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## Do Teacher-Coaches Make the Cut? The Effectiveness of Athletic Coaches as Math and Reading Teachers

*Anna J. Egalite*

Harvard University  
United States

*Daniel H. Bowen*

Rice University  
United States



*Julie R. Trivitt*

University of Arkansas  
United States

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**Abstract:** Math and reading teachers who also coach athletics in the public school system are challenged to balance the responsibilities that come with fulfilling dual occupational roles. While many studies have examined teacher-coaches' stress levels and job perception in the context of role strain, there is no evidence of how student achievement in tested subjects is affected by assignment to these teacher-coaches. A large administrative panel data set provided by the Florida Department of Education allows us to match students to teachers and use a student fixed effects approach to track changes in math and reading test scores over a seven-year time period, from 2002 through 2009. Despite the challenges associated with holding dual occupational roles, we find that students assigned to teacher-coaches perform at the same level

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in reading and math as when they are assigned to non-coaching teachers.

**Keywords:** academic outcomes; athletic coaches; teacher-coaches

### **¿Son Exitosos los Profesores-Entrenadores? La Eficacia de los Entrenadores Deportivos Como Docentes de Matemáticas y Lectura**

**Resumen:** Docentes de matemáticas y de lectura que también son entrenadores de atletismo en el sistema de escuelas públicas tienen el reto de equilibrar las responsabilidades que vienen con el cumplimiento de dos roles ocupacionales. Aunque muchos estudios han examinado los niveles de estrés de los profesores-entrenadores y la percepción de empleo en el contexto de la tensión asociadas al rol, no hay evidencia de cómo el rendimiento estudiantil en materias que se evalúan se ve afectada por recibir instrucción por estos profesores-entrenadores. Un gran conjunto de datos de panel administrativo establecido por el Departamento de Educación de la Florida nos permite relacionar estudiantes y profesores y el uso de un enfoque de efectos fijos para seguir los cambios en matemáticas y resultados de las pruebas de lectura durante el período de 2002 hasta 2009. A pesar de los desafíos asociados con los roles ocupacionales duales, los estudiantes asignados a profesores-entrenadores obtienen el mismo nivel en lectura y matemáticas que cuando tienen profesores no entrenadores.

**Palabras clave:** resultados académicos; entrenadores deportivos; profesores-entrenadores

### **São Bem Sucedidos Professores-Treinadores? A Eficácia dos Treinadores Como Professores de Leitura e Matemática**

**Resumo:** Os professores de matemática e leitura que são também treinadores de atletas no sistema de escolas pública têm o desafio de equilibrar as responsabilidades que vêm com a implementação de dois papéis ocupacionais. Apesar de muitos estudos examinaram os níveis de estresse dos professores-treinadores e a percepção sobre o emprego no contexto da tensão associada com o papel, não há nenhuma evidência de como o desempenho do aluno em exames é afetada por a instrução de professores-treinadores. Um grande conjunto de dados de painel administrativo estabelecido pelo Departamento de Educação da Flórida nos permite relacionar os alunos e professores e o uso de uma abordagem de efeitos fixos para controlar alterações em matemática e resultados dos testes de leitura sobre o período de 2002 até 2009. Apesar dos desafios associados com papéis ocupacionais duplas, os alunos designados para professores-treinadores obter o mesmo nível em leitura e matemática quando os professores não têm treinadores.

**Palavras-chave:** desempenho acadêmico; treinadores; professores-treinadores

## **Introduction**

Much ink has been spilled on the subject of K-12 school sports and the associated costs and benefits for school communities. Supporters of school-sports programs make the case that athletics provide vital outlets for children and teenagers who benefit from the physical, social, and emotional development that these activities provide (American Academy of Pediatrics, 2006; Sothorn, Loftin, Suskind, Udall, & Blecker, 1999). The positive externalities from sports extend to the entire school community. Higher school-wide test scores are positively related to a school's athletic success and student participation in sports (Bowen & Greene, 2012). Schools with higher proportions of students participating in sports also report lower levels of violent crimes and suspensions (Veliz & Shakib, 2012). Sports may also provide more informal venues, which provide frequent opportunities for school-community engagement that facilitates the development of social capital (Coleman, 1988), which is positively associated with student achievement (Dufur, Parcel, & Troutman, 2013).

Opponents, meanwhile, argue that athletics detract from academic pursuits that will be more valuable to students in the long run (Ripley, 2013b). One particularly salient debate in this area relates to the adults who lead school-sponsored sports teams and their roles in the classroom (Sage, 1987). Specifically, when hiring coaches for its athletic teams, should school administrators seek to implement a separation between academics and athletics or do students benefit when these (potentially) complementary spheres overlap? This study aims to better inform this issue by examining the effectiveness of teacher-coaches as measured by one particular assessment of student achievement—students' standardized test-score gains in math and reading.

Math and reading teachers who also coach athletics in the public school system are challenged to balance the responsibilities that come with fulfilling dual occupational roles (Sage, 1987). Additional tasks that go beyond their regular teaching duties include managing sports teams, writing athletic budgets, training athletes, and teaching the fundamentals of sports. At certain times of the year in particular, athletic coaches devote large blocks of time to organizing practices and travelling to games. Athletic coaches often serve as mentors to student-athletes, both on and off the field (Miller, Salmela, & Kerr, 2002), and many coaches also find it necessary to organize fundraising events to offset the many, substantial costs that their players and families may struggle to afford, such as travel, equipment, and facilities fees (Sage, 1989). In many American schools, sports appear to maintain a position of primacy, and critics have argued that many schools will hire a lower-quality teacher if that applicant has an interest in and aptitude for athletic coaching (Ripley, 2013a).

The specific research question addressed in this empirical study is as follows: What is the effect of being assigned to a reading or math teacher who is also an athletic coach? To answer this question, we test whether students in classrooms taught by athletic coaches experience similar learning gains as compared to when they are in classrooms taught by non-coaching teachers. We examine a rich administrative dataset provided by the Florida Department of Education that reports student achievement on standardized tests in math and reading for public school students in grades 3 through 10 over a seven-year period. We use a student fixed-effects model to address the issue of identification.

We find that assignment to a teacher-coach has null effects on student math and reading achievement. This finding is particularly compelling in light of the existing literature on the psychological stress of role strain reported by many teacher-coaches (Figone, 1994b; Locke & Massengale, 1978). Moreover, this research can inform policy decisions regarding how to best evaluate teacher performance in a comprehensive manner that considers faculty workloads and the challenges of fulfilling multiple roles.

