Sportwiss 2014 · 44:78–85
DOI 10.1007/s12662-014-0331-2
Received: 31 August 2013
Accepted: 12 March 2014
Published online: 30 April 2014

Josephine Wartenberg · Thomas Borchert · Ralf Brand
Department of Sport and Exercise Psychology, University of Potsdam, Potsdam, Germany

A longitudinal assessment of adolescent student-athletes' school performance

(Not) Worse in school and (not) putting their education at risk?!

In Germany, extraordinarily talented junior athletes are given the chance to attend so-called *elite schools of sport* (ESSs). These schools seek to provide a school setting in which the daily routines of athletic high-performance training can be optimally adjusted with the affordances of regular school education (Alfermann & Preis, 2013). Nevertheless, elite student-athletes have to cope with the problem of organizing their dual careers (Borggrefe & Cachay, 2012). They are obliged to coordinate the role of being a high-performance athlete (e.g., continuous and systematic training, more than 16 h/week of training on average, taking part in national and international training camps and competitions) with that of being a student (e.g., attend lessons regularly, pass examinations, graduate successfully from school). In this regard, researchers have referred to the comparatively elevated stress levels of elite student-athletes (Brettschneider, 1999) and their limited opportunities for social contact and life outside school (Brettschneider & Klimek, 1998), with the threat of high individual social costs in general (Emrich, Fröhlich, Klein, & Pitsch, 2009). There is recent evidence, on the other hand, that elite student-athletes' chronic mood and their psychological health are not statistically different from those of same-age nonathletes (Brand, Wolff, & Hoyer, 2013). It also has been shown that elite student-athletes who live at affiliated boarding schools at the ESS might develop better volitional skills than nonathletes (Elbe, Szymanski, & Beckmann, 2005).

From a sociological viewpoint, there is apprehension that the sport system tends to produce an instance of *total commitment* (German: *Hyperinklusion*; Cachay & Riedl, 2002; Göbel & Schmidt, 1998), making it difficult for elite student-athletes to reconcile the obligations of successful participation in the general education system (Borggrefe & Cachay, 2010). Attempting an athletic career at an ESS does not prevent student-athletes from getting into risky situations (Teubert, 2009). Athletic success might stay away in spite of all efforts, or an injury might terminate all anticipated rewards from such a career. In fact, most careers in high-performance sport will come to an end after some more or less successful years. General education from school (and/or other institutions in the educational system) thus remains an important resource for athletes' later lives.

Germany's ESSs represent educational organizations in a modern, open, civil society (Hummel & Brand, 2010). Most astonishingly, evidence on the middle- and long-term development of elite student-athletes' school achievements is almost lacking (Prohl & Emrich, 2009). There are previous studies in which student-athletes' school grades were monitored, illustrating that German ESSs provide settings in which dual careers are possible (Richartz & Brettschneider, 1996; Teubert, Borggrefe, Cachay, & Thiel, 2006). However, none of these studies have used school grades, or school grade development, as predictors of school achievement in general education.

The aim of the present study was to empirically explore ESS student-athletes' school grade development and compare it with that of program dropouts. Program dropouts are defined as students who either have been deselected from their ESS's high-performance sport program because they have missed athletic performance criteria, or who have quit pursuing an athletic career with the ESS's program for other reasons (and have either left the school or remained there without further participating in the high-performance sport program). Additional cross-sectional analyses compare student-athletes' average school grades after lower secondary school with those of students who were never enrolled at an ESS (school census results). Inferior school grades in student-athletes might be interpreted as indicators of undesirable total commitment.

Methods

Sample and data

Our main unit of analysis was 260 (159 male, 101 female) ESS student-athletes who joined an ESS in Brandenburg (the federal state has three ESSs) at class level

The first and the second author contributed equally to this paper.

