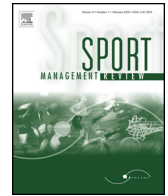




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The influence of sports participation on academic performance among students in higher education



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ABSTRACT

The purpose of this study was to analyse the effect that participating in extracurricular sporting activities has on academic performance among students in higher education. Prior research on this topic has yielded contradictory results: while some authors find a positive effect of sports participation on academic outcomes, others report a negative impact. Accordingly, the authors seek to provide a more rounded understanding of these mixed findings. The empirical evidence is provided by a panel dataset of undergraduate students who studied at a Spanish University over the period 2008–2014. The academic performance of sports participants are compared with those of non-participants in terms of their outcomes in the form of grades. Results reveal that participation in formal sporting activities is associated with higher grades among students at this university. The analysis reinforces the idea that apart from their health benefits for practitioners, sporting activities lead to the attainment of the performance goals to which higher education institutions aspire.

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1. Introduction

Scholars have traditionally expressed substantial interest in understanding whether sports participation impacts on students' academic performance by addressing the topic from different perspectives, such as education, psychology, sociology, and sports (e.g., Feldman & Matjasko, 2005; Fredricks, 2012). Despite the wealth of research on the correlation between sports participation and academic performance (Chuan, Yusof, & Shah, 2013; Gaston-Gayles & Hu, 2009), there is currently no consensus regarding the effect the former has on the latter. Our aim is to provide a more rounded understanding of extracurricular participation and subsequent academic achievement among students in higher education. In particular, our objective is to determine whether student involvement in regular physical-sporting activity has a causal relationship with their academic outcomes (i.e., the direction of the effect is from sports participation to academic performance, and not the other way around).

From a theoretical point of view, we propose several key conditions related to sports participation (e.g., skills and goals, social relations, and mental health capital) that may increase or decrease students' academic performance. Empirically, we rely on a panel data of 3,671 students from a Spanish university (Universidad Carlos III de Madrid) who began to study an

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undergraduate degree in 2008, and had all completed it by 2014. Our main findings show that regular, organised physical-sporting activity leads to higher academic performance among students at this university.

Our analysis becomes relevant insofar as most previous research has focused on undergraduate students participating in sports at universities in the United States (i.e., Kiger & Lorentzen, 1986; McArdle, Paskus, & Boker, 2013), where sports programmes play a central role, covering a broad range of men's and women's elite activities (professional athletes), and generating considerable amounts of advertising revenue. As a result, sports participation is institutionally linked with schools, attendance patterns, formal team selection processes, grades, and social status among peers and teachers (Coakley, 2011, p. 311). Like the US, sports programmes at universities in Canada are also very important. They are financed via athletics departments integrated within Canadian Interuniversity Sport, the organisation in charge of national competitions (Canadian Interuniversity Sport, 2007). The majority of Canadian universities provide training facilities, computer facilities and team sports free of charge. Likewise, the Australian government heavily supports university sports programmes at regional, national and international level, which are administered by Australian University Sport, a not-for-profit organisation and university sport's supreme governing body in that country (Knapp, 2011).

Universities in Spain belong to the European University Sports Association, an umbrella organisation for all national university sports federations in Europe, which coordinates competitions, conferences, mass participation sports events, and other activities at both university and national level. Each university organises its own sports programmes together with the Spanish University Sports Committee (integrated in the Higher Sports Board), which oversees sporting activities at national and international level. Spanish universities receive financial support from the different authorities at national, regional and local levels. Unlike the US, Canada or Australia, however, Spanish universities mainly support sport as a way of complementing students' academic education. Moreover, sports programmes at Spanish universities depend both politically and financially on public resources. Although the current context of higher education in Spain allows students to validate up to six optional credits through extracurricular activities, sport has little or no transcendence beyond the universities themselves. Moreover, compared to the US context for instance, attendance of sports events is minimal among university students in Spain, and athletics programmes hold little interest for the media. This may explain why the relationship between sports participation and academic performance has been underexplored in Spain compared to other institutional settings. The fact that our results reveal that participation in formal sporting activities is associated with higher grades among students renders it essential to provide universities with more opportunities to further invest in extracurricular sporting programmes based on their positive association with the improvement of students' academic performance.

The rest of the paper is organised as follows. The next two sections develop the theoretical analysis (literature review and theoretical framework). Section 4 briefly describes the research context (a Spanish university), and Section 5 describes the data, variables and empirical methods applied. Section 6 presents the main findings, and Section 7 concludes (implications, limitations, and future research).

2. Literature review

Research on the relationship between extracurricular participation and subsequent academic achievement has focused on identifying various plausible explanations for this relationship in specific settings, such as the physically active student population (Busch et al., 2014; Kokolakis, Lera-López, & Panagouleas, 2015; Levine, Etchison, & Oppenheimer, 2014). In this regard, research has presented the theoretical backgrounds for different sides of the argument (Busch et al., 2014). Although our purpose in this section is not to develop a scoping review of the previous literature, Table 1 summarises some of the main empirical studies on the relationship between sports participation and academic performance among students in higher education.

In general, previous research has examined the characteristics of participants (e.g., gender, race, background and academic credentials for college entrance) that are relevant for understanding the relative academic performance of students involved in sporting activities (Cornelius, 1995), as well as external factors that may have some influence on the relationship between sports participation and academic performance—for instance, Chuan et al. (2013) have found a negative link between the support system and the academic performance of physically active students at university.

As Table 1 shows, research has focused on different types of universities—for instance, private versus public ones (Chuan et al., 2013)—as well as on a wide variety of sports: from basketball and volleyball (e.g., Meyer, 1990), to football, basketball, baseball, and hockey (Shapiro, 1984), and even track and field events, or swimming (Miller & Kerr, 2002). In this regard, some authors have also distinguished between revenue and non-revenue sports activities (e.g., Kiger & Lorentzen, 1986). In addition, most literature has focused on the US context (Gaston-Gayles & Hu, 2009; McArdle et al., 2013), although there are other contributions, for example, from Canada (Miller & Kerr, 2002) and Asia (Chuan et al., 2013; Jayanthi, Balakrishnan, Ching, Latiff, & Nasirudeen, 2014).

Despite this growing body of literature, the results obtained are mixed and largely inconclusive. While some researchers have found that student engagement in extracurricular activities (such as sport) improves their academic performance (e.g., Jayanthi et al., 2014; Levine et al., 2014), others contend that the impact of sports participation on students' academic performance is negative (e.g., Miller & Kerr, 2002), or even null (e.g., Hood, Craig, & Ferguson, 1992). The discrepancy in these research findings may be traced to differences in both data gathering methods and methodology. On the one hand, while some studies have been conducted using large samples of national data (e.g., McArdle et al., 2013) others have used smaller

Table 1

Literature review: sports participation and students' academic outcomes in higher education.

