, and Jacquelynne S. Eccles. 2005. "Adolescent Participation in Organized Activities." Pp. 133-46 in *What Do Children Need to Flourish?* Boston, MA: Springer.

Bigler, Rebecca. S., Christia Spears Brown, and Marc Markell. 2001. "When Groups Are Not Created Equal: Effects of Group Status on the Formation of Intergroup Attitudes in Children." *Child Development* 72(4):1151-62.

Big Ten Academic Alliance. 2014. “NSF Approved STEM Fields.” Retrieved May 31, 2019 (https://www.btaa.org/docs/default-source/diversity/nsf-approved-fields-of-study.pdf?sfvrsn=2).

Bottia, Martha Cecilia, Elizabeth Stearns, Roslyn Arlin Mickelson, Stephanie Moller, and Ashley Dawn Parker. 2015. "The Relationships among High School STEM Learning Experiences and Students’ Intent to Declare and Declaration of a STEM Major." *Teachers College Record* 117(3):1-46.

Bottia, Martha Cecilia, Roslyn Arlin Mickelson, Jason Giersch, Elizabeth Stearns, and Stephanie Moller. 2018. "The Role of High School Racial Composition and Opportunities to Learn in Students' STEM College Participation." *Journal of Research in Science Teaching* 55(3):446-76.

Bowen, William G., and Sarah A. Levin. 2003. *Reclaiming the Game: College sports and educational values*. Princeton, NJ: University Press.

Braddock II, Jomills H. 1981. “Race, Athletics, and Educational Attainment: Dispelling the Myths. *Youth & Society* 12(3):335-350.

Brainard, Suzanne G., and Linda Carlin. 1998. "A Six-Year Longitudinal Study of Undergraduate Women in Engineering and Science." *JEE Journal of Engineering Education* 87(4):369-75.

Broh, Beckett A. 2002. "Linking Extracurricular Programming to Academic Achievement: Who Benefits and Why?" *Sociology of Education* 75(1):69-95.

Burke, Peter J., and Jan E. Stets 2009. *Identity Theory*. New York: Oxford University Press.

Burke, Peter J., and Jan E. Stets. 2012. "The Development of Identity Theory." *Oxford Scholarship Online*. Retrieved September 21, 2018 (10.1093/acprof:oso/9780195388275.001.0001).

Byars-Winston, Angela, Yannine Estrada, Christina Howard, Dalelia Davis, and Juan Zalapa. 2010. "Influence of social cognitive and ethnic variables on academic goals of underrepresented students in science and engineering: A multiple-groups analysis." *Journal of Counseling Psychology* 57(2):205-218.

Cao, Yang. 2018. "Limited Outcomes." Presented at University of North Carolina at Charlotte, November 4, Charlotte, NC.

Chen, Steve, Shonna Snyder, and Monica Magner. 2010. "The Effects of Sport Participation on Student-Athletes' and Non-Athlete Students' Social Life and Identity." *Journal of Issues in Intercollegiate Athletics* 2010(3):176-193.

Chen, Xianglei, and Phoebe Ho. 2012. *STEM in Postsecondary Education: Entrance, Attrition, and Coursetaking Among 2003−04 Beginning Postsecondary Students*. NCES 2013-152. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.

Chen, Xianglei, and Thomas Weko. 2009. *Students Who Study Science, Technology, Engineering, and Mathematics (STEM) in Postsecondary Education. Stats in Brief*. NCES 2009-161. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.

Corry, Joel. 2018. "Agent's Take: Inside Aaron Rodgers' new contract and what it means for Russell Wilson." CBS Sports.com. August 30. Retrieved September 22, 2018 (https://www.cbssports.com/nfl/news/agents-take-inside-aaron-rodgers-new-contract-and-what-it-means-for-russell-wilson/).

Davis II, Wade. 2014. "A Numbers Game: Making An NFL Roster." HuffPost.com. October 28. Retrieved May 30, 2019 (https://www.huffpost.com/entry/a-numbers-game-making-an-nfl-roster_b_5731630).

Dormer, Dina L. 2017. "An Investigation of the Impact of Participation in Interscholastic Athletics on the STEM Achievement of Secondary-Level Underrepresented Students." PhD Dissertation, School of Education, Hospitality, and Continuing Studies, Widener University. ProQuest, 10605364.