Table 1 Descriptive data of the study cohort in five data collection waves

	Baseline (year 2008)	Class level 7 (year 2009)	Class level 8 (year 2010)	Class level 9 (year 2011)	Class level 10 (year 2012)
Study cohort description					
Students enrolled in ESS (*n*)	260	255	240	231	212
Student-athletes in class level (*n*)	260	252	232	222	187
Deselected student-athletes in class level (*n*)	–	3	8	9	25
School dropouts from class level (*n*)	–	5	15	18	19
Included in statistical data analyses					
Participants (from enrolled students/year) (%)	91.54	90.98	89.58	84.42	89.15
Student-athletes[a] (*n*, ♀/♂)	144, 50/94	144, 49/95	147, 51/96	134, 51/83	145, 52/93
Program dropouts[a] (*n*, ♀/♂)	94, 40/54	88, 38/50	68, 28/40	61, 30/31	44, 23/21
Age (years)					
Student-athletes[a] (*M, SD*)	♀: 12.79 (±0.48) ♂: 12.86 (±0.41)	♀: 13.45 (±0.46) ♂: 13.52 (±0.41)	♀: 14.43 (±0.43) ♂: 14.53 (±0.42)	♀: 15.42 (±0.40) ♂: 15.48 (±0.40)	♀: 16.39 (±0.47) ♂: 16.45 (±0.40)
Program dropouts[a] (*M, SD*)	♀: 13.02 (±0.44) ♂: 13.06 (±0.61)	♀: 13.67 (±0.45) ♂: 13.74 (±0.62)	♀: 14.61 (±0.51) ♂: 14.77 (±0.68)	♀: 15.61 (±0.43) ♂: 15.70 (±0.66)	♀: 16.64 (±0.45) ♂: 16.62 (±0.62)
Mathematics (average school grade)					
Student-athletes[a] (*M, SD*)	♀: 2.26 (±0.94) ♂: 2.42 (±0.85)	♀: 2.38 (±0.79) ♂: 2.32 (±0.75)	♀: 2.59 (±0.88) ♂: 2.55 (±0.84)	♀: 2.67 (±0.91) ♂: 2.61 (±0.78)	♀: 2.50 (±1.00) ♂: 2.50 (±0.93)
Program dropouts[a] (*M, SD*)	♀: 2.74 (±0.82) ♂: 2.64 (±0.86)	♀: 2.92 (±0.76) ♂: 2.63 (±0.76)	♀: 3.25 (±0.84) ♂: 3.08 (±1.05)	♀: 3.20 (±1.13) ♂: 3.19 (±0.75)	♀: 3.09 (±0.81) ♂: 2.76 (±0.83)
German (average school grade)					
Student-athletes[a] (*M, SD*)	♀: 1.92 (±0.72) ♂: 2.30 (±0.70)	♀: 2.13 (±0.82) ♂: 2.34 (±0.83)	♀: 2.25 (±0.72) ♂: 2.58 (±0.88)	♀: 2.37 (±0.75) ♂: 2.51 (±0.77)	♀: 2.38 (±0.77) ♂: 2.52 (±0.73)
Program dropouts[a] (*M, SD*)	♀: 2.31 (±0.86) ♂: 2.51 (±0.80)	♀: 2.41 (±0.69) ♂: 2.90 (±0.85)	♀: 2.75 (±0.75) ♂: 2.73 (±0.82)	♀: 2.61 (±0.57) ♂: 2.84 (±0.69)	♀: 2.73 (±0.63) ♂: 3.05 (±0.74)

ESS elite schools of sport, *M* mean, *SD* standard deviation

[a]Groups of student athletes and program dropouts are cumulated through the years 2008–2012; the presented data represent observed parameter values used for the statistical multilevel analyses (differences refer to varying numbers of study participants)

7 in 2008. This group of ESS starters comprises the whole age cohort of student-athletes in one of Germany's 16 federal states. These student-athletes were asked to fill out a questionnaire during their first week at the ESS (and 91 % of them did). The same questionnaire was presented at the end of every following school year until 2012 (i.e., after class levels 7, 8, 9, and 10). This led to a repeated-measures design with five data collection waves.

Between class level 7 and 10, 57 (16 female) students dropped out and left their ESS before the end of lower secondary school (school dropouts). Another 45 (29 female) were still ESS students but had dropped out of their ESS's high-performance athletic training program (deselected student-athletes). No information is available on why students left the ESS or why they were no longer part of the athletic program.

This means that 39.2 % ($n = 102$) of all the students who were enrolled in the year 2008 lost their status of being a student-athlete. All of them are referred to as *program dropouts* in our study. There were 60.8 % ($n = 158$) of *student-athletes* remaining.

Although there is an unbalanced data structure (missing cases at measurement points, due to school dropout, or absence because of training camps, competitions, or illness), our statistical approach of multilevel regression analyses allows for the inclusion of the complete set of 260 cases. Conveniently, 88.1 % of the students participated in three or more collection waves (48.1 % in all five collection waves), thereby giving us the opportunity to calculate individual trajectories of change (Singer & Willett, 2003). Detailed descriptive information on the cohort under investigation, as well as the study participants, is given in ◘ **Table 1**.

Sport disciplines taught at the three ESSs in Brandenburg (and thus represented in our sample) are artistic gymnastics, boxing, canoeing/kayaking, cycling, handball, judo, modern pentathlon, rowing, shooting, soccer, swimming, track and field athletics, triathlon, volleyball, weight-lifting, and wrestling. Due to small subsample sizes, no analyses on discipline-specific phenomena were performed. The school settings of the ESSs in Brandenburg are circumstantially described in Borchert (2013).

Measures and variables

Participants reported their average school grades in mathematics and German, using the standard German 6-point grading system (1 = very good/excellent, 2 = good, 3 = satisfactory/average, 4 = fair/pass, 5 = poor/deficient, 6 = fail). In the German school system, an overall average grade of 4 is needed to graduate to the next class level. *School grades* were treated as continuous variables in our analyses. The variables *gender* (0 = male, 1 = female) and *dropout* (0 = program dropout, 1 = student-athlete) were dichotomously coded.

The federal state's school census results, including average class level-10 school grades in mathematics and German from all schools in Brandenburg, were extracted from the Central System for Online Administration of School Information (ZENSOS).

Statistical analyses

The SPSS® 21.0 software package was used for all statistical analyses. Missing values within multiple-item scales (i.e., within cases at measurement points) were substituted with a common expectation-maximization algorithm. The repeated measurements of school grades in mathematics and German (level 1) were nested within individuals (level 2). The longitudinal dataset was thus analyzed with two separate hierarchical multilevel analyses. The main advantages of such a multilevel formulation are the method's robustness against unequal spacing and unbalanced datasets, and that estimations are made on the individual level (accounting for heterogeneous regression slopes) rather than on the sample level. This is different from the more restrictive assumptions of alternative statistical methods like repeated-measures analysis of variance (Field, 2009; Keller, 2003).