Author/Year	Objective	Sample	Main results
Aries, McCarthy, Salovey, & Banaji (2004)	Do athletes underachieve relative to students who enter college with similar backgrounds and academic credentials?	Students at two highly selective north-eastern schools, an Ivy League university and a small liberal arts college	Student athletes do not record any significant academic underperformance compared to other students who enter college with similar demographic profiles and Scholastic Aptitude Test (SAT) scores
Chuan et al. (2013)	To examine factors that influence the academic achievements of university athletes	University athletes from five public Malaysian universities who are in the team playing in the public universities hockey league	A positive relationship between the learning environment and academic achievements of university athletes, but a negative relationship between the support system and academic achievements
Cornelius (1995)	To examine the direct relationships between athletic identity and college student development, the moderating effects of gender and year in school on these relationships, and the mediating effects of socialisation factors for recreational athletes	Undergraduate college students who were recruited as volunteers from physical education classes at a large south-eastern university	A greater athletic identity is associated with having accomplished more developmental tasks
Hood et al. (1992)	To examine the academic achievement of students who had participated in varsity athletics as freshmen, comparing their achievement with that of other groups of non-athletes	Athletes at the University of Iowa	Participation in freshmen athletics does not appear to have any major impact on academic achievement during the freshmen year
Jayanthi et al. (2014)	To examine different factors influencing the academic performance of students in a tertiary institution in Singapore	Students from a tertiary institute in Singapore	Student involvement in extracurricular activities lead to an improvement in cumulative GPA scores
Gaston-Gayles (2004)	To examine the influence of academic and athletic motivation on academic performance after controlling for precollege characteristics (predictors of academic achievement for student athletes)	Student athletes from eight varsity team sports at a Division I university in the Midwest	Academic motivation is important in determining future academic success. Career athletic motivation and student athletic motivation are non-significant in the model
Gaston-Gayles & Hu (2009)	Is the influence of student engagement on college outcomes conditional on the profile level of the sport in which the student-athlete participated?	Student-athletes at Division I universities	Some types of activities have a greater impact for some sports compared to others. For example, participation in academic-related activities is more meaningful for low profile athletes
Kiger & Lorentzen (1986)	To investigate the relative effects of gender, race, and type of sport (revenue vs. nonrevenue sport) on academic performance among university athletes	Athletes at an NCAA Division I school in the Rocky Mountain region	Type of sport in which one participates is not directly related to university grade point average (GPA)
Levine et al. (2014)	To explore the possibility of pluralistic ignorance in regard to academic achievement in middle school, high school, and college athletes	Study 1a: high school students Study 1b: college students	Most student-athletes held positive personal attitudes towards academic achievement, but their peers did not
McArdle et al. (2013)	An application of contemporary multilevel regression modelling to the prediction of 1st-year academic performances in college: to gather information about the academic successes and failures of student-athletes in all NCAA sporting activities	All high school students who wished to participate in an NCAA (National Collegiate Athletic Association) college sports programme	High school grades are the best available predictors of freshman college grades (ACT and SAT test scores are the next best predictors available). College graduation rate has a second-level involving a small negative outcome on the average grades
Meyer (1990)	To examine the attitudes and subjective feelings of female college athletes concerning their roles as student-athletes	Female athletes (only basketball and volleyball players) at a Midwest university	The women's optimism was strengthened over time
Miller & Kerr (2002)	Map how central components in the lives of Canadian student-athletes unfold throughout their university careers	Student-athletes in their 4th and 5th year of eligibility (participants attend a large Canadian university)	Student-athletes aggressively pursued athletic aspiration during their early university career, often compromising their educational success
Pascarella & Smart (1991)	To estimate the net impact of varsity athletic participation on a wide range of educational outcomes	A national sample of students attending 379 four-year colleges and universities (African American and Caucasian men)	Intercollegiate athletic participation has a positive impact on social involvement during college, satisfaction with college, interpersonal and leadership skills, and motivation to complete one's degree.

Table 1 (Continued)

Author/Year	Objective	Sample	Main results
Richards & Aries (1999)	To analyse the costs and benefits to athletic participation at a Division III college	Students at a small north-eastern residential liberal arts college	Athletic participation does not impede academic success, or prevent involvement in most other extracurricular activities or with non-athletes
Robst & Keil (2000)	To examine athletes' grades and graduation rates at an NCAA Division III institution	Students at Binghamton University (BU), which is part of the State University of New York system (all undergraduate students from the 1990-91 through 1995-96 academic years, who take at least 12 credits during the academic year)	Non-transfer student-athletes have higher GPAs than non-athletes, while transfer student-athletes have similar grades to non-athletes. Graduation rates are higher for athletes. There are many academic benefits to athletic participation at the Division III level
Sedlacek and Adams-Gaston (1992)	To predict the academic success of student-athletes using the Scholastic Aptitude Test (SAT) and noncognitive variables	Incoming freshman athletes at a large eastern university with an NCAA Division I athletic programme	Student-athletes seem similar to norm groups of black students on the Noncognitive Questionnaire (NCQ), with all NCQ means in an average range
Shapiro (1984)	To examine the graduation rates of male student athletes at Michigan State University over a 25-year time period	Letterwinners and non-letterwinners for football, men's basketball, baseball, and hockey, who were freshmen	Intercollegiate athletics have a positive influence on the educational attainment of participating athletes

samples from specific states or universities (e.g., Hood et al., 1992; Miller & Kerr, 2002), so their findings are not fully comparable (as regards the latter, problems of external validity are likely to exist).

On the other hand, while some scholars have used qualitative methods (e.g., Levine et al., 2014; Miller & Kerr, 2002), and others have opted for a more quantitative approach (e.g., Robst & Keil, 2000), the studies differ in the degree to which they pursue an explicitly causal argument. Most of the studies reviewed have simply assessed participation levels at a given point in time, and examined correlations between participation and other variables (e.g., academic performance). Unfortunately, some researchers have been tempted to conclude that correlations between sports participation and academic performance imply that participation increases or reduces the latter. However, evidence from studies that simply compare participants and non-participants provide no evidence for causal relationships. Specifically, one important methodological problem plaguing research on sports participation involves the self-selection of students into participants and non-participants (see, e.g., Fredricks and Eccles, 2006b; Fredricks and Eccles, 2010). The danger of self-selection is that pre-existing differences between groups of students who choose or do not choose to participate, rather than the influence of participation, may account for observed differences between participants and non-participants. By considering that self-selection is a necessary condition in our study, our analysis will provide more accurate and consistent estimates of the effects of sports participation than those previously available in most research to date.

