The Association between Sport Activities and Educational Achievements:

Evidence from Russian Longitudinal Data

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Abstract. This paper empirically studies the association between the sport activities and educational achievements of school students from 1st to 11th grade. The sample used included observations over the period 2010–2015 taken from the Russia Longitudinal Monitoring Survey (waves 19–24), which is a unique nationally representative survey. The method consisted of logit regressions with panel data, which allows for controlling time-invariant explanatory variables. The empirical analysis was divided into sport activities at school (in class) and out-of-school (before or after classes). Furthermore, the regression analysis examined the effect of three large groups of sport activities: 1) Combat sports, such as karate, judo, self-defense, wrestling, and boxing, 2) Ball sports, such as tennis, soccer, basketball, and volleyball, 3) Athletic sports, such as track and field, skiing, and skating. General speaking, the findings indicated that sport activities at school do not have significant associations with educational achievements. On the other hand, sport activities out-of-school showed some positive relationships. Specifically, participation in athletic and combat sports increases the probabilities of boys and girls, respectively, being classified as high-performing students. Moreover, male students practicing ball sports out-of-school are less likely to be classified as low-performing students. The time that students spent on these sports does not influence these probabilities. However, male students spending more than 10 hours per week on sports (high-performance sportsmen) are more likely than other students to be linked to the group of low-performing students.

Keywords: sport activities; physical education; educational achievement; Russia; logit regression; panel data.

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1. Motivation

James Coleman was a prominent sociologist who developed our understanding on the relationship between social capital and educational outcomes, and also one of the first scholars suggesting an inverse relationship between sports and educational outcomes [Eitle, Eitle 2002; Troutman, Dufur 2007]. Note that, sometimes, sports generate

distraction, make students too tired or nervous to study or to concentrate in class [Lamborn et al. 1992]. Furthermore, sports have been associated with risky behavior, for instance, drinking alcohol [Eccles, Barber 1999] and alcohol use has been associated with lower levels of educational attainment [Bailey 2016].

Nonetheless, sport activities have also been positively linked to educational aspirations, school grades, attendance, engagement, and other positive educational outcomes [Bailey, 2016]. Sports provide educational experiences that cannot be reached in the classroom, and this has positive impacts not only on educational outcomes, but also on occupational outcomes. In other words, sports provide training [Barron, Ewing, Waddell 2000; Lunn, Kelly 2015], for example, discipline to achieve goals and strategies for interacting with others in the settings.

Barron et al. [2000] noted that the academic differences between athletes and non-athletes can be explained by background factors. In general, American football and basketball, usually classified as revenue sports and associated with black men, are time consuming and are unrelated or negatively related to educational outcomes [Eitle, Eitle,2002; Rettig, Hu 2016]. Troutman and Dufur [2007] found that females participating in interscholastic sports are more likely to graduate from college than female non-participants. This additional benefit of sport participation for women has also been found in Germany. It seems that sports allow girls to reach higher levels of competitiveness. As a result, the positive impacts of sports are even larger for women than for men [Pfeifer, Cornelißen 2010].

Peers also play an important role in school success and aspirations, and this is particularly relevant for students participating in sports. In the sport milieu, it is possible to find new friends. For maintaining status and reputation with them many times it is also necessary to keep good notes and high educational aspirations [DeMeulenaere 2010]. In general, this milieu allows new contacts and networks, that is, social capital. Moreover, instructors, mentors, coaches, and trainers many times are key factors not only for school success.

In short, the literature suggests two opposite hypothesis. First, sports distract and divert energies away from academic activities; therefore, sports correlate with low educational outcomes (the zero-sum hypothesis). Second, sports encourage a series of biological and psychosocial factors supporting and favoring academic activities; therefore, sports correlate with high educational outcomes (the developmental hypothesis). There should be a threshold level, which may depend on individual characteristics, yet much time spent on sports may not allow students to achieve high educational outcomes. This is the case for high-performance sportsmen who usually begin their sport careers at an early age and need specific school programs for academic success [Emrich et al. 2009; Gayles, Hu 2009; Rettig, Hu 2016].

Actually, the claim that sport activities are important for educational outcomes was noted by physicians, neurologists, psychologists and physical educators more than 100 years ago [Park, 2014]. After all, nowadays, sport activities (physical education classes) are part of the school curriculum in the majority of countries, due to proof of their educational worth [Van Deventer 2014].

It is important to note that the empirical literature is centered on high school students and intramural or interscholastic sports in the American context. Consequently, the above mentioned findings cannot simply be generalized to other countries, with different institutional settings and infrastructure. In Russia, as in many other countries, sport activities are mainly practiced in sport clubs or public sport sites. Sometimes schools provide spaces for practicing sports, not only for their students, but these activities are not managed by schools and are not part of their responsibilities. In addition, schools rarely have school teams and formal schedules for sports as extracurricular school activities. In the USA, school sports are well established, are the first stages for professionalism, and participation in school teams is conditioned to average grades on school subjects. This is not the case in Russia, where typically there is a physical education class without high requirements. Given this, the present research addressed the following questions: what is the relationship between sport activities at school and out-of-school and the educational achievements of school students in Russia? And what is the specific relationship by type of sport?

