

Ger J Exerc Sport Res 2023 · 53:410–419
<https://doi.org/10.1007/s12662-023-00878-7>
 Received: 25 November 2022
 Accepted: 7 February 2023
 Published online: 30 March 2023
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Talented athletes as high achievers—only in sports? Analysis of academic performance and the impact of dual career assistance programmes in upper secondary school

Introduction

The general goal of promoting a dual career (DC) is to encourage and support talented athletes in pursuing an academic career during their athletic career that corresponds to their own interests and opens up attractive possibilities in the vocational context after the end of their athletic career. Student-athletes should be prevented from neglecting or prematurely abandoning their academic career in favour of their athletic career, as well as from quitting sports due to incompatibility with their academic career. In order to achieve this goal, dual career development environments (DCDEs) and dual career assistance programmes (DCAPs) have been analysed and (further) developed during the past decade, primarily in the European Union but also elsewhere (De Bosscher, Brockett, & Westerbeek, 2016a; European Commission, 2013, 2016; Guidotti, Cortis, & Capranica, 2015; Morris et al., 2021; Stambulova, Ryba, & Henriksen, 2020; Torregrossa,

Regüela, & Mateos, 2020). In contrast to other parts of the world (e.g., North America), the national education and elite sports systems in many European countries exist independently of one another. The requirements in both areas are extremely rigid and demand a strong focus with the greatest possible commitment and investment of resources. European student-athletes usually recognise that it is difficult to invest fully and continuously in both elite sport and their academic education, particularly at the upper secondary school level. With the competing requirements, they have to plan when to prioritise one field over the other and find and maintain an optimal balance between the two as well as their personal life (Bjørndal & Gjesdal, 2020; Brettschneider, 1999; Christensen & Sørensen, 2009; Conzelmann & Nagel, 2003; Cosh & Tully, 2014; Ryan, 2015; Sallen, Hemming, & Richartz, 2018; Stambulova, Engström, Franck, Linnér, & Lindahl, 2015; Wylleman & Rosier, 2016). The incompatibility of requirements in education and elite sports can

lead to serious problems for student-athletes, as described by Borggreve and Cachay (2012, p. 57): “Thus, when young athletes try to fulfil the requirements of elite sport by optimising their sporting performance, they jeopardise their academic achievement and the educational qualifications they are aiming for”.

There are various DCDE to counteract these incompatibilities. One of the globally established components of DCDE are the so-called elite sports schools (ESS) with their internal DCAPs (De Bosscher, De Knop, & Vertonghen, 2016b; Hong, Morris, López-Flores, & Botwina, 2022; Radtke & Coalter, 2007). ESS are public educational institutions (mostly with boarding houses) that closely cooperate with regional and national sports institutions. The primary mission of ESSs is to create optimal conditions to successfully combine an athletic career with a regular school education. Selected athletes with extraordinary sports talent gain access to ESSs, and thus also to more or less standardised DCAPs. These DCAPs include a variety of DC support services, with

the main focus on making educational requirements more flexible and compatible with those of elite sports. More generally, DCAPs at ESSs aim to help student-athletes deal successfully with athletic and non-athletic career issues and strive for career excellence (Morris et al., 2021; Radtke & Coalter, 2007; Stambulova et al., 2020; Torregrossa et al., 2020). It should be noted that DCAPs are only acceptable from an educational and ethical point of view if they ensure that student-athletes are not given any advantage over the general student population when acquiring school qualifications. DCAPs exclusively compensate for the additional challenges student-athletes face when acquiring academic qualifications (Sallen & Gerlach, 2020).