3. Theoretical framework

In the following section, we propose and discuss (Subsections 3.1–3.4) certain unique conditions of students participating in sports activities that may increase or decrease their academic performance relative to non-participants.

3.1. Development of key skills consistent with educational values

In the athletic context, success has often been associated with self-discipline, the ability to concentrate, staying focused, showing perseverance and determination, and working hard, for example. Whether these qualities are transferred to the academic field will provide a strong signal for earning good grades. When motivated not only towards the athletic domain but also towards the academic one, physically active students manifest self-confidence, maturity, locus of control or a work ethic, and develop certain skills that are consistent with educational values that may lead to a successful academic outcome (Fejgin, 1994; Marsh, 1993).

Furthermore, participating in extracurricular activities such as sports helps students to develop their own personal initiative, as they feel they are doing something they really like because they are doing so on a voluntary basis, and it is something they have chosen to do, so they are willing to make an effort to achieve the challenge they have set themselves. All this is highly conducive to good academic performance, as within this context students will be capable of learning and acquiring new skills, setting goals, and identifying those factors and resources that will enable them to achieve the desired outcome (Mahoney, Cairns, & Farmer, 2003; Gorry, 2016).

3.2. Social relations

Moreover, taking part in extracurricular activities such as sport will have a positive impact on academic performance, as these activities also foster the development of other kinds of skills of considerable importance, such as

those of a noncognitive nature, and which help to forge strong social ties. Taking part in activities of this nature creates the opportunity to develop interpersonal relationships outside the classroom with other students and adults (e.g., a figure of authority such as the trainer), which provides support by increasing a student's social acceptance, and even by reducing antisocial behaviour (Mahoney et al., 2003). This also promotes the development of certain skills, such as teamwork and self-confidence, reinforcing self-control and effort, and encouraging students to interact with other individuals, and even learn from them, as these may possess a series of values and skills that are of great transcendence within the educational sphere (Covay & Carbonaro, 2010; Eccles, Barber, Stone, & Hunt, 2003; Freeman & Rees, 2010). In sum, sporting activities provide a potential path to college attachment and belonging, as well as social capital (Finn, 1989), providing sources for the dissemination of educational information and resources, and encouraging students to comply with norms, whereby such activities contribute positively to the quality of the academic purpose (Broh, 2002).

3.3. *Need to achieve a goal*

Apart from fomenting social relations, playing sport strongly reinforces and promotes the need to achieve a goal (Gillet, Berjot, & Gobancé, 2009), as those individuals doing so have to perform before an audience and learn how to cope with the opinions expressed by other people, and often have to deal with both success and failure (the well-known dilemma of winning versus losing). This is yet more important when the activity involves a team (see Allen, Coffee, & Greenlees (2012); McEwan & Beauchamp, 2014), as in this case each individual is assigned a role and will have to behave in an ethical manner with all the other team members (Covay & Carbonaro, 2010).

3.4. *Mental health capital*

Furthermore, it should be noted that sport is also associated with psychological benefits for its practitioners, as it provides greater doses of happiness, tolerance of stress, self-perception, concentration, sociability and extroversion, while reducing the risk of experiencing depression and anxiety (Babiss & Gangwisch, 2009; Keeley & Fox, 2009). Accordingly, those college students who take part in sporting activities are expected to be capable of honing skills that are consistent with the educational values that will enable them to record a good academic performance.

3.5. *Time for sporting aspirations*

So far we have discussed the reasons for a positive relationship between sports participants and academic performance. Nevertheless, there are also counterarguments contending that a student's involvement in sporting activities may not be as favourable as it may appear at first sight, given that it is not exempt from certain risks that may compromise a good academic performance.

While certain qualities among physically active students might lead to a positive impact on academic performance, other aspects probably have a negative impact. As physically active students are expected to spend time on sports programmes and devote energy to them, the obligations and responsibilities towards this extracurricular activity may mean they sacrifice the time they should be studying, resulting in a negative impact on academic performance (Cantor & Prentice, 1996; Fizek & Fort, 2004). These students put considerable effort into participating in sports and, consequently, they may not develop the necessary knowledge, skills and competences within the academic arena. If physically active students decide to invest too many hours in sports participation, this dedication may lead them to spend less time on classroom attendance, educational aspirations, etc. (Fejgin, 1994). To some extent, therefore, sports participation may be considered as a zero-sum game in which more time spent on non-academic goals (i.e., sporting activities) diverts attention away from academic performance.

3.6. *Sport objectives versus academic goals*

Just as an increase in the amount of time dedicated to sport may lead to a drop in a student's academic performance, giving too much importance to such participation is another of the factors that may contribute to a poorer academic outcome. In this sense, and as indicated previously, although a sense of athletic identity could have a positive influence on a student's academic performance through, for instance, the development of interpersonal skills, or the formation of social networks that ease feelings of loneliness and stress, etc. (Astin, 1993; Miller & Kerr, 2002), an excessive focus on sport may compromise the performance of students in higher education. In particular, this may be the case of those involved at the highest level of athletic competition and who aim to play at professional level (students training intensively may be too exhausted to concentrate on studying). In this case, the demands and aspirations associated with playing sport could be negatively related to academic tasks, with the ensuing negative consequences in the academic arena (Shulman & Bowen, 2002). If the desire to excel at sport outweighs the motivation to obtain a high grade point average (GPA) at college, it could ultimately lead to a poor academic outcome. This idea was empirically confirmed in the study by Yukhymenko-Lescroart (2013), such that more intense athletic involvement leads to a stronger athletic identity and a weaker academic one.

4. Research context

Sporting opportunities at Spanish universities are provided through three programmes: (1) Health-oriented activities designed to improve fitness (yoga, aerobics, spinning, weight training, Pilates, etc.); (2) Activities designed to teach different sports; and (3) Nature-based activities (Integral Plan for Physical and Sporting Activity, 2010, pp. 116–117). The most recent figures available show that in 2015 the highest rates of sports participation were recorded among students in higher education (73.4%) (Spain's Ministry of Education, Culture and Sport, 2015).