To address these questions the analysis drew on data from the Russia Longitudinal Monitoring Survey (RLMS-HSE). The data set allowed the use of logit regressions with panel data, controlling for time-invariant explanatory variables and allowing better estimations of the specific effect of sport activities, which has been a challenge for previous studies as noted by DeMeulenaere [2010]. Subsequently, this research contributes to the literature in three ways. First, in contrast to most of the previous studies, which focused on high school students and school sports, here the sample included students in all levels of school training (11 years of schooling) and participation in sport activities out-of-school. Second, this study included time estimations, in hours and minutes, dedicated to sport activities, and not only dummy or ordinal variables on sport participation. Finally, note that for the Russian case there are several studies with a focus on the relationship between educational outcomes and socioeconomic status, cultural capital, social capital, school resources, and psychological factors [Popov, Tyumeneva, Kuzmina 2010, 2012; Roshchina 2010, 2012; Tovar-García 2013, 2014]. It is also possible to find studies with a focus on specific groups, for instance, on migrants [Alexandrov, Baranova, Ivaniushina 2012; Tovar-García 2017], and even on the role of language [Alòs i Font 2016; Tovar-García, Alòs i Font 2017], yet there are no studies with a focus on the nexus between sport and educational outcomes.

2. Method

The present research used data from six waves of the Russia Longitudinal Monitoring Survey (RLMS-HSE), conducted by the National Research University Higher School of Economics (HSE) and ZAO "Demoscope" together with Carolina Population Center, University of North Carolina at Chapel Hill and the Institute of Sociology, Russian Academy of Sciences (RAS). RLMS-HSE is a nationally representative study that collects information to monitor the effects of Russian reforms on the health and economic welfare of households and individuals. The first wave of the survey was conducted in 1992 but the information required for this research (from the questionnaire for children) is only available for the period 2010–2015, that is, from round 19 to round 24.[1] The baseline sample consists of 11243 observations from 3753 school students.

2.1. Dependent variables

The variables on educational achievements were operationalized by what the respondent, usually the father or mother, believed was the educational progress of his or her children. The item is "How would you estimate (his/ her) progress?" The response categories are: 1 = Almost all the grades are five, 2 = Basically all five and four, 3 = Basically all four, 4 = Basically all four and three, 5 = Basically all three, 6 = Basically all three and often two, 96 = Marks are not given, 97 = Doesn't know, 98 = Refuses to answer. From option 1 to 6 the variable was reverse coded to use it in an ordinal manner so that higher scores were reflective of higher educational progress and all other responses and missing data were not included. Note that the grading system in Russian schools, in practice, only uses marks from 2 to 5, where the minimal mark to pass is 3.

After this stage, the variable was re-coded to obtain two dummy variables. First, school students whose grades are almost all five were coded 1, and 0 otherwise (HIGH-PERFORMING STUDENTS). Second, school students whose grades are basically all three and whose grades are basically all three and often two were coded 1 (LOW-PERFORMING STUDENTS). About 11% of the students are classified as high-performing students and 5% are classified as low-performing (see Table 1).

TABLE1

2.2. Independent variables

Participation in sport activities was measured by several items allowing a division in the analysis between activities in class at school and

[1] Details about the design of the survey are well described in the official website of RLMS-HSE. Note that respondents, usually the parents of children, are advised on the research motives of the survey and the surveyors are highly qualified. Nevertheless, it is possible to expect a bias in the answers given to the questions used to operationalize the key variables of this research. This is a limitation of the study, which is minimized due to the longitudinal nature of the survey and the method.

activities before or after classes (out-of-school), measuring the degree of this participation and by type of sport. Note that these activities may take place within the school facilities, but they are not part of the school curriculum.

First, the question "Does (he/she) attend physical education classes at school?" was used. The response categories are: 1 = Yes, 2 = No, 7 = Doesn't know, 8 = Refuse to answer. A dummy variable coded 1 for positive answers (97%) and 0 for negative answers (3%) was built (SPORT AT SCHOOL). Therefore, practically all students have a physical education class, as expected because of the school curriculum in Russia. Exceptions correspond to specific cases where students are unable to practice sports or due to temporal difficulties to practice sports at the school grounds. Note that this is a very high figure in comparison with the USA where participation in physical education classes has been decreasing from the 70's; around 30% of American students attended such classes in 2006 (Park, 2014).