Unconditional means models allow to split level-1 and level-2 variances in the absence of predictors. This is a necessary check for systematic variation in outcome variables. The unconditional growth model is needed to check whether there is (unconditional) significant change over time. The participants' age was used as the temporal variable, grand mean centered (0 = age – 12.92) for its initial status in the year 2008. This individualization of the temporal predictor results in a superior data fit when great variance (as is the case with the broad ranges of age in each wave; **Table 1**) would otherwise remain unexplained (Singer & Willett, 2003). The predictor variables *age*, *gender*, *dropout*, and the two resulting *cross-level interaction terms* (gender × age, dropout × age) were entered successively into the model.

1. Level 1: $Y_{ti} = \beta_{0i} + \beta_{1i}\,(age_{ti} - 12.92) + \varepsilon_{ti}$
2. Level 2: $\beta_{0i} = \gamma_{00} + \gamma_{01}\,gender_i + \gamma_{02}\,student\text{-}athlete_i + u_{0i}$
3. Level 2: $\beta_{1i} = \gamma_{10} + \gamma_{11}\,gender_i + \gamma_{12}\,student\text{-}athlete_i + u_{1i}$
4. Composite: $Y_{ti} = \gamma_{00} + \gamma_{01}\,gender_i + \gamma_{02}\,student\text{-}athlete_i + \gamma_{10}\,age_{ti} + \gamma_{11}\,gender_i \times (age_{ti} - 12.92) + \gamma_{12}\,student\text{-}athlete_i \times (age_{ti} - 12.92) + [\varepsilon_{ti} + u_{0i} + u_{1i}\,age_{ti}]$

The term Y_{ti} is the individual *i* value ($i = 1, 2, \ldots, N$) of mean school grades, and age_{ti}

Sportwiss 2014 · 44:78–85 DOI 10.1007/s12662-014-0331-2

J. Wartenberg · T. Borchert · R. Brand

A longitudinal assessment of adolescent student-athletes' school performance. (Not) Worse in school and (not) putting their education at risk?!

Abstract

In Germany, extraordinarily talented student-athletes are offered the special school setting of elite schools of sport (ESSs). These schools seek to optimally adjust the daily affordances of athletic high-performance training with those of regular school education. The aim of the present analysis was to empirically explore whether elite student-athletes' school grades develop differently than those of fellow students who dropped out of the ESS's athletic program. One cohort of student-athletes ($N = 260$) was tracked from the moment of their enrollment in the ESS until the end of lower secondary school (from school level 7 to 10). Multilevel modeling was used to analyze this longitudinal dataset. Elite student-athletes who manage to still meet their school's athletic standards after class level 10 ($n = 158$) came to their ESSs with better school grades in mathematics and German from primary school than program dropouts ($n = 102$). Additional comparisons show that after class level 10, all ESS students' school grades in mathematics and German were not significantly different from the federal state's general average at schools without high-performance sport programs. Findings are interpreted against the background of the hypothesis that the system of high-performance sports tends to produce an instance of total commitment and that educational disadvantages for ESS student-athletes could follow as a consequence.

Keywords

Elite schools of sports · High-performance sports · Total commitment · Dual career

Eine längsschnittliche Analyse der Schulleistungen von jugendlichen Schülerathleten. (Nicht) Schlechter in der Schule und deshalb (un-)gefährlich für die Ausbildung?!

Zusammenfassung

In Deutschland wird die institutionelle Begabungsförderung von sportlich talentierten Kindern und Jugendlichen an sogenannten Eliteschulen des Sports (EdS) organisiert. Diese Einrichtungen haben die Aufgabe, die in Schule und Spitzensport entstehenden Belastungen in Einklang zu bringen. Das Ziel der vorliegenden Analyse war es, empirisch zu überprüfen, inwiefern sich Schülerathleten in der Entwicklung ihrer Schulleistungen im Vergleich zu den Schülerathleten unterscheiden, die im Untersuchungszeitraum aus dem Spitzensport ausscheiden (Sport Dropout). Dabei wurde eine Kohorte von EdS-Schülerathleten ($N = 260$) vom Beginn bis zum Ende der Sekundarstufe I verfolgt (von der Klassenstufe 7 bis 10). Die Datenanalyse im Längsschnitt erfolgte mittels hierarchischer Mehrebenenanalysen. Die Ergebnisse zeigen, dass Schülerathleten, die durchgehend in der Sekundarstufe I spitzensportlich aktiv sind ($n = 158$), bereits bei der Einschulung in Klassenstufe 7 bessere Schulleistungen in den Fächern Mathematik und Deutsch aufweisen, als Sport Dropouts ($n = 102$). Querschnittliche Vergleiche mit Schülern von Schulen ohne Sportprofil zeigen zudem, dass sich EdS-Schülerathleten am Ende der Klassenstufe 10 in Mathematik und Deutsch nicht signifikant von diesen unterscheiden. Die Ergebnisse werden vor dem Hintergrund der Hypothese interpretiert, dass für die EdS-Schülerathleten aus einer Hyperinklusion durch den Spitzensport Nachteile im schulischen Bildungsertrag resultieren.