Eagan, Kevin, Sylvia Hurtado, Tanya Figueroa, and Bryce E. Hughes. 2014. "Examining STEM pathways among students who begin college at four-year institutions." *National Academy of Sciences*.

Eccles, Jacquelynne S., and Bonnie L. Barber. 1999. "Student Council, Volunteering, Basketball, or Marching Band: What Kind of Extracurricular Involvement Matters?" *Journal of Adolescent Research* 14(1):10-43.

Eitle, Tamela. M., and David J. Eitle. 2002. "Race, cultural capital, and the educational effects of participation in sports." *Sociology of Education* 75(2):123-146.

Eitle, Tamela M. 2005 "Do gender and race matter? Explaining the relationship between sports participation and achievement." *Sociological Spectrum* 25(2):177-195.

Eitzen, Stanley D., and Dean A. Purdy. 1986. "The Academic Preparation and Achievement of Black and White Collegiate Athletes." *Journal of Sport and Social Issues* 10(1):15-29.

Fejgin, Naomi. 1994. "Participation in High School Competitive Sports a Subversion of School Mission or Contribution to Academic Goals." *Sociology of Sport Journal* 11(3):211-30.

Foster, Sayvon, JL., and Matt R. Huml. 2017. "The Relationship between Athletic Identity and Academic Major Chosen by Student-Athletes." *International Journal of Exercise Science* 10(6):915-25.

Fountain, Jeffrey J., and Peter S. Finley. 2009. "Academic Majors of Upperclassmen Football Players in the Atlantic Coast Conference: An Analysis of Academic Clustering Comparing White and Minority Players." *Journal of Issues in Intercollegiate Athletics* 2(1):1-13.

Fox, Claudia K., Daheia Barr-Anderson, Dianne Neumark-Sztainer, and Melanie Wall. 2010. "Physical Activity and Sports Team Participation-Associations with Academic Outcomes in Middle School and High School Students." *Journal of School Health* 80(1):31-37.

Gaston-Gayles, Joy L. 2004. "Examining Academic and Athletic Motivation among Student Athletes at a Division I University." *Journal of College Student Development* 45(1):75-83.

Glennie, Elizabeth J., and Elizabeth Stearns. 2010. "Opportunities to participate: Extracurricular activities' distribution across and academic correlates in high schools." *Social Science Research* 39(2):296-309.

Grace-Martin, Karen. N.d. “Why Use Odds Ratios in Logistic Regression.” Retrieved May 10, 2019 (https://www.theanalysisfactor.com/why-use-odds-ratios/).

Hackett, Gail. 2013. "Social Cognitive Career Theory of Career Choice." Presented at University of Missouri: Kansas City.

Hahs-Vaughn, Debbie L. 2005. "A primer for using and understanding weights with national datasets." *The Journal of Experimental Education* 73(3):221-248.

Hamilton, John. N.d.a. “Teaching Strategies for Dual & Team Sports.” Study.com. Retrieved May 10, 2019 (https://study.com/academy/lesson/teaching-strategies-for-dual-team-sports.html).

Hamilton, John. N.d.b. “Individual Sports: Definition, Examples & Skill Development.” Study.com. Retrieved May 10, 2019 (https://study.com/academy/lesson/individual-sports-definition-examples-skill-development.html).

Hanson, Sandra L., and Rebecca S. Krauss. 1998. "Women, Sports, and Science: Do Female Athletes Have an Advantage?" *Sociology of Education* 71(2):93-110.

Hanson, Sandra L., and Rebecca S. Krauss. 1999. "Women in Male Domains: Sport and Science." *Sociology of Sport Journal* 16(2):92-110.

Hersh, Philip. 2016. “Chasing Katie Ledecky.” ABC News. August 8. Retrieved April 30, 2019 (https://abcnews.go.com/Sports/chasing-katie-ledecky/story?id=41197627).

Higher Education Research Institute. 2014. “TABLE 2-8. Intentions of freshmen to major in S&E fields, by race or ethnicity and sex:2014.” Retrieved January 9, 2019 (https://www.nsf.gov/statistics/2017/nsf17310/static/data/tab2-8.pdf).

Hill, Catherine, Christianne Corbett, and Andresse St. Rose. 2010. *Why So Few? Women in Science, Technology, Engineering, and Mathematics*. Washington, DC: American Association of University Women.