Second, an ordinal variable (OFTEN SPORT AT SCHOOL) was built using the question "How often does (he/she) engage in physical activities during school, in class?" with response categories: 1 = 1–3 times a month, 2 = 1 time a week, 3 = 2 times a week, 4 = 3–4 times a week, 5 = Every day, 7 = Doesn't know, 8 = Refuse to answer. Only options 1 to 5 were used, and responses 7 and 8, and missing data, were not included. On average, students practice sports 2 times per week, which agrees with the school curriculum of the majority of regular public schools.

Third, four dummy variables by type of sport and four continuous variables on time spent by type of sport were built using the item "Now I will list various kinds of physical activities and ask you to tell me in which of them (he/she) participates during class, and if so, for how many hours and minutes per week". The response categories are:[2]

1) "Karate, judo, self-defense, wrestling, boxing, gymnastics". A dummy variable (COMBAT SPORTS AT SCHOOL) was built, coded 1 for positive answers. Then, the time spent on these kinds of sports was measured only in hours (adding the reported minutes) and the variable HOURS COMBAT SPORTS AT SCHOOL was built.

2) "Active sports: badminton, tennis, soccer, basketball, volleyball, hockey, or swimming". A dummy variable (BALL SPORTS AT SCHOOL) was built, coded 1 for positive answers. Then, the time spent on these kinds of sports was measured in hours and the variable HOURS BALL SPORTS AT SCHOOL was built.

3) "Track and field, skiing, skating". As in previous cases, a dummy variable (ATHLETIC SPORTS AT SCHOOL) and a continuous variable (HOURS ATHLETIC SPORTS AT SCHOOL) were built.

[2] Gymnastics is not a combat sport, swimming is not a ball sport, and skiing is not a type of athletics. The reason to be included in their respective items is unknown. Therefore, this is another limitation of the survey.

4) “Other kinds of physical activity”. Similarly, a dummy variable (OTHER SPORTS AT SCHOOL) and a continuous variable (HOURS OTHER SPORTS AT SCHOOL) were built.

In the survey, very similar questions and response categories are used to measure participation in sport activities and the degree of this participation before or after classes. Thus, the same dummy variables and continuous variables were built using the words OUT SCHOOL to distinguish them from activities AT SCHOOL. Subsequently, the dummy variable SPORT OUT SCHOOL corresponds to the question “Does (he/she) engage in physical activities and sports before or after classes? Bearing in mind training sessions with a coach as well as simply active games outdoors, soccer, tag, hopscotch, hide and seek, riding a bicycle, roller skating, etc.” The ordinal variable OFTEN SPORT OUT SCHOOL corresponds to the question “How often does (he/she) engage in physical activities and sports, including outdoor games, before or after classes?”. The rest of the dummy and continuous variables by type of sport OUT SCHOOL correspond to the item “I will list various physical activities and ask you to tell me in which (he/she) engages before or after classes, and for how many hours and minutes per week”.

On average, 60% of students practice sports out-of-school (68% of boys and 52% of girls), 3–4 times per week, that is, with a frequency of almost 2 times more than at school. These figures are similar to those reported in Germany, where 64% of men and 44% of women participated in sports activities out-of-school (Pfeifer & Cornelißen, 2010). Besides, on average, Russian schoolchildren spent more hours out-of-school than at school in all type of sports. This makes sense because some of the sports undertaken do not require expensive or very specific equipment, and also because in Russia sports are mainly practiced in sport clubs or public sport sites (see Table 1).

2.3. Control variables

This research in operationalizing control variables is borrowed from Tovar-García (2017): socioeconomic status, regular schools, health issues, the largest cities of Russia, age, and gender.

The following three items operationalized socioeconomic status (SES): “Does he/she have his/her personal (1) Tablet PC, (2) Mobile PC, notebook, laptop, netbook, and (3) Smartphone, Communicator, i-Phone”. The response categories are: 1 = Yes, 2 = No, 6 = used by several family members, 7 = Doesn’t know, 8 = Refuse to answer. Positive answers obtained 1 point and 0.5 points were given for the use of the device by other family members. Then, these points were added to obtain the ordinal variable SES, which can take values from 0 to 3. Note that socioeconomic status will not substantially change over time and the method is already controlling for this variable, as stated in the following section. However, it is adequate to include this proxy of SES to obtain more accurate estimations and because SES has impacts on the selection effect into sports.