The remainder of the paper is organized as follows: We first present the theoretical framework underlying this study. We then review the existing literature on athletic coaches and sports in schools, both in terms of the influence of interscholastic sports over school communities (i.e. social capital) and student achievement. Next, we describe the data for this study as well as the matching and estimation strategies. We then present our results and conclude with a discussion of the limitations, key takeaways, and possible policy implications of our findings.

## **Theoretical Framework**

The theoretical framework guiding this research is provided by role theory, which is an examination of the characteristic behavioral patterns and expectations associated with a given social position (Biddle, 1979). Teacher role expectations, in particular, are not always clearly defined or consistent, which can create role conflict (Biddle, 1986; Konukman et al., 2010; Spencer, 1986). When an individual occupies multiple, sometimes conflicting, roles, they may also experience role

strain, characterized by psychological stress and social instability (Goode, 1960, p. 567). Theorists are divided over whether role strain will inevitably require the individual to prioritize one role over the other or if mutually reinforcing roles can actually complement one another so that the rewards of role accumulation actually outweigh the burden (Sieber, 1974). Research examining this question in the context of teacher-mothers, revealed both complementarities and disadvantages associated with the dual role (Claesson & Brice, 1989). While teacher-mothers reported beneficial interaction between the two roles, they also experienced unrealistically high expectations for both roles. The present study builds upon this theoretical literature by examining the interaction of teacher-coach roles, providing the first empirical evidence in an ongoing debate about the efficacy of athletic coaches as academic teachers.

Building on this literature, we propose two competing hypotheses for how teachers respond to the role strain of being both a teacher and a coach. The first is that the teaching and coaching roles are substitute uses of the faculty member's scarce time. If this is the case, teacher-coaches may find that coaching responsibilities require time that could otherwise be spent preparing to teach their academic classes. To the degree that coaches are more interested in or have higher stakes attached to their performance as a coach, they may disproportionately focus on ensuring athletic success at the expense of academic success for their students. As a result, student academic achievement might suffer as a result of assignment to a teacher-coach.

An alternative hypothesis is that having faculty who serve as both teachers and coaches could produce positive outcomes if coaching and teaching are complementary activities. Sports may provide an additional venue for fostering better relationships and means of communication among teachers, students, and parents (Smoll, Cumming, & Smith, 2011), which could result in higher levels of student academic achievement. Coaches often have to motivate their teams, and they may be able to capitalize on this skill in the classroom. Similarly, successful coaches know how to effectively manage student behavior on the field. While many non-coaching teachers effectively manage student behavior in the classroom also, it could be the case that teacher-coaches may be especially effective in this regard, providing learning environments where students can be productive. Finally, as with students, participating in sports programs could provide teacher-coaches with important outlets that help them relieve stress outside of the classroom (Blumenthal et al., 1990).

## **Literature Review**

Studies of teacher-coaches have examined role overload, role ambiguity, and inter-role conflict among this unique subgroup of teachers (Capel, Sisley, & Desertrain, 1987; Drake & Hebert, 2002; Locke & Massengale, 1978). High school teacher-coaches report high degrees of inter-role conflict and occupational stress resulting from conflicts between teaching and coaching responsibilities (Locke & Massengale, 1978). However, none of these studies have examined the impact that teacher-coaches have on student academic achievement.

There are conflicting hypotheses about how we might expect teacher-coaches to influence student achievement outcomes. On the one hand, the strain of having to meet expectations for separate roles may lead to frustrations or tensions (Figone, 1994b; Locke & Massengale, 1978). When weighing the competing demands of this type of teacher-coach role conflict, individuals primarily hired as head coaches may perceive that a poor coaching record (e.g., season wins and losses) will more likely lead to job termination than an unsatisfactory teaching performance. Therefore, teacher-coaches may choose to disproportionately shift resources and energy into the coaching segment of their job. The time demands of coaching can potentially exacerbate this problem. Chu (1978) estimates that teaching consumes 23.6 hours for males and 27.9 hours for

females in a typical week during the non-coaching season. However, the combined weekly workload of teaching and coaching increases by more than 175% for males and 80% for females during the competitive season for their sport.

Importantly, many teacher-coaches may not equally value their dual roles. Chu (1980) and Segrave (1980) surveyed pre-service teachers about their preferences, with Chu (1980) reporting that many teacher-coaches view coaching as the role with the greatest rewards. Similarly, Segrave (1980) finds that 62% of prospective teacher-coaches prefer the athletic coaching over the academic teaching aspect of their job. These findings are perhaps unsurprising since many prospective teacher-coaches may go into education primarily to become sports coaches (Sage, 1989). Also, there tend to be both intrinsic and very tangible, extrinsic rewards that can be associated with coaching such as media exposure and recognition in the local community (Roberts, 2008). These effects may increase as the coaching role becomes a defining part of the teacher-coach's identity (e.g., students commonly referring to these teachers as "Coach" in the hallways).

Coaches of highly visible school sports may experience even more serious demands on their time and increased pressure to have their teams perform at a high level. By devoting substantial blocks of time to coaching responsibilities, teacher-coaches might be forced to find shortcuts when preparing and updating their knowledge to teach their academic course. Figone (1994a), Massengale (1981), and Sage (1987) postulate that teacher-coaches might even ignore their more academic-focused expectations. In addition to lesson preparation, other faculty duties include attending faculty meetings, engaging in departmental committees, and participating in professional development. As higher levels of effort are exerted toward the coaching role, the teacher-coach may perceive her teaching role as burdensome (Ryan & Sagas, 2006).

On the other hand, teacher-coaches may benefit from complementarities of the two activities through the development and benefits of social capital, a concept popularized by sociologist James Coleman (1990) that refers to the strength of social networks in bolstering people's abilities to achieve their goals. Coleman (1988) predicted that investment in the social connections that perpetuate social norms and shared obligations would permit the development of social capital, which in turn would lead to positive student outcomes. In the context of education, social capital has been shown to positively influence students' academic achievement (Dufur, Parcel, & Troutman, 2013), decreasing the likelihood of a child dropping out of school (Teachman, Paasch, & Carver, 1996) and reducing juvenile delinquency by compensating for poor parental attachment (Hoffmann & Dufur, 2008). While much of the prior research has focused on the relationship between family social capital and children's academic achievement (Furstenber & Hughes, 1995; Muller, 1994; Parcel & Geschwender, 1995; Valenzuela & Dornbush, 1994), a smaller but equally important body of work has examined the effects and mechanisms of social capital accumulation within school-communities (Coleman, 1988; Sun, 1999). This source of social capital development through relationships with institutional agents such as teacher-coaches may be particularly important for children whose family resources are limited (Stanton-Salazar, 1997; Stanton-Salazar & Dornbusch, 1995).