Effectiveness of DCAPs for upper secondary school student-athletes at ESSs

The question arises as to whether and which upper secondary DCAPs effectively support student-athletes in developing their full academic potential. DCAPs can be classified as effective and responsible if the academic performance of the enrolled student-athletes does not deviate either negatively or positively from the average of the entire upper secondary student population. Empirical studies on the relationship between student-athletes' academic achievements and their use of upper secondary DCAPs at ESSs are rarely visible in reviews of DC research (Guidotti et al., 2015; Sallen & Gerlach, 2020; Stambulova & Wylleman, 2019; Torregrossa et al., 2020). It is evident that a very large proportion of adolescent student-athletes aspire to or obtain a general higher education entrance qualification. This proportion is larger than in the general population (Conzelmann & Nagel, 2003; De Bosscher et al., 2016b; Jonker, Elferink-Gemser, & Visscher, 2009). Brettschneider and Klimek's (1998) longitudinal study revealed the following findings: from the beginning of lower secondary school to the middle of upper secondary school, the overall grade point average on the end-of-year report cards of ESS student-athletes decreased at the

same rate as that of non-athletes at the same school and students at regular schools in the same region. ESS student-athletes had significantly better overall grade point averages on their end-of-year report cards than students in the two comparison groups over the entire qualification period. Other studies also reported that student-athletes perform better at the secondary school level compared to students without engagement in elite sports (Georgakis, Evans, & Warwick, 2015; Storm & Eske, 2022). These results indicate that talented athletes are also high achievers academically. Other studies show contrary results, where students at regular schools outperform ESS student-athletes in terms of academic performance (Emrich, Fröhlich, Klein, & Pitsch, 2009; Van Rens, Elling, & Reijgersberg, 2015). The results of further studies show that the grades and grade progression of ESS student-athletes at the lower and upper secondary school levels do not differ from those of age-matched students without athletic careers (Henriksen & Christensen, 2013; Wartenberg, Borchert, & Brand, 2014). Moreover, there does not seem to be a direct association between the use of DC services (extra tuition, 1-year extension of the qualification period) and the school grades of student-athletes (Storm & Eske, 2022).

In addition, it is known that ESS student-athletes are no less satisfied with their academic achievements than same-aged students without athletic careers (Hallmann, Breuer, Ilgner, Giel, & Rossi, 2018; Körner et al., 2017). The majority of student-athletes find DC services at ESSs helpful and rate them overwhelmingly positively (Körner et al., 2017; Van Rens et al., 2015; Von Heijden-Brinkman et al., 2012). This is also true for extending the qualification phase and splitting the final exam phase at the end of upper secondary school into multiple parts (Henriksen & Christensen, 2013; Reijgersberg, Gijsbers, & Elling, 2010; Sallen, 2018). Hoffmann, Sallen, Albert, and Richartz (2011) and Sallen, Wendeborn, and Gerlach (2023) provide evidence showing that the time freed up by extending the qualifying phase in upper secondary school is largely invested by

ESS student-athletes into their athletic training. Student-athletes with an extra school year are also more likely to belong to a competitive squad compared to other student-athletes (Sallen, Wendeborn, & Gerlach, 2022).

Overall, the current state of research suggests that DCAPs at ESSs effectively help student-athletes to reach their full achievement potential in secondary schools. At the same time, there remain significant research gaps (Storm & Eske, 2022): there is a lack of studies that 1) focus on student-athletes' upper secondary school grades and their development; 2) focus on final exam performance; 3) conduct school performance comparisons considering different DCAPs or DC services; and 4) compare the school performance of student-athletes with that of the entire student population. In addition, in most studies, the school performance of student-athletes was recorded only via self-report. However, it is empirically evident that students' self-reported school performance tends to lack accuracy and that this lack is consistently related to several student characteristics (Rosen, Porter, & Rogers, 2017). In the present investigation, the aforementioned empirical findings and shortcomings were taken into account when analysing student-athletes' school performance as an indicator for the effectiveness of DCAPs at ESSs.

The present investigation

The present investigation was part of a research programme evaluating educational DC services for upper secondary student-athletes at ESSs in the federal state of Brandenburg, Germany (Sallen et al., 2023). The investigation was carried out on behalf of and under the supervision of the Ministry of Education, Youth and Sport, which is responsible for all schools in Brandenburg.