Hox, Joop. 1998. “Multilevel modeling: When and why.” Pp. 147-154 in *Classification, Data Analysis, and Data Highways*, edited by I. Balderjahn, R. Mathar, and M. Schader. Springer Berlin Heidelberg.

Institute of Education Sciences. N.d a. “Educational Longitudinal Survey of 2002 (ELS:2002): Survey Design and Sample Sizes.” Retrieved August 31, 2018 (https://nces.ed.gov/surveys/els2002/surveydesign.asp).

Institute of Education Sciences. N.d b. “Statistical Analysis of NCES Datasets Employing a Complex Sample Design.” Retrieved April 7, 2019 (https://nces.ed.gov/training/datauser/COMO_04.html).

Irick, Erin. 2017. "NCAA Sports Sponsorship and Participation Rates Report 1981-82 – 2016-17." Indianapolis, IN: National Collegiate Athletic Association.

Ingels, Steven J., Daniel J. Pratt, James E. Rogers, Peter H. Siegel, and Ellen S. Stutts. 2004. *Education Longitudinal Study of 2002: Base Year Data File User's Manual.* NCES 2004-405. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.

King, Barbara. 2016. "Does Postsecondary Persistence in STEM Vary by Gender?" *AERA Open 2*(4):1-10

Kramer, Laura. 2005. "Learning and Doing Gender." *The Sociology of Gender*. Los Angeles, CA: Roxbury Publishing Company.

Knobler, Mike. 2008. "College Athletes: Academic Performance: Behind the Line on Grades." *Atlanta Journal-Constitution*.

Knott, Stephen. E. 2016. "The Impact of Dual Identities of College Student-Athletes on Academic Performance." PhD Dissertation, Department of Teaching and Learning, Old Dominion University.

Laborde, Slyvain, Félix Guillén, and Emma Mosley. 2016. "Positive personality-trait-like individual differences in athletes from individual-and team sports and in non-athletes." *Psychology of Sport and Exercise* 26 9-13.

Lapchick, Richard E. 2016. "Racial and Gender Report Card: A comprehensive analysis of hiring practices of Major League Baseball, the National Basketball Association, the Women's National Basketball Association, the National Football League, Major League Soccer, and College Sport." University of Central Florida: The Institute for Diversity and Ethics in Sport. Retrieved May 30, 2019 (https://nebula.wsimg.com/79924d9304a4a4cd7260a17ec69416be?AccessKeyId=DAC3A56D8FB782449D2A&disposition=0&alloworigin=1).

Leaper, Campbell. 1994. "Exploring the Consequences of Gender Segregation on Social Relationships." *New Directions for Child and Adolescent Development* 1994(65):67-86.

Leaper, Campbell, and Carly Kay Friedman. 2007. "The Socialization of Gender." Pp. 561-87 in *Handbook of Socialization: Theory and Research.* New York, NY, US: Guilford Press.

Leite, Walter. N.d. "Survey Data Analysis." PDF file.

"Logistic Regression: Interaction Terms." N.d. PDF file.

Lent, Robert. W., Steven. D. Brown, and Gail Hackett. 2002. "Social Cognitive Career Theory." *Career Choice and Development* (4):255-311.

Lewis, Taylor. 2010. “Principles of Proper Inferences from Complex Survey Data.” Paper presented at the SAS Global Forum, April 11 – 14, Seattle, WA.

Lumpkin, Angela, and Judy Favor. 2012. "Comparing the Academic Performance of High School Athletes and Non-Athletes in Kansas 2008-2009." *Journal of Sport Administration and Supervision* 4(1):41-62.

Ma, Yingyi. 2011. "Gender Differences in the Paths Leading to a STEM Baccalaureate." *Social Science Quarterly* 92(5):1169-90.

MacPhee, David, Samantha Farro, and Silvia Sara Canetto. 2013. "Academic self-efficacy and performance of underrepresented STEM majors: Gender, ethnic, and social class patterns." *Analyses of Social Issues and Public Policy* 13(1):347-369.

Margolis, Jane, and Allan Fisher. 2002. *Unlocking the Clubhouse: Women in Computing*. MIT Press.