When teachers interact with students and parents in a coaching capacity in addition to their teaching role, this provides an additional medium for the development of school-community social capital. Thus teacher-coaches are in a unique position to contribute to the development of social capital because they have more opportunities to encounter students and families through their dual roles. Fritch (1999) describes how sporting events serve as venues for communities to gather, interact, and develop tighter social networks. Moreover, Uslander (1999) finds that sporting events facilitate social capital development in communities. A strong sense of community between parents, teachers, coaches, and students can facilitate collaborative efforts to improve school quality and

bring about positive student outcomes (Parcel & Dufur, 2001). These efforts can serve as a source of social control and reinforcement of community norms (Broh, 2002). Therefore, sports and coaches potentially build social capital networks that can lead to higher student academic achievement.

Teacher-coaches may also personally benefit from participating in athletics. Repeated studies in the stress literature reveal that teachers are particularly prone to burn out and high levels of stress (Guglielmi & Tatrow, 1998). This finding does not hold for teacher-coaches, who have been shown to have lower burnout than their non-coaching counterparts (Capel et al., 1987; Drake & Hebert, 2002). Therefore, the extra commitments and strains that come with coaching could produce an outlet that helps to reenergize these teachers for the classroom and potentially improve the likelihood that they stay in teaching longer.

In summary, while previous studies have examined the influence of teacher-coach role conflict on turnover intentions and job satisfaction, this paper expands upon the study of teacher-coach role conflict. We hypothesize that accumulation of social capital in the school community as a result of exposure to teacher-coaches has the potential to influence student achievement outcomes in math and reading. While prior work has examined the issue of teacher-coach role conflict for teachers of physical education, this study marks an important extension of that literature by examining teachers of those academic subjects that are the primary focus of state standardized testing, math and reading. By measuring the direct impact of assignment to a teacher-coach on student academic outcomes in math and reading, this paper provides the first, rigorous, quantitative analysis of its kind.

## **Research Design**

### **Data**

This paper draws upon an extensive administrative dataset, which was provided by the Florida Department of Education. This dataset includes student achievement on standardized tests for 2.7 million students in grades 3 through 10 in the Florida public school system. Using unique student, teacher, and class identifiers, we successfully matched students to more than 74,000 teachers over a seven-year time period from 2002- 2009. The student-level files contain information on student demographic characteristics as well as their math and reading test scores on the Florida Comprehensive Assessment Test (FCAT). The teacher files contain general demographic information, information on teacher endorsements, and job classification codes. We linked students to teachers over time using a unique classroom identifier that appears in both the student and teacher files. In addition, course identification numbers allowed us to identify the particular subject as well as the particular teacher for a student.

### **Developing a Matching Algorithm**

The annual student and teacher data files provide a unique classroom identifier, which we used to match students to teachers. We then employed a series of screening rules to eliminate any multiple matches of student-teacher-year in a given subject, a procedure previously applied to these data to assess teacher-student achievement effects (see Egalite, Kisida, & Winters, 2015). The first screen was relevant to the elementary grades only (i.e., grades 3-5), where teachers are most likely to serve as generalists, teaching all of the core subjects. A grade-specific code identified the primary teacher for that grade; thus, we dropped student-teacher matches that did not contain this code. For example, the code for a third grade general classroom is "Third Grade." Thus, we dropped those third grade student-teacher matches that did not have this code as these teachers were not likely to be the primary reading or math teacher. For grades six through ten, where students are more likely

to have different teachers for different subjects, we started at Screen Two. We generated lists of the courses aligned with the particular subject under consideration, either math or reading, ranked from most enrollees to least. Starting with the course with the highest frequency of student enrollees, we moved through the list hierarchically, keeping those student-teacher matches with the relevant course identification numbers. Any student-teacher matches that did not contain a relevant course code were dropped (e.g., art, music, etc.). In Screen Three, for the small number of students who continued to have more than one student-teacher-year observation, we excluded any matches where the teacher was not classified as being “full time,” as it is unlikely that a part-time teacher was the child’s primary teacher in a given classroom or subject. Overall, we successfully matched 96% of all 2.7 million students in our original sample.

Once this process created the student and teacher pairings, the final step was merging the student-teacher matched dataset with teacher endorsement information that allowed us to identify teachers who had ever earned an endorsement in athletic coaching during their teaching tenure in the State of Florida. In total, 4,356 teachers were identified as ever earning an athletic coaching endorsement. Of these teachers, 16% taught reading and 23% taught math in a tested grade in our data. To examine potential sorting patterns into coaching, Tables 1 and 2 provide descriptive information for all teachers in our sample. Teacher-coaches in both math and reading are far more likely to be male than their non-coaching counterparts; they are less likely to hold a master’s degree; and tend to have fewer years of teaching experience.

Table 1  
*Evidence of Math Teachers Sorting into Coaching*

Variable	Teachers Selecting into Coaching			Teachers Not Selecting into Coaching			Diff
	Obs.	Mean	SD	Obs.	Mean	SD	
Male	2,991	65.30%	0.48	221,574	20.58%	0.40	44.71***
1-2 Years of Experience	2,991	19.73%	0.40	221,574	16.33%	0.37	3.39***
3-5 Years of Experience	2,991	36.81%	0.48	221,574	33.07%	0.47	3.74***
6-12 Years of Experience	2,991	36.21%	0.48	221,574	32.17%	0.47	4.04***
13-20 Years of Experience	2,991	1.87%	0.14	221,574	8.90%	0.28	-7.02***
21+ Years of Experience	2,991	1.54%	0.12	221,574	6.74%	0.25	-5.20***
Master’s Degree	1,184	32.18%	0.47	79,413	44.00%	0.50	-11.82***
Ed.D/ Ph.D Degree	1,184	0.68%	0.08	79,413	1.09%	0.10	-0.41