The focus of this study was on two DCAPs (DCAP-1, DCAP-2) and their effect on the school performance of student-athletes. Both DCAPs were offered at an ESS. The only students admitted to this ESS are those who—in addition to a regular school certificate from a lower and/or upper secondary school—are also

aiming for a career in one of the Olympic sports supported by this ESS. Dropout or retirement from elite sports usually leads to exclusion from the DCAP and/or ESS. DCAP-1 gives student-athletes at the secondary school level the opportunity to obtain the necessary general higher education entrance qualification in Germany (the *Abitur*; Latin: *abire*=leaving [school]) in a traditional way. This way is analogous to that available in regular upper secondary schools in Germany (2-year qualification phase divided into four semesters) and finishes with mandatory final exams in four subjects within a period of a few weeks at the end of the higher education entrance qualification phase. The final exam subjects can be chosen by the students from different categories within the school framework at the beginning of the qualification phase.

DCAP-1 includes the following DC support services: a) planning of lessons and exams in accordance with training and competition schedules; b) flexible postponement of lessons, exams, and vacation times; c) provision of open time slots in the morning for extracurricular athletic training; d) generous exemptions from lessons for participation in athletic training and competitions; and e) the option to choose physical education as a subject in the final exams. These DC support services are offered at all ESSs in Brandenburg. However, DCAP-1 goes partly beyond what DCAPs contain at the other ESSs in Germany (Borggrefe & Cachay, 2012).

DCAP-2 goes beyond what DCAP-1 offers and focuses on DC support services at the end of the qualification phase. In order to prevent student-athletes from becoming overstrained at the end of the qualification phase, DCAP-2 contains two additional academic DC services. These are considered innovations in the German school education system. They cannot be found in this form or combination at any other upper secondary school (including ESSs) in Germany. A state exemption enables the student-athletes at this ESS to take another route to the general higher education entrance qualification. In DCAP-2, the qualification phase can be extended to six semesters. This can significantly reduce

the number of teaching hours per week without changing the lesson content and scope required for the German general higher education entrance qualification. Furthermore, the student-athletes can take individual final exams at an earlier point in time (e.g., in a certain subject) when they have completed the necessary lessons in that particular subject. Thus, the final exams can be spread out over several school years. In addition, the school obligations can be better coordinated with the individual training and competition schedules. This is made possible by a modularised, compact lesson structure in the final exam subjects. The final exams take place at the end of the school years (second and/or fourth and/or sixth semester). This special format meets all federal requirements with regard to the teaching content and scope of the general higher education entrance qualification.

DCAP-2 has been offered since 2011 to talented athletes who participate in individual sports that are particularly intensive in terms of training and competition (triathlon, swimming, track and field athletics, rowing, canoeing, modern pentathlon). Usually, these student-athletes belong to a high-ranking performance squad in their sport. The number of student-athletes in DCAP-2 is limited to approximately 20 individuals per cohort. For both DCAP-1 and DCAP-2, the examination content, scope and admission requirements that apply uniformly to all students in the state of Brandenburg remain unchanged.

Research questions

Three research questions were examined:

Q1: Does the upper secondary school performance in the final exams and the overall performance for the higher education entrance certificate differ between DCAP-1 users and DCAP-2 users?

Q2: Does the development of upper secondary school performance in various subjects differ between DCAP-1 users and DCAP-2 users?