Schlüsselwörter

Eliteschulen des Sports · Spitzensport · Hyperinklusion · Duale Karriere

Table 2 Taxonomy of multilevel models for the dependent variable mathematics (school grades)

		Parameter	Unconditional means model	Unconditional growth model	Final model (gender, dropout)
Fixed effects					
	Intercept (initial status)	γ_{00}	2.63*** (0.05)	2.43*** (0.05)	2.58*** (0.10)
	Gender	γ_{01}			0.09 (0.11)
	Student-athletes	γ_{02}			−0.31** (0.11)
	Age (annual rate of change)	γ_{10}		0.08*** (0.02)	0.12*** (0.03)
	Gender × age	γ_{11}			−0.01 (0.03)
	Student-athletes × age	γ_{12}			−0.05 (0.03)
Variance components					
Level 1	Within-person	σ^2_ε	0.37*** (0.02)	0.29*** (0.01)	0.35*** (0.02)
Level 2	In initial status	σ^2_0	0.44*** (0.05)	0.31*** (0.05)	0.26*** (0.07)
	In rate of change	σ^2_1		0.02 (0.04)	0.01 (0.01)
Goodness of fit					
	Deviance (−2LL)		2404.34	2335.48	2310.46
	AIC		2410.34	2347.48	2330.46
	BIC		2425.24	2377.19	2379.98

Significant at *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$
LL log likelihood, *AIC* Akaike's information criterion, *BIC* Schwarz's Bayesian criterion

is his or her age (in years) at time t ($t = 1, 2, \ldots, T$). Thus, β_{0i} represents an individual i's true initial status, when age_{ti} is 0; β_{1i} represents an individual i's true rate of change for each unit of increase in age; and ε_{ti} is the unpredicted portion of individual i's outcome at occasion t. The residual ε_{ti} is assumed to be independently drawn from a normal distribution with mean 0 and variance σ^2_ε. In the level-2 submodels, γ_{00} and γ_{10} are the level-2 intercepts. Initial status and rate of change represent an average individual male athlete (male = 0) in the group *program dropout* (program dropout = 0). γ_{01} and γ_{11} represent level-2 slopes for the effect of gender on the change trajectories by providing increments (or decrements) to both initial status and rates of change for female students (female = 1). γ_{02} and γ_{12} represent level-2 slopes for the effect of *student-athlete* on the change trajectories by providing increments (or decrements) to both initial status and rates of change for individuals of the two groups (student-athlete = 1). Both level-2 residuals, u_{0i} and u_{1i}, represent the deviations of initial status and rate of change of the individual change trajectories from the average population.

Cross-sectional comparisons (*school grades* at class level 10 of *student-athletes* and *program dropouts* vs. *school census results*) were analyzed using one-sample t tests for the school subjects mathematics and German separately.

Results

Descriptive statistics for all variables are summarized in ◘ **Table 1**. Checks for gender differences revealed no statistically significant influences in mathematics, neither for initial status ($t(223) = 1.12$, $p = 0.26$) nor for slope ($t(199) = -0.19$, $p = 0.85$). For German, however, female students were enrolled in the ESS with a significantly better average school grade ($t(238) = -2.69$, $p = 0.01$). The subsequent statistical growth in German was again unaffected by gender ($t(204) = -0.71$, $p = 0.48$). The null (unconditional means) models yielded intraclass correlation coefficients of $\rho = 0.54$ for mathematics and $\rho = 0.51$ for German. This means that 54 and 51 % of the variability in the dependent variables is due to differences between persons, thus indicating the appropriateness of a level-2 analysis ($\rho \geq 0.05$). The taxonomy of all multilevel models for school grades in mathematics and German is given in ◘ **Tables 2 and 3**.

Checks for longitudinal change (unconditional growth models) revealed a significant yearly decrease in all students' school grades from the beginning to the end of lower secondary school. Starting from grade 2.43 at the beginning of class level 7, all students' performance in mathematics deteriorated by 0.08 units per year ($t(199) = 5.09$, $p < 0.01$). Grades in German developed very similarly. Starting from an average grade of 2.24, there was a deterioration of 0.09 units with each year of age for all students ($t(205) = 6.67$, $p < 0.01$).

Final model analyses revealed significant differences in the school grades of student-athletes and program dropouts. Regression diagrams, with highlighted initial status and time trajectories, are illustrated in ◘ **Figs. 1 and 2** (grades in mathematics and German).

Student-athletes were enrolled in the ESS with an average grade in mathematics of 2.27. This was significantly better than the 2.58 reached by future program dropouts ($t(235) = -2.91$, $p < 0.01$). Gender did not influence this effect. Student-athletes as well as program dropouts had a significant decrease in mathematics school grades by 0.12 units per year ($t(233) = 3.70$, $p < 0.01$). The initial difference between student-athletes and later program dropouts before school enrollment in class level 7 was preserved over time (as indicated by the insignificant

Table 3 Taxonomy of multilevel models for the dependent variable in German (school grades)

		Parameter	Unconditional means model	Unconditional growth model	Final model (gender, dropout)
Fixed effects					
	Intercept (initial status)	γ_{00}	2.47*** (0.04)	2.24*** (0.05)	2.50*** (0.10)
	Gender	γ_{01}			−0.30** (0.10)
	Student-athletes	γ_{02}			−0.25* (0.10)
	Age (annual rate of change)	γ_{10}		0.09*** (0.01)	0.11*** (0.03)
	Gender × age	γ_{11}			0.02 (0.03)
	Student-athletes × age	γ_{12}			−0.03 (0.03)
Variance components					
Level 1	Within-person	σ^2_ε	0.32*** (0.02)	0.30*** (0.02)	0.30*** (0.02)
Level 2	In initial status	σ^2_0	0.33*** (0.04)	0.31*** (0.06)	0.28*** (0.06)
	In rate of change	σ^2_1		0.01 (0.01)	0.01 (0.01)
Goodness of fit					
	Deviance (−2LL)		2220.26	2150.63	2123.29
	AIC		2226.26	2162.63	2143.29
	BIC		2241.15	2192.33	2192.79