In the specific case of Universidad Carlos III de Madrid, there is an extensive programme that includes different types of sports such as paddle tennis, tennis, or Pilates, along with water activities and fitness activities (individual and in groups); activities in which a professional individually trains and coaches a single student on a personal fitness or body-building programme; internal competitions (football, basketball, volleyball, etc.); and external competitions in which the university's teams or individual athletes participate in regional, national and international competitions (rugby, judo, karate, etc.). There are also theoretical sessions in monographic courses, among others. In addition, the University provides its students with large, multipurpose sports facilities located close to the main campus, and equipped with the latest generation sports equipment. Within this sporting context, there are three outstanding aspects that have made a significant contribution to this university's external recognition: (1) the opening of the new sport centre on the Getafe Campus (Madrid) in 2011; (2) the large number of sporting activities offered to students with academic credit acknowledgement, which benefited 2,937 students during the 2014-2015 academic year; and (3) the ongoing improvement and adaptation of sporting activities to students' expectations.

5. Method

5.1. Data gathering and sample

The data have been extracted from an administrative dataset collected by Universidad Carlos III de Madrid (Spain) that provides information on the educational attainment of the entire population of students beginning their undergraduate studies from 2008 onwards. Out of these, we base our analysis on those students who had finished their undergraduate degree by 2014. The quality of this dataset is deemed to be high; being administrative in nature, the information is free of the problems common to survey data (e.g., non-response and interviewer bias). It includes the individual and family characteristics of students who had finished their degree by 2014, as well as information about their university record (see Section 5.2). This dataset was matched with another administrative dataset that provides information on each student's sports participation at the university. Thus, we know whether or not each student has participated in sporting activities during their degree, and, when doing so, the type of sporting activity, as well as the start and end dates of each one. Our final sample consists of 3,671 individuals. These university students were classified as sports participants if they played any sport before finishing their degree, and this was the case of around one third of our sample (1,174 students). The definitions of the variables used in this study are presented in Table 2. Our dependent variable measures students' degree results (via their GPA). Universities in Spain use an 11-point grading scale. Thus, the GPA variable is a continuous variable ranging from 0 to 10. Since this variable is positively skewed (few students have very low GPAs), it was transformed by taking the natural logarithm. Most prior studies have chosen GPA as the main dependent variable (Jayanthi et al., 2014; Kiger & Lorentzen, 1986; Robst & Keil, 2000).

Table 3 reports descriptive statistics for the whole sample, and also separately for sports participants and non-participants (columns 3 and 4). Overall, a higher fraction of sports participants (as opposed to non-participants) are male and younger. Sports participants are also more likely to be Spanish nationals, and to have finished degrees in the Engineering branch (instead of Social Sciences and Law, or Humanities). Finally, on average, sports participants record a lower GPA than non-participants.

Fig. 1 shows the distribution of GPA scores for the two groups of students separately, depending on the branch of their degree course (no specific degrees can be differentiated in Humanities because Universidad Carlos III de Madrid offers only one Humanities degree). Although the distribution of these scores for participants overlaps that of non-participants, the latter is slightly closer to lower GPA levels than the former. In addition, the distribution of scores in Social Sciences and Law and in Humanities is more diverse than that obtained by students studying Engineering.

In addition, Fig. 2 offers additional evidence on the relationship between sports participation and GPA scores. This figure shows data aggregated at degree level in order to compare the proportion of sports participants with their degree scores. A negative relationship between such variables is obtained for the total sample and for students studying Engineering. Such negative relationships imply that very demanding degree courses mean students are less involved in sporting activities (the exception are those students studying Social Sciences and Law and Humanities), where no apparent relationship appears to exist between the two variables).

While suggestive, these figures are means that do not account for other individual level descriptors or the endogeneity of sports participation status. As such, they are limited in their ability to inform about the consequences of participating in sporting activities with regard to academic performance. In what follows, we address those limitations.

Table 2
Variables and definitions.

Variables	Definitions
University grade	Student's grade point average (GPA) in their degree, coded on a running scale from 0 to 10
Number of sports clubs per capita	Number of sports clubs in the student's region of residence relative to the overall population in the region
Sports participant	Dummy variable equal to 1 for students that have participated, at least, in one sports activity before finishing his/her degree
Male	Gender dummy
Migrant	Dummy variable equal to 1 for migrant students
Age	Age of student as of the first year of university degree
High-school GPA	Student's grade point average (GPA) at high school, coded on a running scale from 0 to 10
University entrance examination	Dummy variable equal to 1 for students who entered higher education via the university entrance examination
Times as grant holder	Number of times the student received a grant at Carlos III University before finishing his/her degree
Membership of a large family in years ^a	Number of years the student belonged to a household with more than two children before finishing his/her degree
Region	Dummy variables equal to 1 for the student's region of residence in Spain
Engineering	Dummy variables equal to 1 for students graduating in Aerospace Engineering, Biomedical Engineering, Industrial Technologies and Automation Engineering, Electrical Power Engineering, Computer Science and Engineering, Mechanical Engineering, Telematics Engineering, Audiovisual System Engineering, Communication System Engineering, Industrial Technologies Engineering, Telecommunication Technologies Engineering
Social Sciences & Law	Dummy variables equal to 1 for students graduating in Business Administration, Political Science, Film, Television and Media Studies, Law, Economics, Statistics and Business, Finance and Accounting, Library and Information, Journalism, Employment and Labour Relations, Sociology, Tourism, Law and Political Science, Law and Business Administration, Law and Economics, Journalism, and Film, Television and Media Studies
Humanities	Dummy variable equal to 1 for students graduating in Humanities

Source: Carlos III University. The number of sports clubs was obtained from the dataset DEPORTEData, Spanish Ministry of Education, Sports and Culture (accessible at <http://www.mcu.es/deportebase/cgi/um?L=0>). The population was obtained from the dataset INEbase, National Statistics Office in Spain (accessible at <http://www.ine.es/jaxiT3/Datos.htm?t=9681>).

^a In Spain, a person is considered to be a member of a large family for the number of years there are more than two children in the household until they reach the age of 18.

Table 3
Differences in means: sports participants versus non-sports participants.