McFarland, Joel, Bill Hussar, Jijun Zhang, Xiaolei Wang, Ke Wang, Sarah Hein, Melissa Diliberti, Emily Forrest Cataldi, Farrah Bullock Mann, and Amy Barmer. 2019. *The Condition of Education 2019*. NCES 2019-144. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Retrieved June 4, 2019 (https://nces.ed.gov/ pubsearch/pubsinfo.asp?pubid=2019144).

Melnick, Merrill J., Donald F. Sabo, and Beth Vanfossen. 1992. “Educational Effects Of Interscholastic Athletic Participation on African-American and Hispanic Youth.” *Adolescence* 27(106):295-308.

Messner, Michael, Cheryl Cooky, and Robin Hextrum. 2010. "Gender in Televised Sports." *Center for Feminist Research* 39:437-53.

MLB. 2019. “25-man roster.” MLB.com. Retrieved May 30, 2019 (http://m.mlb.com/glossary/transactions/25-man-roster).

Mod-U Powerful Concepts in Social Science. 2017. YouTube. “Introduction to Multi-Level Modeling.” Retrieved April 7, 2019 (https://www.youtube.com/watch?v=m4fx_mzlBQI).

National Collegiate Athletic Association. 2018a. “Estimated probability of competing in college athletics.” Retrieved September 22, 2018 (http://www.ncaa.org/sites/default/files/2018RES_2017-18ProbabilityofGoPro_20180423.pdf).

National Collegiate Athletic Association. 2018b. “Test Scores.” Retrieved March 9, 2018 (http://www.ncaa.org/student-athletes/future/test-scores).

National Collegiate Athletic Association. 2018c. “Division I Academic Requirements.” Retrieved March 9, 2018 (http://www.ncaa.org/sites/default/files/2018DIEC_Requirements_Fact_Sheet_20180117.pdf).

National Federation of State High School Associations. 2013. "Participation Statistics: 1971-1972.” NFHS. Retrieved August 29, 2018 (http://www.nfhs.org/ParticipationStatics/ParticipationStatics.aspx/).

National Federation of State High School Associations. 2017. "2016-17 High School Athletics Participation Survey." NFHS. Retrieved September 22, 2018 (https://www.nfhs.org/ParticipationStatistics/PDF/2016-17_Participation_Survey_Results.pdf).

National Federation of State High School Associations. 2018. "2017-18 High School Athletics Participation Survey." NFHS. Retrieved January 9, 2019 (http://www.nfhs.org/ParticipationStatistics/PDF/2017-18%20High%20School%20Athletics%20Participation%20Survey.pdf).

National Science Foundation. 2016. “TABLE 5-6. Ethnic and racial distribution of bachelor's degrees awarded to U.S. citizens and permanent residents.” Retrieved January 9, 2019 (https://www.nsf.gov/statistics/2017/nsf17310/static/data/tab5-6.pdf).

National Science Foundation. N.d. “Table B-1. Classification of Fields of Study.” Retrieved May 31, 2019 (https://www.nsf.gov/statistics/nsf13327/pdf/tabb1.pdf).

Nemeth, Jennifer. N.d. “Dual & Team Sports: Definition & Comparison.” Study.com. Retrieved May 10, 2019 (https://study.com/academy/lesson/dual-team-sports-definition-comparison.html).

Noonan, Ryan. 2017. “STEM Jobs: 2017 Update (ESA Issue Brief# 02-17).” Washington, DC: US Department of Commerce, Economics and Statistics Administration, Office of the Chief Economist. Retrieved January 9, 2019 (http://www.esa.gov/reports/STEM-jobs-2017-update).

North Carolina High School Athletic Association. 2018. “2018-19 NCHSAA Handbook Cross Country.” Retrieved May 10, 2019 (https://www.nchsaa.org/sites/default/files/2018-19CrossCountry.pdf).

Park, Hyeoun-Ae. 2013. “An Introduction to Logistic Regression: From Basic Concepts to Interpretation with Particular Attention to Nursing Domain.” *Journal of Korean Academy of Nursing* 43(2):154-164.

Pearson, Jennifer, Sarah R. Crissey, and Catherine Riegle-Crumb. 2009. "Gendered Fields: Sports and Advanced Course Taking in High School." *Sex Roles* 61(7-8):519-535.

Radunzel, Justine, Krista Mattern, and Paul A. Westrick. 2016. “The Role of Academic Preparation and Interest on STEM success.” ACT Research Report Series 2016-8. Iowa City, IA: ACT.