Significant at *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$
LL log likelihood, *AIC* Akaike's information criterion, *BIC* Schwarz's Bayesian criterion

interaction term student-athletes × age ($t(217) = -1.43$, $p < 0.15$).[1]

A similar pattern of results was apparent for grades in German. Male student-athletes had already enrolled in the ESS with a better school grade of 2.25 on average, compared with future male dropouts with an average grade of 2.50 ($t(251) = -2.39$, $p < 0.02$). This group difference was even accentuated in female students ($t(236) = -2.90$, $p < 0.01$). Female student-athletes started with an average grade in German of 1.95, compared with future female program dropouts' average grade of 2.20. Male and female student-athletes' as well as program dropouts' school grades in German then decreased by 0.11 units per year ($t(236) = 3.91$, $p < 0.01$). The initial difference in school grades in German (between student-athletes and program dropouts) was preserved over time (both interaction terms, gender × age as well as student-athletes × age, remain statistically insignificant).[2]

Both final models (for grades in mathematics and German) with the level-2 predictors *gender* and *dropout* reached a better data fit compared with the unconditional growth models [$\chi^2(4) = 25.02$, $p < 0.01$ (mathematics), and $\chi^2(4) = 27.34$, $p < 0.01$ (German)]. The amount of remaining unexplained variance indicated that additional predictors (at level 1 as well as at level 2) should be added in further studies.

Cross-sectional analyses showed that class level-10 elite student-athletes' school grades in German [mean (M) = 2.5, standard deviation (SD) = 0.8] and mathematics ($M = 2.5$, $SD = 1.0$) did not differ from the federal state's average (German: $\mu = 3.4$, $\sigma = 1.0$; $t(157) = -0.90$, $p = 0.37$; mathematics: $\mu = 3.3$, $\sigma = 1.2$; $t(157) = -0.66$, $p = 0.51$). The same was true for the program dropouts' grades in German ($M = 2.9$, $SD = 0.7$; $t(42) = -0.33$, $p = 0.74$) and mathematics ($M = 2.9$, $SD = 0.8$; $t(42) = -0.50$, $p = 0.62$).

Discussion

This study's aim was to empirically explore ESS student-athletes' school grade development and compare it with that of ESS program dropouts. The 260 young elite athletes, who chose (with their parents' consent, of course) to enroll in an ESS at class level 7 by the age of 13 years, started their school careers with "good" grades (in terms of the German grading system) from primary school. Subsequent dropout from the school's athletic high-performance training program can be statistically predicted by weaker school grades from primary school. Program dropouts, defined as students who during lower secondary school were either deselected from athletic high-performance training by their coaches or refrained from high-performance training for other unknown reasons, entered the ESS with weaker grades in mathematics (−0.31 grade units) and German (−0.25 grade units). Similar yearly decreases in school performance (−0.12 grade units per year in mathematics and −0.11 in German) can be observed from school level 7 to 10 for all students (student-athletes and program dropouts). Such decreases can be observed throughout the German school system and across different types of schools (Baumert, Trautwein, & Artelt, 2003; Valtin, Badel, Löffler, Meyer-Schepers, & Voss, 2003). This leads to the situation that at the end of lower secondary school, student-athletes' school performance accords with "good" grades, whereas program dropouts broadly arrive in the area of "satisfactory/average" school grades. It is, however, im-

[1] School grades in mathematics differed significantly between student-athletes and program dropouts at every measurement point; all t's > 2.23, all p's < 0.03.

[2] School grades in German differed significantly between student-athletes and program dropouts at every measurement point; all t's > 2.65, all p's < 0.01.

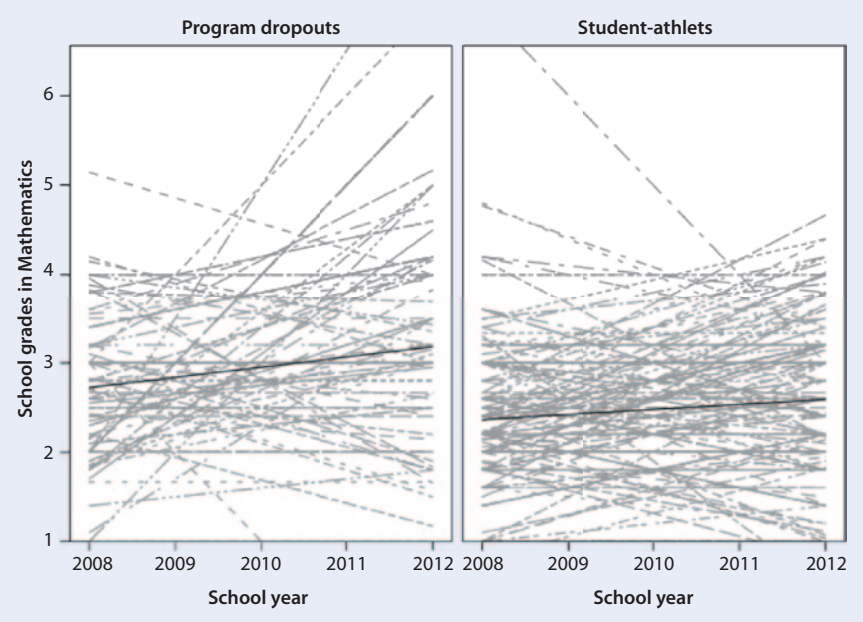

Fig. 1 ▲ Fitted ordinary least squares trajectories for school grades in mathematics. *Dashed lines* represent individual regression lines; *continuous lines* represent the groups' average growth trends