*Note:* Author’s calculations from math teacher/student /certification matched file, using data from the Florida Data Warehouse. The observations column reflects the number of teacher-year observations, by variable. The total number of math teachers selecting into coaching is 987. The total number of math teachers not selecting into coaching is 71,983. Difference column displays value and significance level from a two-sample difference in means test. \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

Table 2  
*Evidence of Reading Teachers Sorting into Coaching*

Variable	Teachers Selecting into Coaching			Teachers Not Selecting into Coaching			Diff
	Obs.	Mean	SD	Obs.	Mean	SD	
Male	1,722	48.08%	0.50	226,489	13.53%	0.34	34.56***
1-2 Years of Experience	1,722	18.58%	0.39	226,489	17.98%	0.38	0.61
3-5 Years of Experience	1,722	38.85%	0.49	226,489	33.09%	0.47	5.77***
6-12 Years of Experience	1,722	35.08%	0.48	226,489	30.51%	0.46	4.56***
13-20 Years of Experience	1,722	1.39%	0.12	226,489	8.19%	0.27	-6.79***
21+ Years of Experience	1,722	1.34%	0.11	226,489	6.11%	0.24	-4.77***
Master's Degree	700	28.29%	0.45	83,806	43.35%	0.50	-15.06***
Ed.D/ Ph.D Degree	700	1.43%	0.12	83,806	1.11%	0.10	0.32

*Note:* Author's calculations from reading teacher/student /certification matched file, using data from the Florida Data Warehouse. The observations column reflects the number of teacher-year observations, by variable. The total number of reading teachers selecting into coaching is 693. The total number of reading teachers not selecting into coaching is 73,752. Difference column displays value and significance level from a two-sample difference in means test. \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

A potential concern with an analysis of the effectiveness of teacher-coaches is the introduction of endogeneity bias in the absence of random assignment of students to teachers. If students are systematically sorted to teacher-coaches and the criteria used for sorting is correlated with any of the other exogenous variables, a naïve analysis could incorrectly attribute achievement gains (or losses) to teacher-coaches (Clotfelter, Ladd, & Vigdor, 2006; Kalogrides, Loeb, & Beteille, 2013).

While we cannot test for systematic sorting on unobservable characteristics, evidence of sorting on observable characteristics would be suggestive that systematic sorting occurred. Table 3 compares the observable characteristics of students assigned to teacher-coaches and those assigned to non-coaching teachers (according to whether or not the teacher had an athletic coaching endorsement). Students assigned to teacher-coaches were significantly more likely to be black, white, male, and eligible for special education services. They were significantly less likely to be Asian, Hispanic, English language learners, or to qualify for free or reduced price lunch. Finally, students who were assigned to athletic coaches also tended to be lower-achieving based on their baseline standardized test scores in both math and reading. All differences were significant at  $p < .01$  and have important implications for the analytical model chosen, which is explained in the next section.



Table 3  
Evidence of Student Sorting into Coaches' Math or Reading Classrooms

Variable	Students Assigned to Athletic Coaches			Students Never Assigned to Athletic Coaches			Diff
	Obs.	Mean	SD	Obs.	Mean	SD	
Female	477,778	48.44%	0.50	8,551,280	49.33%	0.50	-0.90***
White	477,778	51.65%	0.50	8,551,280	48.01%	0.50	3.65***
Hispanic	477,778	18.91%	0.39	8,551,280	24.19%	0.43	-5.28***
Black	477,778	24.65%	0.43	8,551,280	22.44%	0.42	2.21***
Asian	477,778	2.27%	0.15	8,551,280	2.41%	0.15	-.014***
Free Lunch	477,778	36.66%	0.48	8,551,280	37.46%	0.48	-0.80***
Reduced Lunch	477,778	9.03%	0.29	8,551,280	9.21%	0.29	-0.18***
Special Education	477,778	31.26%	0.46	8,551,280	30.04%	0.46	1.21***
Limited Eng. Proficiency	477,778	8.12%	0.27	8,551,280	11.51%	0.32	-3.38***
Reading Achievement	421,458	0.04	0.97	7,743,180	0.09	0.97	-0.05***
Math Achievement	447,079	0.01	0.95	7,725,584	0.07	0.96	-0.06***

Note: Author's calculations from merged math and reading teacher/student /certification matched files, using data from the Florida Data Warehouse. Reading and math scores have been standardized by subject, grade, and year. The observations column reflects the number of student-year observations, by variable. The total number of students assigned to teacher-coaches is 121,836. The total number of students not assigned to teacher-coaches is 2,828,330.

### Empirical Strategy

Our empirical model built on that of Kane, Rockoff, and Staiger (2008), which tested whether teacher certification was related to effectiveness in raising student math or reading achievement outcomes. To estimate the relationship between student achievement and having an athletic coach as a math or reading teacher, we used STATA's ordinary least squares (OLS) and *areg* procedures to estimate the following regression:

$$A_{it} = \beta_g X_{it} + \lambda_g \bar{X}_{it}^c + \zeta \bar{X}_{it}^s + \delta W_{it} + \nu Coach_{st} + \zeta_{igst} + \pi_{gt} + \epsilon_{it} \quad (1)$$

Where  $A_{it}$  was the math or reading test score of student  $i$ , during year  $t$ ;  $X$  was a vector of observable student characteristics;  $\bar{X}_{it}^c$  and  $\bar{X}_{it}^s$  were the classroom level and school level mean values of the observable student characteristics in year  $t$ ;  $W_{it}$  was a vector of characteristics for the teacher that student  $i$  was assigned to in year  $t$ ;  $\zeta$  was a student fixed effect;  $\pi$  was a fixed effect for school-grade by year; and  $\epsilon$  was a stochastic error term. Because students in our sample were nested within teachers, we could not assume that error terms were independent and identically distributed. For this reason, all standard errors were clustered at the teacher level.  $\nu$  was the estimated impact of having a teacher-coach in a given year and was our parameter of interest.

Observable student characteristics included cubic polynomials in prior year math and reading scores; race/ethnicity, gender, free or reduced price lunch status, English language learner status,

special education status, structural and non-structural moves between schools<sup>1</sup>, grade repetition, and the number of days absent from the prior year. The class-level variables included class-level proportions of the demographic characteristics, by year, in addition to a class size variable and a control for teacher experience. Similarly, the school-level variables included school-level proportions of these demographic characteristics, by year, and a class size variable representing the average class size in that school. For ease of interpretation, all test scores were standardized before the matching process within grade and by year, to have a mean of zero and a standard deviation of one. Consequently, the measure of effect sizes in this evaluation is the standardized beta coefficient (e.g., Caldas, 1993; Gottfried, 2013; Hoxby, 2000).