Variable	Total sample Mean (SD)	Sports participants Mean (SD)	Non-participants Mean (SD)
University grade	6.91 (0.76)	6.76 (0.71)	6.98 (0.77)
Male	0.52 (0.50)	0.72 (0.45)	0.43 (0.49)
Migrant	0.02 (0.15)	0.02 (0.13)	0.03 (0.16)
Age	18.75 (2.51)	18.62 (1.74)	18.81 (2.79)
High-school GPA	5.34 (1.10)	5.33 (1.11)	5.35 (1.10)
University entrance examination (1=yes)	0.95 (0.22)	0.96 (0.20)	0.95 (0.22)
Times as grant holder	1.05 (1.59)	1.02 (1.55)	1.07 (1.61)
Membership of a large family in years	0.58 (1.45)	0.58 (1.46)	0.58 (1.44)
<i>Bachelor's Degree Branch:</i>			
Engineering	0.31 (0.46)	0.42 (0.49)	0.25 (0.44)
Social Sciences & Law	0.69 (0.47)	0.58 (0.49)	0.73 (0.44)
Humanities	0.008 (0.09)	0.003 (0.06)	0.01 (0.10)
Number of observations	3,671	1,174	2,497

5.2. Model

The main purpose here is to assess the impact that participating in sporting activities has on students' degree results. Prior studies have sought to address this effect by estimating the following model:

$$y_i = \lambda + \alpha I_i + \beta X_i + \varepsilon_i \quad (1)$$

where y_i captures the outcome being examined –i.e., students' degree results (measured via their GPA) – vector X_i includes a variety of controls, I_i is a binary variable that takes the value one if student i is a sports participant and zero otherwise; ε_i is the error term; and λ is the constant term. In order to assess whether the impact of being a sports participant originates from its correlation to other individual or family characteristics crucial to participants and non-participants, or instead from intrinsic features of being a participant (e.g., socialisation via sports), the vector X_i includes a variety of controls. These variables control for observed differences between participants and non-participants, differences that would

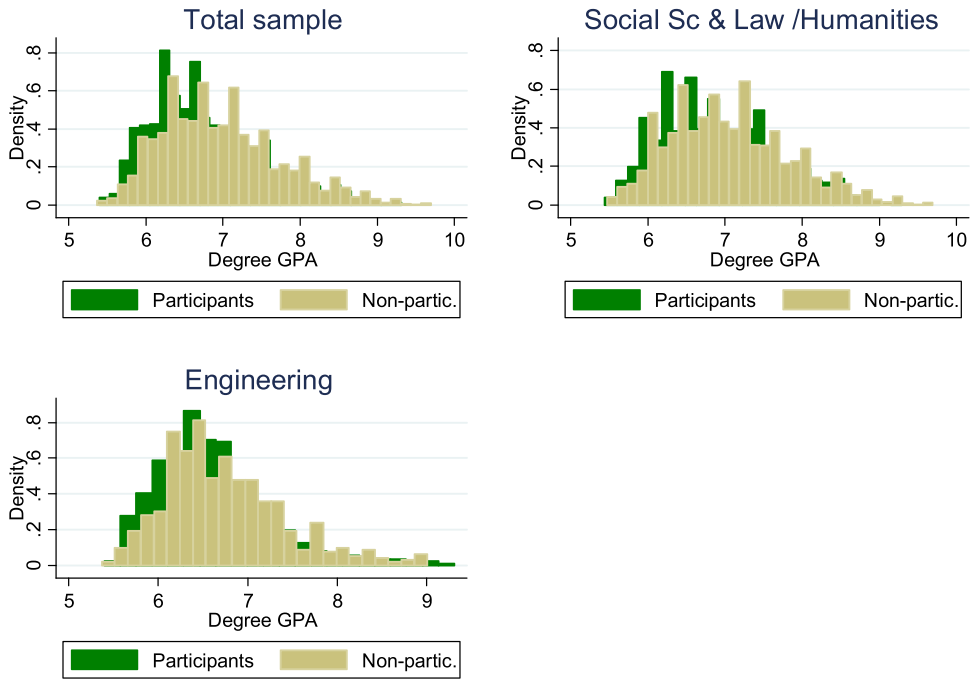


Fig. 1. Distribution of college scores for sports participants and non-sports participants, by branch of bachelor's degree.

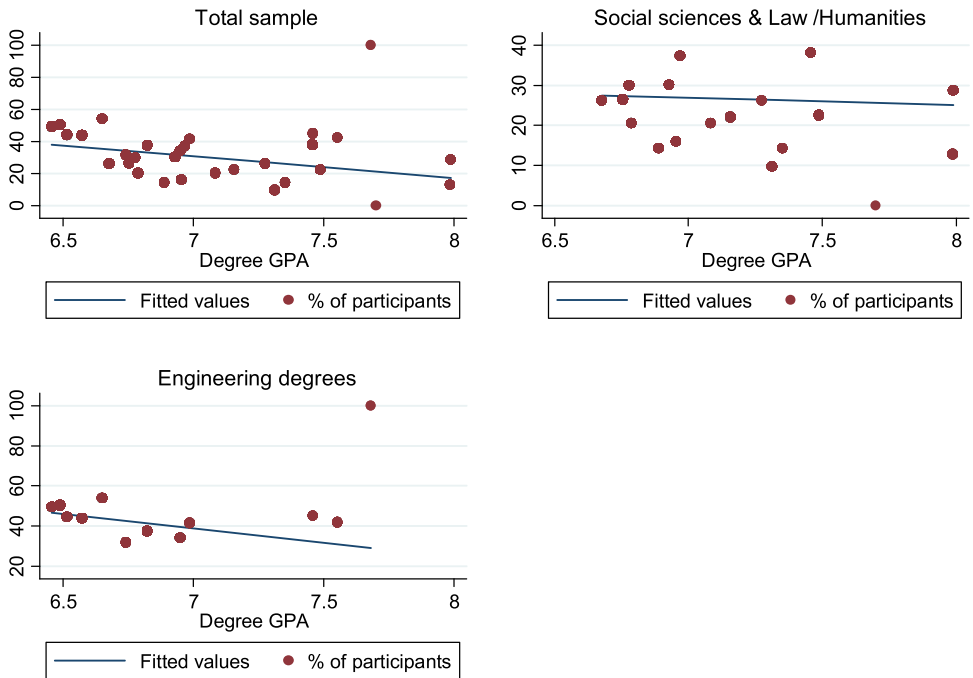


Fig. 2. Percentage of sports participants and college scores, by branch of bachelor's degree.

otherwise be confused with the effect of sports participation. First, we account for a variety of personal characteristics known to affect university performance (see Table 2 above for variable definitions). Specifically, we include information on students' age, gender, migrant status, and previous educational attainment (measured by their GPA at high school¹). Some authors (e.g., Frölich, 2008) have indicated that if students' prior cognitive achievement is included as a covariate in the equation explaining academic achievement, such a variable might be correlated with unobserved student ability or motivation, and therefore be endogenous. For this reason, we have checked whether qualitatively similar results are obtained within our estimation sample in a model that excludes the control variable "High school GPA" (results are available from the authors upon request). Excluding the aforementioned control variable leads to qualitatively similar results to those presented here. These findings do not therefore undermine the validity of our results. Likewise, we also have information regarding students' university record – such as the type of degree chosen—, and whether they have entered higher education via the university entrance examination or via other means (e.g., vocational training, previous graduate, mature students aged over 40, or course validation). Family characteristics are also key to explaining university outcomes. Therefore, the vector X_i includes certain proxies of student family income, such as information on whether the student has been a grant holder or belongs to a large family. Finally, X_i includes a set of dummies indicative of the region where each student resides during their studies, which are intended to capture differences in academic outcomes driven by idiosyncratic characteristics of students from a particular region. Overall, the estimated coefficient α measures how being a sports participant is correlated with university scores.