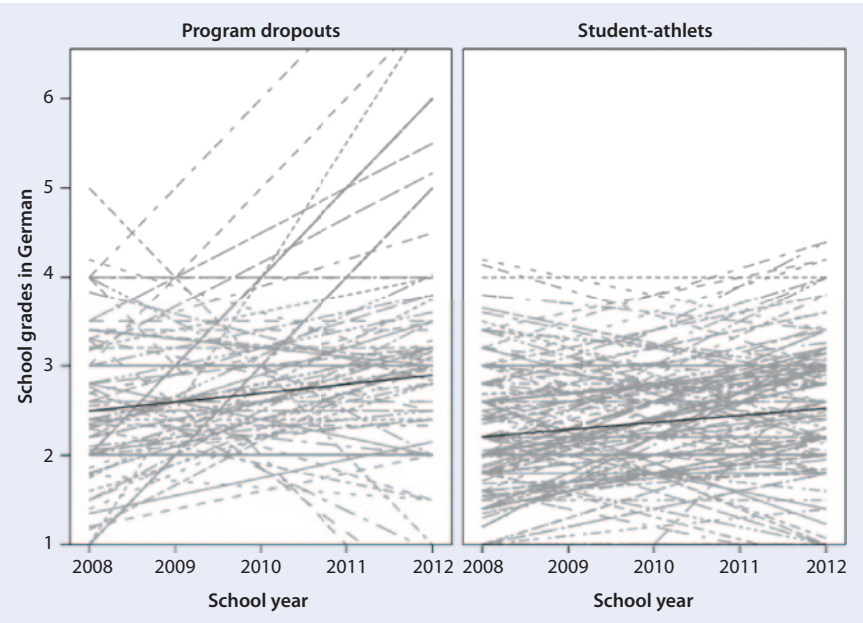

Fig. 2 ▲ Fitted ordinary least squares trajectories for school grades in German. *Dashed lines* represent individual regression lines; *continuous lines* represent the groups' average growth trends

portant to emphasize that both groups' school grades did not significantly differ from the federal state's school census norms; i.e., ESS students' performance was not different from that of students from other schools without high-performance sport programs.

The superordinate research question of our study was whether there are reflections of total commitment by the system of high-performance sport (Borggrefe & Cachay, 2010) in ESS student-athletes' school performance. The answer to this question is bipolar.

On the one hand, it became obvious that successful (in a sense that they are able to meet their ESS's athletic criteria) student-athletes' school grades are neither worse nor better than that of program dropouts and nonathletes. This may counter the hypothesis of total commitment (at least partially, with regard to school grades, as one eminent facet of school performance and school success). For the group of successful student-athletes, the criticism of Emrich et al. (2009), that individual costs for student-athletes at German EESs may be (too) high, can be put into perspective. This finding might also relativize one major argument of good judgment critique on school-based high-performance sport promotion (in the shape of German ESSs) that such programs reduce elite young athletes' educational opportunities once their sporting careers have come to an end. Given that school grades in mathematics are a reasonable predictor of later job-related success (Baumert, Bos, & Lehmann, 2000), opting for an ESS is at least not automatically associated with early educational disadvantages. Results also correspond with anecdotal evidence gathered from such special schools' principals in Australia, Canada, Sweden, and The Netherlands (Radke & Coulter, 2007). They have reported that in their experience, elite sport-students' school grades are not seldom above average, as especially targeted support measures (e.g., private lessons for absent student-athletes) are routinely offered to them. Such offers have also been established in Brandenburg.

On the other hand, 18.5 % of the students who enrolled in the ESS at class level 7 left the ESS already within the following 4 years, ahead of time, before having finished lower secondary school (at the ESS). Information about this group's motivation or about these students' further careers (in general education and in sport) is unfortunately not available. Another 20.8 % chose to stay at their ESS, but dropped out of high-performance sports. Again, we have no information about their motivation to do so. It is important to acknowledge that the total commitment hypothesis (Borggrefe & Cachay, 2010) might be a valid explanation for all these dropouts. These students may have been unable to reconcile the obligations of successful participation in the general education system and high-performance athletic training at the same time. Brand

et al. (2013) found evidence for deselected ESS student-athletes' elevated risk of suffering from psychological symptoms. Some of our results can thus be interpreted in light of the findings by Riedl and Cachay (2002) from older adolescent athletes. They illustrated that only a minority of young athletes (older adolescents in their study) would opt for a potential career in elite sports when their general education was seriously compromised.