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Talented athletes as high achievers—only in sports? Analysis of academic performance and the impact of dual career assistance programmes in upper secondary school

Abstract

The simultaneous pursuit of success in elite sport and the highest school qualification is considered to be one of the challenges for adolescents who are sporting talents. Dual career assistance programmes (DCAPs) for student-athletes are designed to help master this challenge in the best possible way. This study focusses on the upper secondary school performance of 200 student-athletes from an elite sports school. First, the school performance of student-athletes enrolled in two different DCAPs was compared. In addition to the educational services in DCAP-1, DCAP-2 includes a 1-year extension of the school period and the option of spreading the final exam phase out over several school years. Second, the school performance of student-athletes was compared with the performance of the entire student population. The analyses yielded the following findings: 1) student-athletes' school performance is well above the average of the entire student population. 2) Although, DCAP-2 users are much more involved in elite sport, their school performance and performance development do not differ from DCAP-1 users. These results do not provide any indication of a systematic neglect of student-athletes' academic career in favour of their athletic career. DCAPs appear to ensure the success of student-athletes' academic careers effectively.

Keywords

Support · Competitive sport · Adolescence · Achievement · Development

Q3: Does the upper secondary school performance in various subjects, in the final exams and overall differ between ESS student-athletes and the entire student population?

Table 1 Distribution patterns of DCAP-2 users' final exams ($N=61$)

Pattern	Number of final exams per school year in the higher education qualification phase			Number of student-athletes	
	1st year	2nd year	3rd year	<i>n</i>	%
A	1	1	2	17	27.9
B	1	2	1	15	24.6
C	0	2	2	12	19.7
D	0	1	3	17	27.9

DCAP dual career assistant programme for student-athletes at the upper secondary school level

Methods

Study design and samples

This was a quantitative study based on cross-sectional and longitudinal data with different groups and measurement times. The University of Potsdam ethics committee approved this study. The focus was on the school performance of all 200 student-athletes with a general higher education entrance certificate who started the qualification phase at the selected ESS (Brandenburg, Germany) in 2012, 2013, or 2014. Of these student-athletes, 139 attended DCAP-1 (years of age: mean [M] = 17.12, standard deviation [SD] = 0.58; sex: 50.4% female, 49.6% male) and 61 attended DCAP-2 (years of age: M = 17.00, SD = 0.66; sex: 42.6% female, 57.4% male). In addition, the average school performance of the entire upper secondary student population at the 25 public comprehensive schools in the federal state of Brandenburg (n = 3606; 49.8% female, 50.2% male), which were provided for the same period, were taken into account.

Data acquisition

The school performance of the student-athletes was extracted by the educational staff of the ESS from copies of the general higher education entrance certificates and made available in anonymised form as an electronic data file. The data acquisition followed a protocol developed by the research team. The school grades and the corresponding grade points achieved at the end of each semester in all school subjects in which the student-athletes took final exams were recorded as performance indicators. In addition, the overall performance (across

all subjects) at the end of the qualification phase was included (value range: 0 to 900 points; at least 300 points are required to acquire the general higher education entrance qualification = grade 4.0, 823 to 900 points = grade 1.0). The scale for school grades ranges from 1.0 (very good) to 6.0 (unsatisfactory), and for subject-specific grade points from 0 (unsatisfactory) to 15 (very good). The data acquisition was limited to the subject-specific performance achieved at the end of each semester in the qualification phase. In addition, the times and results of the final exams were recorded. Comparative data on the entire student population at public comprehensive schools were provided as anonymised electronic data files by the Ministry of Education, Youth and Sport of the federal state of Brandenburg.

Data analyses

Statistical analyses were performed using SPSS® Statistics (version 26.0, IBM Corp., Armonk, NY, USA). The overall school performance and the subject-specific performance in the final exam subjects most frequently chosen by student-athletes were taken into account in the data analyses.

Looking at Q1, the independent t -test was used to perform cross-sectional analyses of differences in school performance between DCAP-1 users and DCAP-2 users. The following performance indicators were considered: 1) overall grade points at the end of the qualification phase; 2) subject-specific grade points for final exams; and 3) subject-specific grade points at the end of each semester.

To clarify Q2, repeated-measures analysis of variance (with group and

time as factors) was used to check for differences in the performance development of DCAP-1 users and DCAP-2 users from the first to the last semester of the qualification phase (four measurement points). The subject-specific grade points at the end of each semester were considered.