Note that, as commented in Section 2 above, one difficulty in assessing the consequences of sports participation is that involvement in those activities is voluntary and determined through self-selection. Specifically, students choose whether or not to participate. Thus, student characteristics (such as ability or motivation) are likely to simultaneously affect sports participation and academic performance. As a result, the estimated coefficient α (intended to capture the causal effect of being a participant on university scores) is likely to be biased.

The typical approach to dealing with this endogeneity problem involves using instrumental variables techniques. This technique allows controlling for the endogenous selection of physically active students. In particular, we will estimate an endogenous binary-variable model (e.g., Cameron & Trivedi, 2005; Wooldridge, 2010) by maximum likelihood –maximum likelihood estimators are preferred to their two-step counterparts on efficiency grounds (see, e.g., Tucker, 2010). In this model, we specify the probability of participating in sports activities (i.e., the endogenous regressor) as a function of students' individual and previous academic record. This probability acts as the selection equation in the model. This selection mechanism is described through a latent variable denoted by I_i^* , with the following process:

$$I_i^* = \gamma Z_i + e_i \quad (2)$$

where Z_i is a vector of specific explanatory variables that describes the determinants of the selection process. This set of variables Z_i includes those variables in X_i measured before students join the university that determine their degree results and the instrumental variable chosen (see below). Parameter γ denotes the corresponding vector of unknown parameters in the selection equation, and e_i is the random component of this equation. However, we only observe the realisation of this latent variable I_i as follows:

$$I_i = \begin{cases} 1 & \text{if } I_i^* > 0 \\ 0 & \text{if } I_i^* \leq 0 \end{cases} \quad (3)$$

that is, I_i is an indicator variable that equals 1 if the student participates in sports, and 0 otherwise. Furthermore, we will consider an equation for the outcome (academic performance):

$$y_i^* = \beta_i X_i + u_i \quad (4)$$

Our model allows for endogeneity in the selection equation by assuming that e_i and u_i have a normal bivariate distribution with mean zero and a covariance matrix as follows:

$$\Omega = \begin{bmatrix} \sigma_e^2 & \\ \sigma_{e,u}^2 & \sigma_u^2 \end{bmatrix}$$

where σ_e^2 denotes the variance of the error term in the selection Eq. (2), and σ_u^2 is the variance of the error term in the outcome Eq. (4). Finally, we use $\sigma_{u,e}^2$ to denote the covariance between u_i and e_i . This term captures the correlation between the probability of sports participation and academic performance. The interpretation of this term is as follows; if, for example, $\sigma_{u,e}^2 < 0$, then there is a negative relationship between the unobserved variables that make a student more likely to participate in sports activities and the unobserved characteristics that increase the student's academic performance. That is, those factors that make students more likely to participate in sports also make them record a worse academic performance. By contrast, if $\sigma_{u,e}^2 > 0$, what makes students more likely to participate in sports also makes them record a better academic performance. If $\sigma_{u,e}^2 = 0$, there is no correlation between the errors of the selection equation and the academic performance

¹ The Spanish university system applies a formula for converting international students' high-school grades into their equivalent in the Spanish system. For details, please see the Resolution of 29th April 2010 issued by Spain's Secretary of Education and Professional Training (available online at https://www.boe.es/diario_boe/txt.php?id=BOE-A-2010-7331).

or outcome equation. Finally, the correlation coefficient between e_i and u_i is denoted by ρ . This coefficient is estimated together with all the other parameters in the model, and its interpretation is analogous to that of $\sigma_{u,e}^2$. The model also provides a test of the correlation of the error terms in the two equations (the outcome equation and the selection equation), which becomes a test for the existence of endogeneity in sports status.

Although the model can be identified by assuming the joint normal distribution of the error terms (u_i and e_i), the consideration of instrumental variables can improve it (Maddala, 1988). In particular, our specification will consider an instrumental variable that is correlated with the endogenous variable (i.e., it is significant in explaining the probability of sports participation), uncorrelated with student scores, and does not affect the outcome of the interest conditional on the included regressors (Stock & Watson, 2007). Following the existing literature (e.g., Pawlowski, Downward, & Rasciute, 2014; Ruseski, Humphreys, Hallman, Wicker, & Breuer, 2014; Wicker & Frick, 2015), we choose the number of sports clubs over the population in the student's region of residence as an instrument. The choice of this instrument rests on the assumption that it does not directly influence a student's GPA, except insofar as it determines the student's likelihood of participating in sports. In particular, in the field of public sports policy, financial support for professional sports clubs and the public sponsorship of sporting events may help to increase the sports participation rate (see, e.g., Lera-López & Rapún-Gárate (2011), for the Spanish case).

In what follows, we provide data in support of this instrument. We base our argument on two kinds of analyses. First, unconditional analyses give us some reason to choose this variable for the identification of the model, since neither non-participants' GPAs nor participants' GPAs vary significantly with the relative number of sports clubs—for instance, for non-participants, GPAs range from 7.04 for regions with a number of sports clubs below the median, to 6.92 for regions above the median (a similar range is obtained for participants). Second, the probability of participating in sporting activities varies greatly with the number of sports clubs in the student's region of residence (ranging from 37.79% for those in regions with a number of sports clubs above the median to 29.15% for those in regions below the median). These unconditional analysis results are required for an appropriate instrument. Second, we checked the robustness of our instrument by estimating the impact of our instrumental variable on students' scores once we control for all the explanatory variables in our model, together with an indicator of whether the student is a sports participant. The coefficient t-test for the variable collecting the number of sports clubs in the student's region of residence indicates that this variable is not a significant predictor of GPA scores once we use the same equation to consider whether or not the student is a sports participant (this coefficient and its standard deviation are 1.034 and 3.356, respectively). We may therefore conclude that the number of sports clubs over the population in the student's region of residence can be used as an instrument, enabling us to identify our model.