Radunzel, Justine, Krista Mattern, and Paul A. Westrick. 2017. “Who Will Declare a STEM Major? The Role of Achievement and Interests.” ACT Research Report Series 2017-4. Iowa City, IA: ACT.

ReStore. 2011. “4.2: An Introduction to Odds, Odds Ratio, and Exponents.” Retrieved May 10, 2019 (http://www.restore.ac.uk/srme/www/fac/soc/wie/research-new/srme/modules/mod4/2/index.html).

Riegle-Crumb, Catherine, Barbara King, Eric Grodsky, and Chandra Muller. 2012. “The More Things Change, The More They Stay The Same? Prior Achievement Fails to Explain Gender Inequality in Entry into STEM College Majors Over Time.” *American Educational Research Journal* 49(6):1048-1073.

Robinson, Mike. 2003. “Student enrollment in high school AP sciences and calculus: How does it correlate with STEM careers?” *Bulletin of Science, Technology and Society* 23(4):265–273.

Sabo, Donald F., Merrill J. Melnick, and Beth E. Vanfossen. 1993. “High School Athletic Participation and Postsecondary Educational and Occupational Mobility: A Focus on Race and Gender.” *Sociology of Sport Journal* 10(1): 44-56.

Sanders, James P. and Kasee Hildenbrand. 2010. “Major Concerns? A Longitudinal Analysis of Student-Athletes’ Academic Majors in Comparative Perspective.” *Journal of Intercollegiate Sport* 3(2):213-233.

Santilena, Kate. 2019. “Which Style of College Team is For You?” Swimming World. January 18. Retrieved May 10, 2019 (https://www.swimmingworldmagazine.com/news/which-style-of-college-team-is-for-you/).

SAS. N.d. “The SURVEYLOGISTIC Procedure.” Retrieved April 7, 2019 (http://support.sas.com/documentation/cdl/en/statug/68162/HTML/default/viewer.htm#statug_surveylogistic_overview.htm).

Sax, Linda J. 1994. "Mathematical Self-Concept: How College Reinforces the Gender Gap." *Research in Higher Education* 35(2):141-66.

Schmidt-Catran, Alexander W., and Malcolm Fairbrother. 2016. “The random effects in multilevel models: Getting them wrong and getting them right.” *European Sociological Review* 32(1):23-38.

Shapiro, Casey A., and Linda J. Sax. 2011. "Major Selection and Persistence for Women in STEM." *New Directions for Institutional Research* 2011(152):5-18.

Shettle, Carolyn, Shep Roey, Joy Mordica, Robert Perkins, Christine Nord, Jelina Teodorovic, Janice Brown, Marsha Lyons, Chris Averett, and David Kastberg. 2007. *The Nation's Report Card: America's High School Graduates*. NCES 2007-467. Washington, D.C.: U.S. Government Printing Office.

Shifrer, Dara, Jennifer Pearson, Chandra Muller, and Lindsey Wilkinson. 2015. "College-Going Benefits of High School Sports Participation: Race and Gender Differences over Three Decades." *Youth and Society* 47(3):295-318.

Singleton, Sarita. 2016. "The Impact of Sports Participation on the Academic Achievement of African American Girls." PhD Dissertation, School of Education, Liberty University.

Snyder, Eldon E. 1985. "A Theoretical Analysis of Academic and Athletic Roles." *Sociology of Sport Journal* 2(3):210-17.

Sobeski, Michael. 2015. "Comparing Mathematics Achievement in Interscholastic Female Athletes to Non-Athletes." PhD Dissertation, School of Education, Northcentral University. ProQuest, 3700679.

Sporting Intelligence. 2017. "Global Sports Salaries Survey 2017." Retrieved January 14, 2019 (https://globalsportssalaries.com/GSSS%202017.pdf).

Sportrac. 2018."Stephen Curry". Retrieved September 22, 2018 (https://www.spotrac.com/nba/golden-state-warriors/stephen-curry-6287/).

Statistics Solution. 2012. "Binary Logistic Regression." Retrieved May 10, 2019 (https://www.statisticssolutions.com/binary-logistic-regression/).

Statistics Solutions. 2019. "Assumptions of Logistic Regression." Retrieved April 7, 2019 (https://www.statisticssolutions.com/assumptions-of-logistic-regression/).