Regarding to Q3, the one-sample t -test was used to perform cross-sectional analyses of differences in school performance between ESS student-athletes and the entire student population. The following performance indicators were considered: 1) overall school grade at the end of the qualification phase; 2) subject-specific grade point average over the entire qualification phase; and 3) subject-specific grade points on final exams.

All data were thoroughly tested for their suitability for the applied statistical methods. No serious violations of requirements were identified. A 95% confidence interval (CI) without including zero was primarily used to identify significant effects, but also a P -value ≤ 0.05 . The effect sizes Cohen's d , Hedges's g and η^2 were calculated and interpreted as small (d , $g \geq 0.20$, $\eta^2 \geq 0.01$), medium (d , $g \geq 0.50$, $\eta^2 \geq 0.06$), and large (d , $g \geq 0.80$, $\eta^2 \geq 0.14$).

Results

Pre-analysis

The final exam subjects most frequently chosen by student-athletes were mathematics (DCAP-1/DCAP-2: n = 99/54), German as a native language (DCAP-1/DCAP-2: n = 85/46), physical education (DCAP-1/DCAP-2: n = 82/50), and history (DCAP-1/DCAP-2: n = 49/32).

All DCAP-2 users spread their four final exams out over the 3-year qualification phase. The majority of them completed one to two exams per semester. Four distribution patterns can be identified, of which patterns A, B and D were chosen with about the same frequency (■ **Table 1**).

Table 2 Analyses of variance in student-athletes' school performance on the final exams and overall

	Group	N	Grade points		Test of group differences				
			M	SD	t	df	p-value	95% CI	d
Overall performance	DCAP-1	139	607.14	107.96	-1.03	198	0.305	[-50.7, 16.0]	0.16
	DCAP-2	61	624.49	114.47					
Final exam performance in the subject ...									
Mathematics	DCAP-1	99	6.88	3.88	-1.51	151	0.133	[-2.3, 0.3]	0.25
	DCAP-2	54	7.89	4.08					
German	DCAP-1	85	7.02	3.26	-1.51	129	0.134	[-2.1, 0.3]	0.27
	DCAP-2	46	7.93	3.38					
Physical education	DCAP-1	82	11.68	2.13	-1.85	130	0.067	[-1.4, 0.1]	0.34
	DCAP-2	50	12.34	1.72					
History	DCAP-1	49	10.18	3.68	-0.56	79	0.574	[-2.0, 1.1]	0.13
	DCAP-2	32	10.63	3.02					

DCAP dual career assistant programme, grade point scale for final exams ranges from 0 to 15 (= excellent), grade point scale for overall performance for the higher education entrance certificate ranges from 0 to 900 (= excellent), *M* mean, *SD* standard deviation, *CI* confidence interval, *d* Cohen's effect size

Table 3 Analyses of variance in student-athletes' school performance at the upper secondary level (higher education entrance qualification phase)

School subject	Group	N	Grade points per semester ^a								Average grade points	
			1st semester		2nd semester		3rd semester		4th semester		Overall	
			M	SD	M	SD	M	SD	M	SD	M	SD
Mathematics	DCAP-1	99	10.10	2.82	10.25	2.82	10.56	2.54	10.10	2.97	10.25	2.54
	DCAP-2	54	10.48	2.89	10.20	2.84	10.07	3.11	9.70	3.23	10.12	2.80
German	DCAP-1	85	8.74	2.44	9.09	2.53	9.20	2.45	9.49	2.28	9.13	2.21
	DCAP-2	46	8.98	2.30	9.07	2.59	9.15	2.94	9.63	2.78	9.21	2.53
Physical education	DCAP-1	82	12.04	1.56	12.06	1.67	12.61	1.28	12.96	1.31	11.43	1.69
	DCAP-2	50	12.56	1.61	12.12	2.02	12.80	1.23	13.00	1.25	11.39	1.81
History	DCAP-1	49	11.76	1.91	11.49	2.08	11.49	1.87	11.00	2.18	12.42	1.21
	DCAP-2	32	11.22	1.93	11.47	1.85	11.47	1.85	11.41	2.14	12.62	1.30