It is interesting that almost no differences in school grades between female and male student-athletes were found, which is in contrast to current knowledge from general education research (*Deutsches Institut für Internationale Pädagogische Forschung*, 2012). One explanation is that the better school grades of successful student-athletes might be rooted in earlier preselection processes. Most students who are enrolled in class level 7 at an ESS are already experienced and have been successful at lower competitive levels in previous years. It is thus a very interesting open question whether student-athletes' advantage in school grades at the time of their school enrollment is also accompanied by a preexisting advantage in athletic skills (which are of course independent of gender).

Our empirical data also strengthen the idea that emerging as an above-average adolescent student-athlete might presuppose above-average cognitive abilities, making it easier for these students to cope with general educational demands at school (Richartz & Brettschneider, 1996). Elite young athletes might be particularly aware of the necessity to perform well in school (regular education), e.g., if they want to receive exemption for competitions and training camps. To advance their careers in the athletic domain, student-athletes may strive for success with greater motivation and work harder for their goals in various areas.

A question directly resulting from our data is whether future success in high-performance sport, or at least an elite student-athlete's success in getting along with the dual pressure of high-performance sport and general education at an ESS, can be statistically predicted. We have shown that school grades from primary school is such a predictor. It is thus important to include the early school performance of young talents as an informative variable into the ESS nomination process before school enrollment. It is, however, important to note that it is only one of several other possible predictors, which have not been analyzed so far, for example self-discipline, self-efficacy, or conscientiousness as a personality trait. In light of the presented data, future studies should focus even more on predictors of later success in sport.

Limitations

One limitation of our study is that we focused on elite student-athletes from the federal state of Brandenburg only. This state modified structural aspects of their ESS program in 2008 (Borchert, 2013). Compared with other school-based high-performance sport promotion programs, Brandenburg has tried to better integrate the two rather disparate systems of education and high-performance sports. For example, high-performance training became part of the ESS school curriculum, with the result that, for instance, more time resources for homework were created. Borggrefe and Cachay (2010) have identified the Brandenburg program as an example of successful structural coupling. Better learning conditions for student-athletes may influence their school performance (better school grades). Thus, it should be further analyzed whether student-athletes from Brandenburg are representative of other ESSs.

Last but not the least, we are completely aware that education is a faceted construct, and that cutting down to "simple" school grades is a sort of oversimplification (Krüger & Neuber, 2012). It is also a fact that school grades are always coupled with social reference standards (Ingenkamp, 1977), and that we cannot be sure that all elite sport-students attained their good grades by having to reach the same school standards compared with other students from their age groups, at regular schools without ESS programs. On the other hand, we do not see any reason to doubt the fairness and professionalism of Brandenburg's ESS teachers in this issue. We, therefore, prefer to conclude from our empirical analyses that it is important to challenge the German ESS system and to continually criticize deficiencies from an academic viewpoint (Emrich et al., 2009). With regard to a potentially discarded general education in Germany's ESSs for the sake of the "blind" promotion of athletic excellence, we tend to say "no," this might not automatically be the case.

Corresponding address

Dr. R. Brand
Department of Sport and Exercise Psychology
University of Potsdam
Am Neuen Palais 10, 14469 Potsdam
ralf.brand@uni-potsdam.de

Compliance with ethical guidelines

Acknowledgments. This research was financed by the Ministry of Education, Youth and Sport Brandenburg (2009–2013). We thank the school's headteachers and all other involved persons for their support.

Conflict of interest. J. Wartenburg, T. Borchert, and R. Brand state that there are no conflicts of interest.

References

Alfermann, D., & Preis, F. (2013). Athletes' careers in Germany. In N. B. Stambulova & T. V. Ryba (Eds.), *Athletes' careers across cultures* (pp. 103–114). New York: Routledge.

Baumert, J., Bos, W., & Lehmann, R. H. (2000). *Dritte Internationale Mathematik- und Naturwissenschaftsstudie: Mathematische und naturwissenschaftliche Bildung am Ende der Schullaufbahn*. [Third international mathematics and science study: Mathematics and Science education at the end of school]. Opladen: Leske and Budrich.

Baumert, J., Trautwein, U., & Artelt, C. (2003). Schulumwelten – institutionelle Bedingungen des Lehrens und Lernens [School environments – institutional conditions of teaching and learning]. In J. Baumert, C. Artelt, E. Klieme, J. Neubrand, M. Prenzel, U. Schiefele, W. Schneider, K-J. Tillmann, & M. Weiß (Eds.), *PISA 2000: Ein differenzierter Blick auf die Länder der Bundesrepublik Deutschland* (pp. 261–331). Opladen: Leske and Budrich.

Borchert, T. (2013). *Ohne doppelten Boden, aber mit Netz? Förderung sportlicher Begabung und soziale Unterstützung an Eliteschulen des Sports in Brandenburg* (Dissertation). [Promotion of sportive endowment and social support at selected schools of sport in Brandenburg (Thesis)]. Chemnitz: Universitätsverlag.

Borggrefe, C., & Cachay, K. (2010). Strukturelle Kopplung als Lösung des Inklusionsproblems schulpflichtiger Nachwuchsathleten? Theoretische Reflexionen zur sachlichen Funktionalisierung von Verbundsystemschulen. [Structural coupling as a solution to the inclusion problem facing school-aged athletes? Theoretical reflections on the "functionalization" of schools for gifted athletes]. *Sport und Gesellschaft – Sport and Society, 7*(1), 45–69.