Table 1. **Descriptive statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max	Mean Male	Mean Female
Educational Achievements							
HIGH-PERFORMING STUDENTS	10466	0.11	0.31	0	1	0.08	0.14
LOW-PERFORMING STUDENTS	10466	0.05	0.22	0	1	0.08	0.03
Sport activities in class at school							
SPORT AT SCHOOL	10009	0.97	0.18	0	1	0.97	0.96
OFTEN SPORT AT SCHOOL	9642	3.43	0.66	1	5	3.44	3.41
COMBAT SPORTS AT SCHOOL	9644	0.22	0.41	0	1	0.22	0.22
BALL SPORTS AT SCHOOL	9640	0.63	0.48	0	1	0.69	0.57
ATHLETIC SPORTS AT SCHOOL	9640	0.46	0.50	0	1	0.45	0.47
OTHER SPORTS AT SCHOOL	9643	0.63	0.48	0	1	0.63	0.64
HOURS COMBAT SPORTS AT SCHOOL	9505	0.20	0.60	0	10	0.22	0.18
HOURS BALL SPORTS AT SCHOOL	9224	0.79	1.10	0	20	0.92	0.67
HOURS ATHLETIC SPORTS AT SCHOOL	9317	0.45	0.72	0	14	0.44	0.46
HOURS OTHER SPORTS AT SCHOOL	9124	0.75	0.94	0	20	0.73	0.77
Sport activities before or after classes (out-of-school)							
SPORT OUT SCHOOL	9996	0.60	0.49	0	1	0.68	0.52
OFTEN SPORT OUT SCHOOL	5903	4.00	0.97	1	5	4.04	3.95
COMBAT SPORTS OUT SCHOOL	5948	0.16	0.37	0	1	0.21	0.11
BALL SPORTS OUT SCHOOL	5946	0.47	0.50	0	1	0.58	0.33
ATHLETIC SPORTS OUT SCHOOL	5943	0.25	0.43	0	1	0.22	0.29
OTHER SPORTS OUT SCHOOL	5947	0.68	0.47	0	1	0.62	0.75
HOURS COMBAT SPORTS OUT SCHOOL	5936	0.66	1.93	0	20	0.85	0.43
HOURS BALL SPORTS OUT SCHOOL	5870	1.67	2.81	0	35	2.18	1.04
HOURS ATHLETIC SPORTS OUT SCHOOL	5863	0.70	1.85	0	28	0.63	0.79
HOURS OTHER SPORTS OUT SCHOOL	5680	3.44	4.72	0	42	3.23	3.70
Control variables							
SES	11243	0.37	0.57	0	3	0.38	0.37
HEALTH ISSUES	11215	3.76	0.55	1	5	3.77	3.75
REGULAR SCHOOLS	11238	0.77	0.42	0	1	0.79	0.76
MOSCOW & SAINT PETERSBURG	11243	0.15	0.36	0	1	0.15	0.14
AGE	11243	10.54	2.61	6	19	10.57	10.50
MALE	11243	0.49	0.50	0	1		
HIGH-PERFORMANCE SPORTSMAN	11243	0.05	0.22	0	1	0.06	0.05

Source: Author's calculation

A dummy variable coded 1 for REGULAR SCHOOLS was built using the question "Is (he/she) studying in…?" with response categories: 1 = Gymnasium or school with gymnasium classes, 2 = School specialized in profile education of subjects, 3 = Comprehensive college, lycee, 4 = Non-residency school, 5 = Regular school, 6 = Another type of school, 7 = Doesn't know, 8 = Refuse to answer. About 77% of students are in regular schools.

The variable HEALTH ISSUES is operationalized using the question "How would you evaluate (his/her) health?" with response categories: 1 = very good, 2 = good, 3 = Average-not good, not bad, 4 = bad, 5 = very bad, 7 = Doesn't know, 8 = Refuse to answer. This variable was reverse coded so that higher scores were reflective of better health, which should also allow the practice of sports.

School students from Moscow and Saint Petersburg were coded 1 (15%), these are the largest cities of Russia, and it is expected a concentration of clubs and sport facilities. In the sample, students are 6 to 19 years old, and the student's age (AGE) is also included as a control variable. Actually, there are very few students of 18 and 19 years old. Usually school students are 17 years old in the last year of post-secondary education (11th grade) and children are usually 7 years old in first grade of the elementary school. Therefore, AGE also allows control for school years.

Male students were coded 1 (49%) creating the dummy variable MALE. As mentioned in the literature review, most of the studies from the 70's to the 90's did not included females in the analysis of the relationship between sport and educational outcomes due to the small percentage of women participating in sport. Yet, recent studies suggest that females obtain more benefits from sports than males (Pfeifer & Cornelißen, 2010; Troutman & Dufur, 2007). In addition, a gender gap has been found in Russia; girls perform better at school than boys (Tovar-García, 2013, 2014). This is also noted in Table 1, where a higher percentage of girls are classified as high-performing students, and a higher percentage of boys are classified as low-performing students.

It is well known that high-performance sportsmen consider their sport activities as a priority, performing poorly at school and/or studying in special school programs (Gayles & Hu, 2009; Rettig & Hu, 2016). Therefore, as a final control variable, students reporting participation in sport activities for more than 10 hours per week (5%) were coded 1 (HIGH-PERFORMANCE SPORTSMAN).

The correlation matrix of the major variables of this study was also analyzed (not shown here). In general, there are low correlation coefficients between independent variables, excluding the dummy variables by type of sport and the corresponding variable on number of hours spent by type of sport. Thus, in the following section several regressions are analyzed to account for possible multicollinearity concerns.