DCAP dual career assistant programme, grade point scale ranges from 0 to 15 (= excellent), *M* mean, *SD* standard deviation

^aThe school performance achieved by DCAP-2 users over six semesters is shown here in an adapted form

School performance of student-athletes using different DCAPs (Q1)

The total number of grade points on the higher education entrance certificate and the final exams' grade points in selected subjects achieved by the DCAP-2 users are apparently slightly higher than the grade points of the DCAP-1 users. The descriptive statistics and effect sizes indicate small differences in mathematics, German and physical education, but these differences were not significant (Table 2).

The subject-specific school performances (without final exams), which were documented on school report cards at the end of each semester, are shown in Table 3 for the entire higher education entrance qualification phase. In the cross-sectional view, DCAP-1 and DCAP-2 users do not differ significantly

from one another in their subject-specific performance at the end of each semester (Table 4).

Development of school performance of student-athletes attending different DCAPs (Q2)

Development of the subject-specific school performance during the qualification phase is shown in Table 3. No significant interaction effects (group × time) could be identified. This means that the school performance of DCAP-1 and DCAP-2 users in mathematics ($F(1.88, 281.50) = 1.09, p = 0.334, \eta^2 = 0.01$), German ($F(1.82, 232.73) = 0.40, p = 0.650, \eta^2 < 0.01$), physical education ($F(1.7, 223.7) = 0.74, p = 0.460, \eta^2 = 0.01$) and history ($F(2, 156) = 1.09, p = 0.412, \eta^2 = 0.01$) developed similarly.

School performance of student-athletes in contrast to the entire student population (Q3)

When comparing the average grade points of student-athletes with those of the entire student population, it can be determined that student-athletes performed better on average, both during the qualification phase and in the final exams in mathematics and history. The effect sizes indicate moderate to large differences in the grade points achieved. No differences in performance could be found in the subject German (Table 5). The overall performance at the end of the qualification phase noted on the higher education entrance certificate shows that student-athletes at the selected ESS not only performed better in some subjects and final exams compared to the entire student population: student-athletes re-

Table 4 Cross-sectional analysis of differences between DCAP-1 and DCAP-2 users' school performance at the upper secondary level (higher education entrance qualification phase)

	Semester	Test of group differences			
		t	df	p-value	95% CI
Mathematics	1	-0.79	151	0.430	[-1.3, 0.6]
	2	0.10	151	0.919	[-0.9, 1.0]
	3	1.03	151	0.303	[-0.4, 1.4]
	4	0.77	151	0.445	[-0.6, 1.4]
German	1	-0.54	129	0.589	[-1.1, 0.6]
	2	0.06	129	0.951	[-0.9, 1.0]
	3	0.10	129	0.921	[-0.9, 1.0]
	4	-0.30	129	0.763	[-1.0, 0.8]
Physical Education	1	-1.85	130	0.067	[-1.1, 0.4]
	2	-0.18	130	0.856	[-0.7, 0.6]
	3	-0.84	130	0.403	[-0.6, 0.3]
	4	-0.16	130	0.874	[-0.5, 0.4]
History	1	1.23	79	0.222	[-0.3, 1.4]
	2	0.05	79	0.963	[-0.9, 0.9]
	3	0.05	79	0.960	[-0.8, 0.9]
	4	-0.83	79	0.411	[-1.4, 0.6]

DCAP dual career assistant programme, CI confidence interval

ceived the highest school qualification based on a significantly better overall school grade, which was calculated from the performance in selected subjects and in the final exams. The effect size is moderate (■ Table 5).