Our primary approach applied a student fixed-effect regression to estimate the effect of having a teacher with an athletic coaching endorsement on the student's test score in a given year while accounting for other potentially important characteristics. The inclusion of student fixed effects ensured that we compared the scores of the same student over time so that our estimates of the parameter of interest  $\nu$ , were net of the effects of both observed and unobserved time-invariant student heterogeneity. A limitation of this approach is an external validity concern arising from the fact that these analyses rely on students who switch into and out of the treatment condition, perhaps limiting our ability to generalize results to the broader student population. As a robustness check therefore, we also ran OLS and regressions that use school fixed effects. If the results of these regressions were in a similar direction and magnitude, we would have more confidence in our findings.

It is important to note that when we incorporated a school fixed effect, we identified the impact of an athletic coach by comparing effectiveness *within*, instead of between schools. This approach took care of student sorting between schools as well as potentially important heterogeneity that could arise from time-invariant school characteristics such as the influence of the school administration or general school culture, but it does not account for student sorting within schools. For instance, if lower achieving students were systematically assigned athletic coaches for reading and math classes, our estimates could be biased downward. Thus, we present the student fixed effects estimates as the most reliable estimates of the math and reading impacts of being assigned to a teacher-coach.

As a final robustness check, we used teachers' job classification codes rather than official athletic coaching endorsements to identify those teachers working as athletic coaches. The State of Florida does not require individuals who hold a valid Florida Educator's Certificate to acquire an athletic coaching endorsement in order to be paid to coach in public schools.<sup>2</sup> As a result, this more inclusive strategy identified more teachers as coaches and captured more students in the school fixed effects estimation than the previous strategy. The downside of this strategy is that an athletic coaching endorsement may indicate a substantial commitment to coaching as opposed to a teacher who coaches reluctantly when no one else was available and thus the identification strategy relying on coaches with endorsements may be more pertinent to the research question of interest.

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<sup>1</sup>A structural change is when a student has to switch schools to attend the next grade due to how the district arranges grades into schools, i.e., going from elementary to middle school. A non-structural switch is when a student is attending a new school for reasons other than having completed the highest grade level available at the school.

<sup>2</sup> Florida Statute 1012.55(2) mandates that paid athletic coaches in public schools must be in possession of a valid full-time Florida Department of Education temporary or professional teaching certification or an athletic coaching certificate that has been issued by the Florida Department of Education.

## Results

Results from our primary model are displayed in the first column of Table 4. Panel A displays estimates for elementary-aged students (grades three through five), panel B displays estimates for students in the middle grades (grades six through eight), and panel C displays estimates for students in the high school grades (nine and ten). Assignment to a teacher-coach had no discernible impact on student reading outcomes in any of the grade levels examined. We repeated the analysis using multiple models for robustness checks and found suggestive evidence that would be consistent with lower-achieving students being assigned to teacher-coaches' classrooms.

First, we added lagged student test scores to the student fixed-effects model (model two), which reduced the number of observations but made the sample more comparable to that used in later models presented in columns three and four. The teacher-coach indicator remained insignificant using this estimation approach. In model three, we ran OLS, which reported a significant negative coefficient on the teacher-coach indicator in grades six and above, but we couldn't rule out student sorting as the reason for this negative effect. Model four included a school fixed effect to capture time-invariant differences in schools which were likely related to both student achievement and the quality of teacher-coaches at a school. By comparing students within the same schools, these results could not be contaminated by any differences in teacher labor market supply, school facilities, or general differences in income distribution or racial composition between schools.

The effect of being assigned to a teacher-coach on reading outcomes was small but negative and significant in grades six and above. In general, the consistency of null findings associated with our primary model, the student fixed effects approach, in all grade-bands increases confidence in our results that assignment to a teacher-coach had null effects on students' reading achievement. This is particularly interesting in light of the negative coefficient on models that do not address student sorting, which would be consistent with lower-achieving students being more likely to be assigned to teacher-coaches.

As a final robustness check, we broadened the identification criteria for teacher-coaches to include any individual whose job classification code indicated that they were working as an athletic coach, regardless of whether or not that individual attained an athletic coaching endorsement. Columns five through seven display the results of assignment to any teacher-coach, a much broader definition than that used in columns one through four. When we re-ran the three main models using this indicator for coach, we found no significant effects on student reading outcomes.

Table 4  
*Effect of Assignment to an Athletic Coach on Reading Outcomes*

	Teacher-Coaches with a Coaching Endorsement				Job Classified Teacher-Coaches		
	Student FE (1)	Student FE, Lagged Scores		School FE (4)	Student FE (5)	OLS (6)	School FE (7)
		OLS (3)					
<b>Grades 3-5</b>							
Coach	-0.00 (0.02)	0.01 (0.02)	-0.01 (0.01)	-0.02 (0.01)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)
Lagged Reading	N/A	-0.36*** (0.00)	0.67*** (0.00)	0.67*** (0.00)	N/A	0.68*** (0.00)	0.68*** (0.00)
Lagged Math	N/A	0.07*** (0.00)	0.21*** (0.00)	0.22*** (0.00)	N/A	0.23*** (0.00)	0.23*** (0.00)
R <sup>2</sup>	0.92	0.94	0.63	0.64	0.93	0.66	0.66
Obs.	1,516,209	885,405	885,405	885,405	2,332,462	2,124,368	2,124,368
<b>Grades 6-8</b>							
Coach	-0.01 (0.01)	-0.00 (0.01)	-0.02* (0.01)	-0.03** (0.01)	0.01 (0.01)	-0.02* (0.01)	-0.01 (0.01)
Lagged Reading	N/A	-.32*** (0.00)	.66*** (0.00)	.66*** (0.00)	N/A	0.65*** (0.00)	0.65*** (0.00)
Lagged Math	N/A	.04*** (0.00)	.22*** (0.00)	.23*** (0.00)	N/A	0.21*** (0.00)	0.21*** (0.00)
R <sup>2</sup>	0.92	0.94	0.68	0.68	0.92	0.69	0.69
Obs.	2,371,290	1,466,371	1,466,371	1,466,371	2,679,776	2,430,024	2,429,916
<b>Grades 9-10</b>							
Coach	-0.00 (0.01)	0.00 (0.02)	-0.01* (0.00)	-0.01** (0.01)	N/A	N/A	N/A
Lagged Reading	N/A	-0.41*** (0.01)	0.64*** (0.00)	0.64*** (0.00)	N/A	N/A	N/A
Lagged Math	N/A	0.06*** (0.01)	0.27*** (0.00)	0.27*** (0.00)	N/A	N/A	N/A
R <sup>2</sup>	0.96	0.97	0.70	0.70	N/A	N/A	N/A
Obs.	1,247,935	730,926	730,926	730,926	N/A	N/A	N/A