Borggrefe, C., & Cachay, K. (2012). "Dual careers": The structural coupling of elite sport and school exemplified by the German Verbundsysteme. *European Journal for Sport and Society, 9*(1+2), 57–80.

Brand, R., Wolff, W., & Hoyer, J. (2013). Psychological symptoms and chronic mood in representative samples of elite student-athletes, deselected student-athletes and comparison students. *School Mental Health, 5,* 166–174. doi:10.1007/s12310-012-9095-8.

Brettschneider, W. D. (1999). Risks and opportunities: Adolescents in top-level sport—growing up with the pressures of school and training. *European Physical Education Review, 5,* 121–133. doi:10.1177/1356336X990052004.

Brettschneider, W. D., & Klimek, G. (1998). *Sportbetonte Schulen. Ein Königsweg zur Förderung sportlicher Talente?* [Sport schools. The gold standard to assist elite athletes?]. Aachen: Meyer.

Cachay, K., & Riedl, L. (2002). *Bosman-Urteil und Nachwuchsförderung. Auswirkungen der Veränderung von Ausländerklauseln und Transferregelungen auf die Sportspiele.* [The Bosman-verdict and promotion of young athletes. Effects of the change of foreign person clauses and transfer regulations in team sports]. Schorndorf: Hofmann.

Deutsches Institut für Internationale Pädagogische Forschung. (2012). Bildung in Deutschland 2012 [Education in Germany 2012]. http://www.bildungsbericht.de/daten2012/bb_2012.pdf. Accessed 19 June 2013.

Elbe, A. M., Szymanski, B., & Beckmann, J. (2005). The development of volition in young elite athletes. *Psychology of Sport and Exercise, 6,* 559–569.

Emrich, E., Fröhlich, M., Klein, M., & Pitsch, W. (2009). Evaluation of the elite schools of sport. Empiricial findings from an individual and collective point of view. *International Review for the Sociology of Sport, 44,* 151–171.

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London: Sage Publications Ltd.

Göbel, M., & Schmidt, J. F. K. (1998). Inklusion/Exklusion: Karriere, Probleme und Differenzierungen eines systemtheoretischen Begriffspaars. [Inclusion/exclusion: Career, problems and differentation of a system theoretical conceptual pair]. *Soziale Systeme, 4*(1), 87–118.

Hummel, A., & Brand, R. (2010). Eliteschulen des Sports als Bildungsorganisationen in einer modernen, offenen Zivilgesellschaft [Elite schools of sport as institutions of education in modern, open civil societies]. *Leistungssport, 40*(1), 37–42.

Ingenkamp, K. H. (1977). *Die Fragwürdigkeit der Zensurengebung* [The dubiety of school grades] (7th ed.). Weinheim: Beltz.

Keller, F. (2003). Analyse von Längsschnittdaten: Auswertungsmöglichkeiten mit hierarchischen linearen Modellen. [Analysis of longitudinal data: Assessment options for hierarchical linear models.] *Zeitschrift für Klinische Psychologie und Psychotherapie, 32*(1), 51–61.

Krüger, M., & Neuber, N. (Eds.). (2012). *Bildung im Sport.* [Education in sport]. Wiesbaden: VS-Verlag.

Prohl, R., & Emrich, E. (2009). Eliteschulen des Sports als Bildungsorganisationen einer Zivilgesellschaft. [Elite schools of sports as educational organizations for a civil society]. *Sportwissenschaft, 39,* 197–209.

Radke, S., & Coulter, F. (2007). *Eliteschulen des Sports/ Sports Schools. Ein internationaler Vergleich unter Einbeziehung von zehn Ländern* [Elite schools of sport. An international comparison of 10 different countries]. Köln: Sportverlag Strauß.

Richartz, A., & Brettschneider, W. D. (1996). *Weltmeister werden und die Schule schaffen*. [Becoming a world champion and accomplish school]. Schorndorf: Hoffmann.

Riedl, L., & Cachay, K. (2002). *Bosman-Urteil und Nachwuchsförderung. Auswirkungen der Veränderung von Ausländerklauseln und Transferregelungen auf die Sportspiele*. [The Bosman ruling and encouragement of young talent. Effects of the adjustment of foreign national clauses and transfer regulation in sport games]. Schorndorf: Hofmann.

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York: Oxford University Press.

Teubert, H. (2009). *Koordination von Spitzensport und Schule. Zur Lösung des Inklusionsproblems schulpflichtiger Athleten* [Coordination of high-performance sport and school. Solutions to the problem of inclusion in school-aged athletes]. Baltmannsweiler: Schneider.

Teubert, H., Borggrefe, C., Cachay, K., & Thiel, A. (2006). *Spitzensport und Schule. Möglichkeiten und Grenzen einer strukturellen Kopplung in der Nachwuchsförderung* [Elite sport and school. Chances and limitations of structural coupling in the promotion of young athletes]. Schorndorf: Hofmann.

Valtin, R., Badel, I., Löffler, I., Meyer-Schepers, U., & Voss, A. (2003). Orthographische Kompetenzen von Schülerinnen und Schülern der vierten Klasse [Orthographic competencies of 4th grade students]. In W. Bos, E. M. Lankes, M. Prenzel, K. Schwippert, G. Walther, & R. Valtin (Eds.). *Erste Ergebnisse aus IGLU. Schülerleistungen am Ende der vierten Jahrgangsstufe im internationalen Vergleich* (pp. 227–264). Münster: Waxmann.