6. Results: the effect of sports participation on GPA scores

Table 4 shows the corresponding estimates for the sports participation equation (columns 2 and 3). All the variables in this equation were assessed prior to participation in the sporting activity, and account for certain factors that influence the selection of sporting activities. The instrumental variable proposed above is a significant predictor of the probability of sports participation. In particular, students from regions with a larger number of sports clubs appear significantly more likely to participate in sports.

Table 4 also shows the estimated results for the outcome equation (columns 4 and 5). The likelihood ratio test indicates that we can reject the null hypotheses of lack of correlation between the error in the outcome equation and the error in the selection equation. Specifically, the $\chi^2(1)$ statistic takes the value of 17.65—with a corresponding p-value of 0.00001. Our results therefore support the finding that there is significant endogenous selection in sports participation. The estimated correlation ρ between the error terms in the sports participation equation and in the outcome equation is negative (-0.637), indicating that the unobservables that raise university GPA scores tend to coincide with unobservables that lower sports participation. One interpretation is that students with greater ability or motivation are more likely to achieve higher GPA scores and, at the same time, are less likely to participate in sporting activities.

What are the key findings when we instrument for students' sports participation status? The estimates in Table 4 reveal that average GPA scores are 8.32% higher ($=100*(\exp(0.080)-1)$) for sports participants than for non-participants (Halvorsen & Palmquist, 1980). Therefore, this participation improves undergraduate students' academic performance in terms of final GPA scores. Note that the descriptive statistics analysis from the previous section concluded that the relationship between students' GPA scores and their sports participation was of the opposite sign. This is plausible if some of the omitted variables in the analysis are directly (inversely) correlated to the likelihood of participating in sports, but inversely (directly) correlated to the university grade attained. Take, for instance, educational expectations, which are necessarily omitted from the empirical model proposed because they are missing from the dataset: students who think they will go far at university are usually the ones that achieve better grades. At the same time, these students may avoid participating in sporting activities if they think that doing so poses a threat to their academic performance (as argued in Section 3.5, for instance). Under such circumstances, estimates that do not take into account the endogeneity of sports participation may be downward biased.

Secondly, sports participation continues to be a significant determinant of university scores even after we account for a wide range of personal, family and regional characteristics linked to the sports participation and GPA scores being examined. These characteristics range from various measures of accumulated human capital—including age, previous educational attainment, and migrant status—to students' university records—type of degree chosen, the way of access into university—, their region of residence, or proxies for family wealth—whether the student has been a grant holder or belongs to a large family. As such, the role

Table 4
Estimation results: participation and outcome equations.

Variables	Sports participation equation		Outcome equation	
	Coefficient	Standard error	Coefficient	Standard error
Constant	0.016	0.362	1.528***	0.022
Number of sports clubs per capita	160.410***	45.772	–	–
Sports participant	–	–	0.080***	0.010
Male	0.661***	0.050	–0.019***	0.004
Migrant	–0.080	0.153	0.001	0.01
Age	–0.042***	0.014	0.003***	0.0007
High-school GPA	–0.043*	0.024	0.055***	0.002
University entrance examination	–0.006	0.120	0.035***	0.008
Times as a grant holder	–	–	0.004***	0.001
Membership of a large family in years	–	–	–0.001	0.001
<i>Bachelor's Degree:</i>				
Aerospace Engineering	0.305	0.301	–0.077***	0.021
Biomedical Engineering	0.498*	0.290	–0.098***	0.021
Industrial Electronics and Automation Engineering	0.183*	0.102	–0.038***	0.007
Electrical Power Engineering	0.295**	0.143	–0.035***	0.010
Computer Science and Engineering	–0.0004	0.101	0.017**	0.007
Mechanical Engineering	0.307***	0.101	–0.063***	0.007
Telematics Engineering	–0.185	0.208	–0.010	0.014
Audiovisual System Engineering	0.343**	0.157	–0.053***	0.011
Communication System Engineering	0.520***	0.184	–0.052***	0.014
Industrial Technologies Engineering	0.063	0.142	–0.067***	0.010
Telecommunication Technologies Engineering	0.259	0.351	–0.033	0.027
Business Administration	–	–	–	–
Political Science	–0.366*	0.225	0.070***	0.015
Film, Television and Media Studies	–0.098	0.125	0.079***	0.008
Law	–0.024	0.086	–0.002	0.006
Economics	–0.046	0.091	–0.008	0.006
Statistics and Business	–0.519**	0.259	0.041***	0.015
Finance and Accounting	–0.121	0.126	–0.006	0.008
Library and Information	–0.395*	0.214	0.111***	0.013
Journalism	0.276**	0.112	0.057***	0.008
Employment and Labour Relations	–0.409**	0.172	0.064***	0.011
Sociology	–0.598**	0.264	0.102***	0.015
Tourism	–0.128	0.183	0.043***	0.012
Law and Political Science	0.021	0.204	0.071***	0.012
Law and Business Administration	–0.122	0.139	0.036***	0.009
Law and Economics	0.249	0.192	–0.011	0.014
Journalism and Film, Television and Media Studies	0.104	0.159	0.107***	0.011
Humanities	–0.430	0.319	0.145***	0.018
ρ			–0.637***	0.050
LR test ($\rho=0$)				
χ^2 statistic	–		17.65	
Prob > F	–		0.00001	
Sample Size	3,671			

Notes: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Correlation (ρ) indicates the correlation between the error terms in the sports participation equation and the outcome equation.

played by sports participation on academic performance does not appear to be driven solely by its correlation to the aforementioned individual, family or regional characteristics. Instead, sports participation may be impacting on university grades through other circumstances innate to being a sports participant, such as those discussed in Section 3 above.

Other findings are as expected. For instance, we find that scores are higher among older students and among those with better previous academic records. Moreover, female students outperform male ones in terms of GPA. Finally, higher scores are also closely associated with students receiving grants. Families with students in this situation may be under higher financial stress, which may result in pressing economic need, and the need for the student to achieve higher grades in order to enjoy better career opportunities after completing their degree. In addition, the fact that students receiving grants perform better than observationally similar students who do not receive any financial support from public institutions may be because these institutions are doing a good job at screening high-ability students.

7. Conclusions

7.1. Contribution, discussion and implications

Despite the fact that scholars have long been interested in identifying the factors that may influence the academic success of students in different educational settings (from middle school to higher education; Gaston-Gayles, 2004), prior

studies have produced contradictory results on whether physically active students record a better academic performance than their non-athletic peers (e.g., [Fredricks & Eccles, 2005](#); [Jayanthi et al., 2014](#)). In this paper, we have sought to shed new light on the role of sports participation in academic performance in higher education by providing new insights from a sample of undergraduate students at Universidad Carlos III de Madrid (Spain) over the period between 2008 and 2014.