*Note:* The dependent variable is the student's standardized score on the FCAT reading test. Models include controls for year; grade; a cubic polynomial in students' prior math and reading scores; student gender and race; controls for student LEP or special education status; absenteeism; structural or non-structural school moves; grade repetition; class-size; free or reduced price lunch status; classroom level controls for each of the student indicators; class size; school level controls for each of the student indicators; and teacher experience. Standard errors clustered by teacher in parentheses; \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ , (two-tailed tests). N/A stands for not applicable. In the student fixed effects model (1), N/A signals that lagged reading and math were not included. In Models (5) through (7), N/A signals that data were not available for job-classified coaches in these grades.

Table 5 displays the results of assignment to a teacher-coach on student math achievement. Results from our primary model are displayed in the first column. We detected no effect of assignment to a teacher-coach on student math outcomes in any of the grade-levels examined. These results remained insignificant when we included lagged test scores with the student fixed effect. As before, we also ran OLS and school fixed effects models. We found null effects in the elementary and middle grades (four through eight) and small, negative effects in grades nine and ten. Given the identification limitations of models three and four, this finding would be consistent with lower-achieving math students being systematically sorted to teacher-coaches in the high school grades. In general however, we found no convincing evidence that teacher-coaches had a differential effect on student math outcomes, compared to non-coaching teachers.

As before, we ran a further robustness check by broadening the identification criteria for teacher-coaches to include any individual whose job classification code indicated that they were working as an athletic coach, regardless of whether or not that individual had an athletic coaching endorsement. Under this broader definition, we also found no significant effects of assignment to a teacher-coach on student math outcomes.

Table 5  
*Effect of Assignment to an Athletic Coach on Math Outcomes*

	Teacher-Coaches with a Coaching Endorsement				Job Classified Teacher-Coaches		
	Student FE (1)	Student FE, Lagged Scores (2)	OLS (3)	School FE (4)	Student FE (5)	OLS (6)	School FE (7)
<b>Grades 3-5</b>							
Coach	-0.00 (0.01)	-0.01 (0.02)	-0.02 (0.02)	-0.01 (0.02)	0.02 (0.03)	0.04 (0.03)	0.04 (0.03)
Lagged Reading	N/A	0.05*** (0.00)	0.16*** (0.00)	0.16*** (0.00)	N/A	0.18*** (0.00)	0.18*** (0.00)
Lagged Math	N/A	-0.33*** (0.00)	0.71*** (0.00)	0.71*** (0.00)	N/A	0.71*** (0.00)	0.71*** (0.00)
R <sup>2</sup>	0.93	0.95	0.66	0.67	0.94	0.67	0.68
Obs.	1,699,922	1,105,298	1,105,298	1,105,298	2,329,389	2,121,756	2,121,756
<b>Grades 6-8</b>							
Coach	-0.01 (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.00 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Lagged Reading	N/A	-0.05*** (0.00)	0.15*** (0.00)	0.15*** (0.00)	N/A	0.15*** (0.00)	0.15*** (0.00)
Lagged Math	N/A	-.29*** (0.00)	.71*** (0.00)	.72*** (0.00)	N/A	0.67*** (0.00)	0.67*** (0.00)
R <sup>2</sup>	0.92	0.94	0.73	0.73	0.92	0.73	0.74
Obs.	2,713,865	1,869,293	1,869,293	1,869,293	3,693,536	3,332,429	3,332,297
<b>Grades 9-10</b>							
Coach	-0.01 (0.01)	-0.01 (0.01)	-0.02*** (0.01)	-0.02*** (0.01)	N/A	N/A	N/A
Lagged Reading	N/A	0.05*** (0.00)	0.11*** (0.00)	0.11*** (0.00)	N/A	N/A	N/A
Lagged Math	N/A	-0.44*** (0.01)	0.75*** (0.00)	0.75*** (0.00)	N/A	N/A	N/A
R <sup>2</sup>	0.95	0.97	0.74	0.74	N/A	N/A	N/A
Obs.	1,631,508	1,076,018	1,076,018	1,076,018	N/A	N/A	N/A

*Note:* The dependent variable is the student's standardized score on the FCAT math test. Models include controls for year; grade; a cubic polynomial in students' prior math and reading scores; student gender and race; controls for student LEP or special education status; absenteeism; structural or non-structural school moves; grade repetition; class-size; free or reduced price lunch status; classroom level controls for each of the student indicators; class size; school level controls for each of the student indicators; and teacher experience. Standard errors clustered by teacher in parentheses; \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ , (two-tailed tests). N/A stands for not applicable. In the student fixed effects model (1), N/A signals that lagged reading and math were not included. In Models (5) through (7), N/A signals that data were not available for job-classified coaches in these grades.

We also checked for heterogeneity in effects by student subgroups. Specifically, we examined impacts separately by gender, race/ethnicity, and economic status (defined by free or reduced lunch eligibility status). Tables 6 and 7 display the results of these estimates, none of which were statistically significant in either reading or math. Collectively, these results suggest that students assigned to teacher-coaches fared no better or worse than when they were assigned to non-coaching teachers.