Stearns, Elizabeth, Martha Cecilia Bottia, Eleonora Davalos, Roslyn Arlin Mickelson, Stephanie Moller, and Lauren Valentino. 2016. "Demographic Characteristics of High School Math and Science Teachers and Girls' Success in STEM." *Social Problems* 63(1):87-110.

Stets, Jan E., and Richard T. Serpe. 2013. "Chapter 2: Identity Theory." Pp. 31-60 in *Handbook of Social Psychology, Handbooks of Sociology and Social Research*, edited by J. DeLamater and A. Ward. Springer Science and Business Media. Retrieved November 21, 2017(10.1007/978-94-007-6772-0_2).

Strenta, Christopher A., Rogers Elliott, Russell Adair, Michael Matier, and Jannah Scott. 1994. "Choosing and Leaving Science in Highly Selective Institutions." *Research in Higher Education* 35(5):513-47.

Stryker, Sheldon, and Richard T. Serpe. 1982. "Commitment, identity salience, and role behavior: Theory and research example." Pp. 199-218 in *Personality, roles, and social behavior.* New York, NY: Springer.

Sweeney, Paul. 2018. "More Than a Swim Coach." Tufts Now. June 7. Retrieved May 10, 2019 (https://now.tufts.edu/articles/more-swim-coach-bigelow).

Troutman, Kelly P., and Mikaela J. Dufur. 2007. "From High School Jocks to College Grads-Assessing the Long-Term Effects of High School Sport Participation on Females' Educational Attainment." *Youth and Society* 38(4):443-62.

Tyson, Will, Reginald Lee, Kathryn M. Borman, and Mary Ann Hanson. "Science, technology, engineering, and mathematics (STEM) pathways: High school science and math coursework and postsecondary degree attainment." *Journal of Education for Students Placed at Risk* 12(3):243-270.

U.S. Bureau of Labor Statistics. 2018."Athletes and Sports Competitors". Retrieved September 22, 2018 (https://www.bls.gov/ooh/entertainment-and-sports/athletes-and-sports-competitors.htm).

U.S. Department of Education. 2015. "Title IX and Sex Discrimination." Retrieved August 29, 2018 (https://www2.ed.gov/about/offices/list/ocr/docs/tix_dis.html).

University of Tennessee Athletics Board Spring Report. 2009. Knoxville, TN: University of Tennessee.

University of Tennessee Athletics Board Spring Report. 2011. Knoxville, TN: University of Tennessee.

Upthegrove, Tanya R., Vincent J. Roscigno, and Camille Zubrinsky Charles. 1999. "Big Money Collegiate Sports: Racial Concentration, Contradictory Pressures, and Academic Performance." *Social Science Quarterly* 80(4):718-737.

Vetter, Betty M. 1996. "Retaining Undergraduate Women in Science, Engineering, and Technology: A Survey of a Student Organization." *The Equity Equation: Fostering the Advancement of Women in in the Sciences, Mathematics, and Engineering,* edited by C. Davis, A.B. Ginorio, C.S. Hollenshead, B.B. Lazarus, and P.M. Rayman. San Francisco: Jossey-Bass Publishers.

Videon, Tami M. 2002. "Who Plays and who benefits: Gender, Interscholastic Athletics, and Academic Outcomes." *Sociological Perspectives* 45(4):415-444.

Wang, Xueli. 2013. "Why Students Choose STEM Majors." *American Educational Research Journal* 50(5):1081-121.

Whitley, Roger L. 1999. "Those 'Dumb Jocks' Are at It Again: A Comparison of the Educational Performances of Athletes and Nonathletes in North Carolina High Schools from 1993 through 1996." *The High School Journal* 82(4):223-33.

Yeung, Ryan. 2015. “Athletics, Athletic Leadership, and Academic Achievement.” Education and Urban Society 47(3):361-387.

Yukhymenko-Lescroart, Mariya A. 2018. "On Identity and Sport Conduct of Student-Athletes: Considering Athletic and Academic Contexts." *Psychology of Sport and Exercise* 34:10-19.

Zaccardi, Nick. 2016. “Katie Ledecky ‘breaks’ Olympic male gold medalist in practice.” NBC Sports. April 14. Retrieved April 30, 2019 (https://olympics.nbcsports.com/2016/04/14/katie-ledecky-conor-dwyer-mesa-swimming/).