Our work adds to previous research by theorising that several key conditions related to sports participation may determine any differences (positive and negative) in terms of academic performance between students who are physically active (participants) and those who are not (non-participants). In addition, whereas the previous literature has analysed the effect that participating in extracurricular activities (such as sports) has on academic performance in middle and high-school students (i.e., [Bailey, 2006](#); [Fox, Barr-Anderson, Neumark-Sztainer, & Wall, 2010](#); [Fredricks & Eccles, 2005](#)), the research stream considering the effect sports participation has on academic performance in higher education is more limited (i.e., [Aries, McCarthy, Salovey, & Banaji, 2004](#); [Kiger & Lorentzen, 1986](#); [Levine et al., 2014](#)). From an empirical point of view, our analysis also advances previous research by using a longitudinal dataset—many previous works use cross-sectional analysis ([Gaston-Gayles, 2004](#); [Marsh & Kleitman, 2002](#); [Mahoney et al., 2003](#))—, and by explicitly considering that by its very nature sports participation is voluntary. Following the prompts in prior literature (e.g., [Fredricks & Eccles, 2006b, p. 711](#)), we adjust for self-selection in sporting activities by using instrumental variables estimation techniques.

Our results show that apart from the value they provide in terms of health benefits for practitioners, sporting activities lead to the attainment of the performance goals to which higher education institutions aspire, and thereby uphold academic standards ([Fox et al., 2010](#)). This finding is consistent with works that emphasise that sporting activities can improve academic performance, whereby such activities become relevant for academic achievement (i.e. [Robst & Keil, 2000](#)). Thus, our work highlights the importance of sports participation for earning good grades among undergraduate students.

Our results provide significant support and acknowledgement for those policies in higher education that seek the holistic education of students and present sporting activity as one of the mainstays of education. It is comforting to find that sporting activities can improve academic performance since, in general, universities and other educational institutions consider that academic achievement is positively related to professional success. This circumstance is especially important at the university in question here, the Universidad Carlos III de Madrid, where one of the goals of the department responsible for developing the sports programme for students is “to contribute to the better integration of students in university life and prevent personal and academic failure”. As [Umbach, Palmer, Kuh, & Hannah \(2006, p. 727\)](#) have pointed out “it is incumbent on colleges and universities to learn more about the experiences of their student-athletes and determine whether they are taking part in educationally sound activities and benefiting in desired ways from college at levels commensurate with their non-athlete peers”. Similarly, [Gaston-Gayles and Hu \(2009\)](#) have also indicated the need for faculty staff to offer services and support that help physically active students to interact more with other students and see themselves as both legitimate students and athletes.

It is important to note the value our results may have at academic level in higher education, particularly within a context in which a raft of student services, including many sporting programmes, have experienced cut-backs in Spain since the onset of the financial crisis. Indeed, public investment in sports activities by national, regional and local authorities in Spain has fallen from a total of 2.77 billion euros in 2010 to only 1.77 billion in 2014 ([Spain's Ministry of Education, Culture and Sports, 2016](#)). Our results therefore help to build a compelling case supporting the importance of both ongoing investment in sports programmes on university campuses in Spain and the professional administration of sport in higher education institutions in order to establish, sustain and increase sports participation among university students. The university sports sector must fight its corner in today's public policy climate, and it is hoped that our results will contribute to that aim. In helping to better prepare students for success in their degrees, universities should consider offering more formal sports programmes to complement their educational offerings. More developed sports programmes may help these students to transfer their passion for sport into the educational arena, and thus increase their academic motivation, their ability to cope with and overcome obstacles, and develop new skills and competencies. In this regard, EU Member States have already undertaken several actions in this field within the university sector, such as the development of academic services, elite sporting provisions, and post-athletic career preparation ([Aquilina & Henry, 2010](#)).

In contrast to this, Spanish universities, governed by the principle of autonomy they enjoy, have a varying track record in terms of the provision of extracurricular activities for their students in general, and, in particular, regarding the possibility of playing sport on a regular and regulated basis on university campuses. For this reason, promoting participation in sporting activities can play an important role in our society. In this regard, Spanish universities have raised the number and quality of their offer of physical activities for students on their campuses in recent years, and what's more, students have responded to this offer by participating in large numbers. Furthermore, the role that sport plays at universities has adapted to the European Higher Education Area, whereby students may extend their degrees to include the skills they have acquired through sport. The widespread participation of university students in extracurricular activities such as sport provides a great opportunity to influence a new generation of students who not only have the motivation to pursue such opportunities, but also aspire to academic achievement. At the same time, the growth in the number of college students in sport may increase the interest universities have to offer education in sports subjects.

7.2. Limitations and future research

This research is not without its limitations, whereby further contributions may be made to this field of study. Firstly, our study focuses on a single higher education institution (Universidad Carlos III de Madrid, Spain), and on those students who practice sport within the university. This restricts the possibility of generalising its findings (Gaston-Gayles, 2004; McArdle et al., 2013). Therefore, one of the future lines informed by this research involves conducting a comparative study across different institutions (e.g., public versus private universities; European versus US, etc.), with a view to discovering whether the findings reported here are also valid in other educational contexts. Thus, for example, regarding the distinction between public and private universities in Spain, we may highlight the different ways in which students access sporting activities, as the ones provided by public universities are largely funded by the students themselves through the payment of a registration and participation fee; while in most private universities these activities are included in the student's enrolment fees.

In addition, future research could analyse the potential benefits of taking part in other kinds of extracurricular activities (Eccles & Barber, 1999; Mahoney et al., 2003), for as Feldman and Matjasko (2005, p. 194) reported at the time, not all extracurricular activities are the same. For example, activities such as sport require very close supervision by a trainer or sponsor, they are held several times a week, they entail a certain amount of competition, and they generally involve a large body of students. By contrast, activities such as, for instance, foreign language clubs tend to have a fewer number of students with a higher turnover, and involve less contact with the sponsor.

Finally, note should also be taken of the need to know whether the duration, number and type of activities in which students take part have an impact on the academic outcome recorded (Feldman & Matjasko, 2005; Fredricks & Eccles, 2006a). Although these variables are only available for sports participants (and not for non-participants), including them in the analysis would allow conducting further studies that consider solely those students that play sport, and analyse such aspects as the effect of the duration or intensity this has on academic performance.

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