3. Results

Data analysis was conducted using regression analysis, mainly logit regressions with panel data. This empirical strategy differs from previous empirical studies using longitudinal data, but cross-sectional regression models. Note that panel data have several advantages because they are more informative, show more variability, present less collinearity concerns, give more degrees of freedom and offer more efficiency [Baltagi 2005].

It is possible to recognize a large list of explanatory variables of educational achievements, yet most of them will not change (gender, ethnicity, race, and so on) or will slowly change over time. The core components of cultural capital, social capital and the students' socioeconomic status, usually measured by parental education, parental professional status and family income, are variables that will hardly change over time. Even variables affecting the selection effect into sport participation (for example, sport facilities and parental involvement in sports) will not substantially change over the period under study. Therefore, in this analysis of educational achievements, it is particularly relevant that regressions with panel data allow control measures for time-invariant explanatory variables [Tovar-García 2017].

It is easier to identify these advantages in a panel data model with two time periods (before-after comparisons). This is also a model in first-differences, comparing values of the dependent variable in the second period with values in the first period. In Equation (1), let Z_i be a variable that determines educational achievements in the case of the *i*th school student, but does not change over time (so the $_t$ subscript is absent). On the contrary, let X_{it} be a variable that changes over time and determines educational achievements (sport activities in this research).

(1) $\text{Educational achievements}_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_i + u_{it}$.

Because Z_i does not change over time, in the regression model in Equation (1) it will not produce any change in the educational achievements between the first period and the second period. Thus, in this regression model the influence of Z_i can be eliminated by analyzing the change in educational achievements between the two periods. Consider Equation (2) for the first period and Equation (3) for the second period.

(2) $\text{Educational achievements}_{i1} = \beta_0 + \beta_1 X_{i1} + \beta_2 Z_i + u_{i1}$.

(3) $\text{Educational achievements}_{i2} = \beta_0 + \beta_1 X_{i2} + \beta_2 Z_i + u_{i2}$.

Subtracting Equation (2) from Equation (3) eliminates the effect of $Z_{i,}$ as it is showed in Equation (4).

(4) $\text{Educational achievements}_{i2} - \text{Educational achievements}_{i1} = \beta_0 + \beta_1(X_{i2} - X_{i1}) + u_{i2} - u_{i1}$.

Thus, Equation (4) eliminates the effects of the unobserved variables Zi that are constant over time. This result is clearly extended to panel data models with fixed effects, and the flexible effects models can even consider the information from time-invariant variables. Therefore, here the baseline model is given by Equation (5), estimated using logit regressions on panel data with robust standard errors and random effects, allowing the inclusion of time-invariant independent variables (in opposition to fixed effects).

(5) $$\text{Educational achievements}_{it} = \beta_0 + \beta_1 \text{SPORT AT SCHOOL}_{it-1} + \beta_2 \text{OFTEN SPORT AT SCHOOL}_{it-1} + \text{TYPE OF SPORT AT SCHOOLS}'\alpha_{it-1} + \text{HOURS TYPE OF SPORT AT SCHOOL}'\gamma_{it-1} + \beta_3 \text{SPORT OUT SCHOOL}_{it-1} + \beta_4 \text{OFTEN SPORT OUT SCHOOL}_{it-1} + \text{TYPE OF SPORT OUT SCHOOLS}'\delta_{it-1} + \text{HOURS TYPE OF SPORT OUT SCHOOL}'\theta_{it-1} + \text{CONTROL VARIABLES}'\rho_{it} + \mu_i + u_{it},$$

Where educational achievements include two dependent dummy variables: HIGH or LOW PERFORMING STUDENTS as explained in the previous section. Note that the variables on sport activities are included with one lag to account for reverse causality. Endogeneity concerns have been already noted in the literature, but the majority of studies only warned readers about this concern. A few studies used instrumental variables, which is an excellent strategy. However, because of data limitations, it was impossible to find adequate instrumental variables for the present research.

Table 2 provides the major results for the dependent variable HIGH-PERFORMING STUDENTS. Column 1 shows the estimated coefficients for the simplest specification and column 5 shows results for the most multifaceted model (given collinearity restrictions). Columns 6 and 7 replicate the regression model of column 5 by subsamples of males and females, respectively. In fact, many different specifications were estimated with different combinations of the independent variables. Here, only the most substantial results are reported in tables. In addition, the software (Stata 13) automatically removed variables due to collinearity.

The results indicate that the dummy variables for sport participation at school and out-of-school are positively signed. Yet, only participation out-of-school is statistically significant, increasing the probability of being classified as a high-performing student (see column 1). Moreover, this positive association is due to participation in combat sports and athletic sports (see column 3). Participation out-of-school in athletic sports has a specific positive association with boys (see column 6) and combat sports have a specific positive association with girls (see column 7); it is possible to assume that gymnas-

tics is the sport practiced by girls. The coefficients of ball sports and other sports are not statistically significant. In addition, the frequency of this participation and the number of hours spent on these sports will not increase the probability of being classified as a high-performing student, these variables are not statistically significant (see columns 2, 4, and 5).