Table 6

*Tests for Heterogeneity in Student Fixed Effects Estimates of Assignment to an Athletic Coach in Reading*

	Female (1)	Male (2)	White (3)	Non-White (4)	Poor (5)	Non-Poor (6)
<i>Grades 3-5</i>						
Coach	0.00 (0.02)	-0.01 (0.02)	-0.01 (0.02)	0.01 (0.02)	-0.00 (0.03)	0.00 (0.02)
R-Squared	0.93	0.92	0.92	0.92	0.92	0.93
Observations	751,115	765,094	701,475	814,734	653,392	862,817
<i>Grades 6-8</i>						
Coach	-0.00 (0.01)	-0.02 (0.01)	-0.01 (0.01)	-0.02 (0.01)	-0.02 (0.02)	-0.01 (0.01)
R-Squared	0.92	0.91	0.90	0.92	0.92	0.92
Observations	1,172,946	1,198,344	1,156,631	1,214,659	898,442	1,472,848
<i>Grades 9-10</i>						
Coach	0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	0.01 (0.02)	0.00 (0.04)	-0.01 (0.02)
R-Squared	0.96	0.96	0.95	0.96	0.97	0.96
Observations	621,965	625,970	648,222	599,713	347,435	900,500

NOTE: The dependent variable is the student's standardized score on the FCAT reading test. Models include controls for year; grade; student gender and race; controls for student LEP or special education status; absenteeism; structural or non-structural moves; grade repetition; class-size; and free or reduced price lunch status; classroom level controls for each of the student indicators; class size; school level controls for each of the student indicators; and teacher experience. Standard errors clustered by teacher in parentheses; \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ , (two-tailed tests).

Table 7

*Tests for Heterogeneity in Student Fixed Effects Estimates of Assignment to an Athletic Coach in Math*

	Female (1)	Male (2)	White (3)	Non-White (4)	Poor (5)	Non-Poor (6)
<i>Grades 3-5</i>						
Coach	0.00 (0.02)	-0.01 (0.02)	0.00 (0.02)	-0.01 (0.02)	-0.02 (0.02)	0.01 (0.02)
R-Squared	0.93	0.93	0.93	0.92	0.92	0.94
Observations	841,210	858,712	786,668	913,254	732,108	967,814
<i>Grades 6-8</i>						
Coach	-0.01 (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
R-Squared	0.92	0.92	0.93	0.92	0.92	0.94

Table 7 (Cont'd.)

*Tests for Heterogeneity in Student Fixed Effects Estimates of Assignment to an Athletic Coach in Math*

Observations	1,337,684	1,376,181	1,288,055	1,425,810	1,070,828	1,643,037
<i>Grades 9-10</i>						
Coach	-0.01 (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.01 (0.01)	0.00 (0.01)	-0.00 (0.01)
R-Squared	0.96	0.95	0.95	0.95	0.96	0.96
Observations	811,962	819,546	820,007	811,501	468,875	1,162,633

NOTE: The dependent variable is the student's standardized score on the FCAT math test. Models include controls for year; grade; student gender and race; controls for student LEP or special education status; absenteeism; structural or non-structural moves; grade repetition; class-size; and free or reduced price lunch status; classroom level controls for each of the student indicators; class size; school level controls for each of the student indicators; and teacher experience. Standard errors clustered by teacher in parentheses; \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ , (two-tailed tests).

## Discussion

The literature on teacher-coaches up to this point has primarily relied on role theory to explore the conflicts teacher-coaches may experience as they juggle the multiple, sometimes competing, expectations that occur both in the classroom and on the field (e.g., Drake & Hebert, 2002; Figone, 1994b; Locke & Massengale, 1978; Ryan, 2008; Templin & Anthrop, 1981). This study advances this literature, however, in two important ways. First, prior studies have been limited to teacher perceptions of role conflict, job satisfaction, time demands, and the expectations associated with occupying multiple roles in a school community (e.g., Chu, 1978; Roberts, 2008; Segrave, 1980). This study, however, is the first to empirically examine how teacher-coaches affect students' academic achievement, specifically in terms of math and reading test-score gains.

Second, prior studies of teacher-coaches have primarily focused on teachers of physical education (P.E.) classes (e.g., Aicienena, 1999; Herbert, 2007). States do not currently standardize, broadly implement, or include P.E. assessments into their accountability programs. While P.E.-relevant outcomes are still certainly of value to the K-12 curriculum, these circumstances present challenges to researchers, limiting both the generalizability of findings and not adequately addressing graver concerns with regard to perceived school academic-athletic conflicts. All teacher-coaches likely face the challenges of role conflict, but those instructing higher-stakes and tested subjects are potentially the most likely to experience these pressures. Therefore, by examining teacher-coaches whose instructional efforts can be tied to students' math and reading outcomes, this study allows the researchers to examine whether the potential challenges of inter-role conflict are likely to have meaningful effects on student achievement.

In general, the student fixed effects estimates presented here show that assignment to a teacher-coach had null effects on student math and reading outcomes in all of the grade levels examined. We also tested for heterogeneous effects for student subgroups, checking for achievement effects associated with assignment to a teacher-coach for female, male, white, non-white, poor, and non-poor students. Given our large sample of 2.7 million unique students, we are confident that our study was sufficiently powered to detect an effect for one of these large subgroups.

These results are remarkable given the existing literature on teacher-coaches' inter-role conflicts and the view that the crossover between athletics and academics inherently undermines scholastic achievement (e.g., Coleman, 1961; Ripley, 2013a; Sage, 1987). Although correctly



identifying a particular explanation for how or why these teacher-coaches appear to be able to serve as athletic coaches without necessarily coming at the expense of their effectiveness in the classroom is beyond the scope of this study, there are a few plausible explanations. One explanation is that educators who are either assigned to or willing to undertake the role of both teacher and coach know how to properly balance and leverage these roles to make up for any inter-role conflicts (Drake & Hebert, 2002). The related literature on the dual roles of teacher-mothers identified physical exercise as one such coping strategy used by these individuals to reduce role strain (Claesson & Brice, 1989). Another possibility, from a student perspective, could be that the increases in social capital, as a result of additional venues of interaction with a teacher-coach, offset potential negative effects that stem from role conflicts.

The findings of this study have important policy implications and considerations. Given the literature on teacher-coach role conflict and the associated time demands (e.g., Sage, 1989), these findings imply that teacher-coaches have somehow developed effective coping strategies to handle these demands. Important policy implications follow from this finding. For instance, teacher evaluation systems that rely primarily on test scores for assessing teacher quality will likely fail to capture the comprehensive value of teacher-coaches' efforts. Conversely, an evaluation system that incorporates multiple measures of quality teaching will be more accurate to ensure teacher-coaches are rewarded for their comprehensive efforts. This broader approach should also allow school leaders to identify ineffective teacher-coaches who may benefit from mentoring programs by colleagues who have developed effective coping strategies to address role strain.