Sport participation at school, its frequency, and the type of sport practiced at school and time spent on it have no statistically significant effects for becoming high-performing students. There are a few statistically significant coefficients of these variables, yet they do not show robustness, losing statistically significance in the majority of specifications. However, it is interesting to note that participation in combat sports at school has a statistically positive coefficient in the female subsample, supporting the above mentioned specific effect of these types of sports out-of-school for girls.

In general, the control variables show the expected sign and statistical significance. The proxy of SES is positively signed and is statistically significant in all specifications, excluding the male subsample (column 6). Therefore, this variable has a particular effect for girls, increasing their likelihoods of being classified as high-performing students. For their part, the coefficients of public regular schools are negatively signed and are statistically significant in all specifications, excluding the male subsample (column 6). Therefore, the probability of being classified as a high-performing student decreases, particularly for girls studying in regular public schools. However, in general, girls outperform boys in educational achievements; the dummy MALE is negative and statistically significant in all regressions. AGE is also negative and statistically significant in all regressions; this result has been already noted in the literature (Tovar-García, 2017), suggesting a puberty effect, lower grades as subjects become more difficult in the last years of education, or in RLMS-HSE survey parents are stricter on the reported grades as their children get older. The rest of the control variables have no statistically significant effects.

The results reported in Table 3 regarding low-performing students indicate that, in particular, male students practicing ball sports out-of-school are less likely to be classified as low-performing students (see columns 3, 5, and 6). However, the time that they spend on these sports does not reduce this probability.

The other independent variables on sports out-of-school do not show robust effects. Nevertheless, there are two other interesting results. First, participation in athletic sports out-of-school and time spent on these sports are negatively signed and statistically significant in the specifications of columns 3 and 4, but their coefficients lose significance in other regressions (columns 5 to 7), thinly suggesting a decrease in the probability of being a low-performing student. Second, the time spent on other sports out-of-school has positive signs and is statistically significant, particularly, in the case of girls (see columns

Table 2. **Regression coefficients of sport activities on educational achievements (HIGH_PERFORMING)**

	(1)	(2)	(3)	(4)	(5)	Male (6)	Female (7)
Sport activities in class at school							
SPORT AT SCHOOL	0.30						
OFTEN SPORT AT SCHOOL		-0.03					
COMBAT SPORTS AT SCHOOL			0.04		0.23	-0.48	0.88*
BALL SPORTS AT SCHOOL			0.10		0.06	0.88*	-0.51
ATHLETIC SPORTS AT SCHOOL			0.04		-0.18	-0.51	-0.06
OTHER SPORTS AT SCHOOL			-0.06		-0.06	-0.10	-0.12
HOURS COMBAT SPORTS AT SCHOOL				-0.004	-0.20	0.09	-0.55
HOURS BALL SPORTS AT SCHOOL				-0.02	-0.02	-0.18	0.06
HOURS ATHLETIC SPORTS AT SCHOOL				0.25***	0.29*	0.27	0.36
HOURS OTHER SPORTS AT SCHOOL				-0.10	-0.07	-0.08	-0.07
Sport activities before or after classes (out-of-school)							
SPORT OUT SCHOOL	0.30**						
OFTEN SPORT OUT SCHOOL		0.001					
COMBAT SPORTS OUT SCHOOL			0.70***		1.17***	0.77	1.85***
BALL SPORTS OUT SCHOOL			-0.01		0.11	0.56	-0.18
ATHLETIC SPORTS OUT SCHOOL			0.39*		0.73***	1.33***	0.42
OTHER SPORTS OUT SCHOOL			0.16		0.27	0.10	0.55
HOURS COMBAT SPORTS OUT SCHOOL				0.06	-0.09	-0.14	-0.05
HOURS BALL SPORTS OUT SCHOOL				-0.05	-0.05	-0.08	-0.05
HOURS ATHLETIC SPORTS OUT SCHOOL				-0.01	-0.14	-0.13	-0.16
HOURS OTHER SPORTS OUT SCHOOL				0.01	0.01	-0.04	0.04
Control variables							
SES	0.34***	0.47***	0.44***	0.32*	0.31*	0.09	0.51***
HEALTH ISSUES	0.06	-0.07	-0.07	0.06	0.06	0.14	0.05
REGULAR SCHOOLS	-0.53***	-0.65***	-0.66***	-0.76***	-0.74***	-0.45	-0.98***
MOSCOW & SAINT PETERSBURG	0.12	-0.05	-0.10	-0.06	-0.10	0.70	-0.88
AGE	-0.32***	-0.34***	-0.35***	-0.36***	-0.36***	-0.39***	-0.30***
MALE	-1.07***	-1.12***	-1.18***	-1.13***	-1.16***		
HIGH-PERFORMANCE SPORTSMAN	-0.64*	-0.53	-0.51	-0.66	-0.64	-0.53	-0.61
Constant	-1.02	0.43	0.11	-0.13	-0.56	-2.12	-1.01
Observations	6425	3777	3782	3415	3415	1845	1570
Pseudo R2 (a)	0.45	0.65	0.66	0.69	0.70	0.66	0.72

(a) The scale the log-likelihood value of the model to the log likelihood of the constant-only model.
* significant at 10% level; ** significant at 5% level; *** significant at 1% level

4, 5 and 7), but the dummy variable on participation in other sports out-of-school does not show statistical significance in all regressions. Thus, these results are thinly suggesting that girls spending more time on other sports raise their probabilities of being classified as low-performing students.

The results also indicate that participation in combat sports at school reduces the chances of being a low-performing student, for both boys and girls (see columns 3, 5, 6 and 7). However, the time spent on these sports is statistically insignificant, excluding the female case, suggesting that girls spending more hours on these sports are more likely to be classified as low-performing students (column 7). On the contrary, participation in other sports at school increases the chances of being a low-performing student, for both boys and girls (see columns 3, 5, 6 and 7). Nevertheless, boys spending more time on other sports at school are less likely to be classified as low-performing students (see columns 5 and 6). Therefore, generally speaking, there is not any clear effect of sports at school.

The control variables present slightly different results in comparison with those reported in Table 2 regarding high-performing students. The variables AGE and MALE support previous findings, their coefficients are positive and statistically significant in all regressions. This indicates that older students and boys are more likely than younger students and girls, respectively, to be classified as low-performing students. Now, the proxy of SES is statistically insignificant in the majority of regressions and there is only weak evidence suggesting that regular public schools increase the chances of being a low-performing student.

The most interesting result given by control variables is the positive sign and statistical significance of HIGH-PERFORMANCE SPORTSMEN. This indicates that students spending more than 10 hours per week on sports are more likely than the rest of the students to be classified as low-performing students, yet this claim is valid only in the case of boys (see columns 6 and 7). The rest of the control variables have no statistically significant effects.

As an additional robustness check, Equation (5) was also estimated using the population-averaged estimator instead of random effects, assuming pooled data, and using probit regressions (not shown). The main findings remain qualitatively the same.

4. Discussion and final remarks

As in many other countries, for instance, Germany [Pfeifer, Cornelißen 2010], in Russia sports are mostly practiced in sport clubs or public sport facilities. According to this institutional framework, the results of this research suggest a positive association between sports out-of-school and educational achievements, supporting the developmental hypothesis. As expected, the participation of boys in sports out-of-school is higher than for girls, but the results do not suggest that one

Table **3. Regression coefficients of sport activities on educational achievements (LOW_PERFORMING)**

	(1)	(2)	(3)	(4)	(5)	Male (6)	Female (7)
Sport activities in class at school							
SPORT AT SCHOOL	-0.76*						
OFTEN SPORT AT SCHOOL		-0.02					
COMBAT SPORTS AT SCHOOL			-0.47*		-1.01**	-0.84*	-1.47*
BALL SPORTS AT SCHOOL			-0.16		-0.03	-0.03	-0.14
ATHLETIC SPORTS AT SCHOOL			0.004		-0.33	-0.35	-0.33
OTHER SPORTS AT SCHOOL			0.43*		1.09***	1.06**	1.41*
HOURS COMBAT SPORTS AT SCHOOL				-0.15	0.32	0.08	0.93*
HOURS BALL SPORTS AT SCHOOL				-0.17	-0.11	-0.10	-0.10
HOURS ATHLETIC SPORTS AT SCHOOL				-0.20	-0.01	0.01	-0.03
HOURS OTHER SPORTS AT SCHOOL				0.04	-0.38*	-0.47*	-0.27
Sport activities before or after classes (out-of-school)							
SPORT OUT SCHOOL	0.16						
OFTEN SPORT OUT SCHOOL		0.11					
COMBAT SPORTS OUT SCHOOL			-0.53		-0.84	-1.16	-0.02
BALL SPORTS OUT SCHOOL			-0.52**		-0.80**	-0.86**	-0.29
ATHLETIC SPORTS OUT SCHOOL			-0.77***		-0.16	-0.40	0.25
OTHER SPORTS OUT SCHOOL			0.07		-0.23	-0.07	-0.50
HOURS COMBAT SPORTS OUT SCHOOL				-0.04	0.02	0.08	-0.21
HOURS BALL SPORTS OUT SCHOOL				-0.02	0.05	0.07	-0.07
HOURS ATHLETIC SPORTS OUT SCHOOL				-0.20**	-0.17	-0.16	-0.21
HOURS OTHER SPORTS OUT SCHOOL				0.06***	0.06**	0.03	0.10**
Control variables							
SES	-0.43***	-0.24	-0.32	-0.30	-0.31	-0.27	-0.40
HEALTH ISSUES	-0.36**	-0.28	-0.22	-0.30	-0.28	-0.13	-0.60
REGULAR SCHOOLS	0.55**	0.63**	0.53*	0.57*	0.52	0.50	0.52
MOSCOW & SAINT PETERSBURG	0.48	0.06	0.25	0.42	0.54	0.56	0.46
AGE	0.31***	0.29***	0.32***	0.37***	0.40***	0.37***	0.43***
MALE	1.37***	1.23***	1.36***	1.33***	1.46***		
HIGH-PERFORMANCE SPORTSMAN	0.74**	0.73**	0.80**	0.77**	0.79**	0.88**	0.55
Constant	-7.94***	-8.74***	-8.54***	-9.04***	-9.26***	-7.82***	-9.19***
Observations	6425	3777	3782	3415	3415	1845	1570
Pseudo R^2 (a)	0.39	0.62	0.62	0.67	0.67	0.66	0.68