These results also potentially have implications with regard to school-personnel decisions. One consequence of statewide accountability programs is what has become referred to as "staffing to the test", where effective teachers, as measured by successes with increasing standardized test scores, are more likely to be assigned to tested grades and subjects (Chingos & West, 2011; Cohen-Vogel, 2011). This strategy has also been linked to a trend of schools hiring off-campus personnel to fill coaching positions rather than using teachers in this role (e.g. Silvy, 2014). Since there does not appear to be a negative academic tradeoff that results from having teachers coach athletics, there may not be significant benefits to this strategy and possibly unintended consequences such as eliminating opportunities for acquiring social capital. Staffing to the test might also prove to be an inefficient strategy should hiring off-campus coaches cost schools more than providing stipends to teachers for taking on coaching duties.

## **Limitations**

There are a number of limitations to the present study that should be acknowledged. First, these results rely exclusively on test score data. Because we cannot observe individual teachers' pedagogical style or philosophy, we cannot offer any insight into what actually happens inside the teacher-coach's classroom. We also cannot extrapolate our findings to teacher-coaches who teach non-tested subject areas, as these individuals are excluded from our analyses. For example, many teacher-coaches teach untested, core subjects (e.g., social studies) as well as teaching non-core or elective courses (e.g., physical education, driver's education). Moreover, by selecting into or being assigned to teach high-stakes, tested subjects, these coaches may not be representative of the typical teacher-coaches' dedication and, consequently, effectiveness in the classroom.

We also cannot rule out that teacher-coaches help students with other outcomes. We can only examine student test scores in this analysis but there are other outcomes where teacher-coaches could help produce positive outcomes. For instance, the social capital literature finds that increases in social capital are associated with reductions in the likelihoods of dropping out and in juvenile delinquency (Hoffmann & Dufur, 2008; Teachman, Paasch, & Carver, 1996). As such, assignment to

a teacher-coach may help students reach important milestones including high school graduation and college enrolment, as well as improving their non-cognitive skills such as leadership and the ability to work as part of a team.

Finally, a major limitation of this study is that we cannot isolate those students who are exposed to their teacher-coach in both an academic and sports capacity. We might expect to observe effects on those students who interact with the teacher-coach in both settings but because we do not have data on sports participation, we cannot identify that important subgroup of students.

### **Future Research**

While situating the findings from this study within the context of relevant, prior literature provides guidance for interpreting results, additional research is needed to help administrators and policymakers determine ways to effectively balance the role of athletics in schools, specifically with regard to school personnel decisions. For example, due to data limitations this study does not examine the extent to which teacher-coaches' commitments in either domain might influence student outcomes. Perhaps examining these tradeoffs, for instance by measuring teacher-coach roles on a more continuous spectrum, would provide a better sense of a tipping point where commitments as an athletic coach come at the expense of academics. This insight might corroborate the contention that it may be wise to limit the number of sports for which a teacher-coach is the head coach (Pangrazi & Darst, 2014).

These findings also raise questions about the inner-workings of the complementarities and tensions between the dual teacher and athletic coaching roles. Specifically, what are the specific mechanisms through which coaching experiences contribute to teaching? In what ways do the roles influence each other, both positively and negatively? Do teachers interact differently with those student-athletes that they also coach? Finally, future evaluations should explore alternative measures of student well-being, such as socio-emotional and noncognitive skills, which teacher-coaches may be particularly adept at developing in their students. This would help school leaders to develop a more comprehensive understanding of the benefits and tradeoffs of having faculty members serving multiple roles in schools. Further research, applying an array of mixed-method approaches will hopefully address some of these questions.

### **Conclusion**

Interscholastic athletics are often accused of serving as deterrents to schools' academic missions (e.g., Coleman, 1961; Ripley, 2013a). One area where such a conflict of interest would likely occur is with school staffing decisions. Specifically, in order to provide school-sponsored sports, administrators must hire personnel as athletic coaches. In many cases these individuals serve as teachers both in the classroom and on the playing fields. While the demands and objectives of this dual role can present challenges, it also provides opportunities that can potentially be beneficial to school communities.

In this study we examined an important question with regard to this potential school athletics-academics conflict: Do students experience negative effects as a result of having an athletic coach as a teacher? We analyzed the math and reading outcomes of Florida public school students assigned to teacher-coaches between 2002 and 2009. We hypothesized that accumulation of social capital in the school-community as a result of the contributions of teacher-coaches would offset potential, negative influences that come from inter-role conflict on their students' test achievement outcomes in math and reading. Our primary estimation approach revealed that assignment to a teacher-coach had no discernible impact on student academic achievement. In other words, students

performed no better or no worse in years when they were assigned to a teacher-coach as in years when they were assigned to a non-coaching teacher.

This finding is particularly meaningful in light of the existing literature on the psychological stress of role strain reported by many teacher-coaches. Given that our study is sufficiently high powered to detect an effect if one existed, we propose that teacher-coaches have developed effective coping strategies to address the challenges of their dual roles. Considering these findings and the existing research that has documented the time demands of both roles (Chu, 1978), we propose that teacher evaluation systems that evaluate teacher-coaches primarily on student test scores would overlook the considerable effort it takes to produce the same academic results while fulfilling the demands of two roles. Additionally, school administrators should consider these findings with regard to decisions pertaining to the choice between hiring off-campus personnel versus teachers to fill coaching positions. Hiring teacher-coaches does not appear to harm student achievement, but doing otherwise may prove to be financially inefficient and possibly comes at the expense of particular benefits from interscholastic sports, such as the enhancement of school-community social capital.

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## About the Authors

### Anna J. Egalite

Harvard University

[Anna\\_Egalite@hks.harvard.edu](mailto:Anna_Egalite@hks.harvard.edu)

Anna J. Egalite is a Postdoctoral Fellow in the Program on Education Policy and Governance at Harvard University. She has published original research on the competitive and racial stratification effects of school choice programs as well as the effects of teacher policies on the educational outcomes of disadvantaged students.

### Daniel H. Bowen

Rice University

[daniel.h.bowen@rice.edu](mailto:daniel.h.bowen@rice.edu)

Daniel H. Bowen is a postdoctoral fellow at Rice University's Houston Education Research Consortium. His research focuses on educational interventions and programs that are typically not considered part of the "core" K-12 curriculum in addition to teacher quality, school choice, and nontraditional outcome measures in education.

### Julie R. Trivitt

University of Arkansas

[JTrivitt@walton.uark.edu](mailto:JTrivitt@walton.uark.edu)

Julie Trivitt is a Clinical Assistant Professor of Economics. Her research interests include human capital, education and unintended responses to incentives.

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