(a) The scale the log-likelihood value of the model to the log likelihood of the constant-only model.
* significant at 10% level; ** significant at 5% level; *** significant at 1% level

gender obtains more benefits than other, as suggested in previous studies [Pfeifer, Cornelißen 2010; Shifrer et al. 2015]. Here, the emphasis should be on the type of sport practiced by gender. For boys, participation in athletic sports has particular positive effects on their chances of becoming high-performing students. For girls, the practice of combat sports increases these chances.

The impact of martial arts, such as karate and taekwondo, on educational outcomes has been investigated in previous studies, suggesting no effects [Bird, Tripney, Newman 2013]. Here, the effect of these types of sports is particularly relevant for girls. In all probability, these sports predominantly encourage their competitiveness and this allows girls to compete and outperform non-participant students, as was observed in the case of German girls [Pfeifer, Cornelißen 2010].

In the USA, revenue sports, such as basketball and American football, have been negatively associated with educational outcomes [Eitle, Eitle 2002; Rettig, Hu 2016). In this research, ball sports are the closest category to revenue sports, and the findings do not suggest a negative association. On the contrary, the practice of ball sports out-of-school reduces the probability of being classified as a low-performing student in the case of boys.

In contrast to the USA, where many sport activities take place at school as extracurricular activities, in Russia sport activities at school mostly consist of physical education classes, but an increase in extracurricular sport activities at school has recently been observed. Although, Russian schools allow the practice of different types of sports, the findings of this research suggest that these activities have no significant effects on educational achievement. There are no negative impacts, there is no support for the zero-sum hypothesis, and this lack of significant effects should be a result of Russia's institutional framework.

The role of physical education classes in school curriculums has been widely discussed in the literature [Van Deventer, 2014]. One major concern is the seriousness of these classes as often the requirements to pass these classes are very low, and the activities consist of simple tasks without a clear syllabus, program, process, or proceedings. The findings suggest that this is the case in Russia, and consequently there is no evidence of positive associations between sports at school and educational achievements.

Therefore, the findings of this research are a wake-up call for education policy makers, who should reevaluate the role of physical education classes, reconsidering its status, seriously. This demand for the restitution of quality physical education has been underlined many times in the American literature [Park, 2014]. In Russia, not only should policy makers be aware of the relevance of sport activities, but also teachers and parents, encouraging children to participate in sports.

The main method of this research, logit regressions with panel data, allowed control for time-invariant explanatory variables. More-

over, the inclusion of the key independent variables with one lag allowed control for reverse causality concerns, which had been a major concern in previous literature [DeMeulenaere, 2010]. However, it is important to acknowledge two major limitations of this study. First, the data used were not collected from an experimental design, consequently, it is not possible to stipulate causality. Second, due to data limitations some variables influencing the selection effect into sports were not controlled, for instance, preferences and aptitudes for sport activities. However, the above mentioned findings were robust to several specifications and other econometric methods.

Finally, it is noteworthy that the major concern is not about the type of sport, revenue or non-revenue, as stated in the American literature. The key condition to observe positive associations between sports and educational achievements is the time spent on sports. First, the findings suggest that the benefits derived from sports will not increase if students spend more time on them. The simple practice of sports is what matters (in the Russian context, out-of-school). Each student can decide how much time to spend on sports, there is not any negative association between time spent on sports and educational achievements. Yet, if a lot of time is spent on sports, this will be negatively linked to educational achievements. In this research, it was found that male students spending more than 10 hours per week on sport activities are more likely to be classified as low-performing students. Consequently, the findings indicate a conditional support for the zero-sum hypothesis: either you are studying or you are playing sports. Too much of the latter will negatively affect your educational achievements. Thus, sport participation should be moderate in order to observe positive links, unless of course you wish to be a professional sportsman.

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