Discussion

Starting point of the study were the concerns and experiences frequently discussed in sports policy and sports science related to the mastering of dual careers. On the one hand, we needed to clarify whether student-athletes enrolled in an upper secondary DCAP at an ESS with the DC support services “school time extension” and “splitting of the final exams phase” (DCAP-2) performed differently to student-athletes at the same ESS enrolled in an upper secondary DCAP without these two DC support services (DCAP-1). On the other hand, there was the question of whether athletic engagement in adolescence is accompanied by a systematic neglect of school and a lasting impairment of academic career opportunities. These questions were examined using data on the school performance of student-athletes based on school report cards and public data

on school performance for the entire student population.

The preliminary analysis showed that all DCAP-2 users took advantage of the opportunity to split up their final exams. This special DC service apparently meets a real need of student-athletes for flexibility and support in a targeted manner. The broad spectrum of the final exam distribution patterns chosen by student-athletes indicates that this need for support has highly individual contours.

The first question about differences in performance between DCAP-1 users and DCAP-2 users must be answered in the negative based on the cross-sectional findings. The subject-specific performance, the final exam performance and the overall school performance of DCAP-2 users is neither worse nor better than that of DCAP-1 users! This indicates that the DCAP-2 as a whole, and especially the DC service “splitting of final exams”, is working as intended.

The second question must also be answered in the negative. There were no significant differences in the development of school performance between DCAP-1 users and DCAP-2 users. The results of the longitudinal analysis are compatible with the cross-sectional findings and are

fully in line with the intended effects associated with DCAP-2.

The results for Q1 and Q2 are consistent with the results of a study on Danish student-athletes by Storm and Eske (2022). They found no differences in school grades between student-athletes who did and did not receive DC services (e.g., extending the higher education qualification phase by 1 year). Like these authors, we assume that student-athletes who choose to make use of DC services are under more pressure. They need more time and flexibility to be able to balance and cope with athletic and academic demands. This assumption is supported by further findings from our research project (Sallen et al., 2022) and other studies (Hoffmann et al., 2011; Storm & Eske, 2022) indicating that users of secondary school DCAPs with an extra school year invest more time in athletic training, are more likely to participate in high-ranking competitions and are more often members of an athletic elite squad. This is to be seen on the one hand as a phenomenon accompanying the selection of student-athletes for enrolment in DCAPs and, on the other hand, as a desired effect of DCAPs. In addition, quite a few student-athletes retrospectively reported that without enrolling in extended DCAP, they would not have been able to obtain a higher education entrance certificate and maintain an athletic career at the same time (Sallen, 2018; Storm & Eske, 2022). Against this background, it can be concluded that possible impairments of the academic career due to a particularly high investment of time into the athletic career are apparently prevented by enrolling in DCAP-2. DCAP-2 users seem to be able to develop their academic performance potential just as well as DCAP-1 users. There are no indications of an excessive, artificial increase in school performance due to enrolment in DCAP-2 compared to DCAP-1. In order to maintain the value and comparability of school leaving certificates, the academic content and requirements of lessons and exams must also be maintained unchanged. Our preliminary conclusion is that DCAP-2 effectively supports student-athletes in their endeavours to achieve the highest

Table 5 Comparison of upper secondary school performance of student-athletes (SA) and the entire student population (SP) at comprehensive schools in the federal state of Brandenburg

	Group	N	School performance		Test of group differences				
			M	SD	t	df	p-value	95% CI	g
			School Grade						
Overall performance	SA	200	2.22	0.61	-7.00	199	<0.001	[-0.4, -0.2]	0.54
	SP	3606	2.52	0.55					
School performance in the subject ... (average over the entire qualification phase of 4 to 6 semesters)									
			Grade points						
Mathematics	SA	153	10.20	2.63	6.61	152	<0.001	[1.0, 1.8]	0.54
	SP	1697	8.80	2.60					
German	SA	131	9.16	2.32	0.29	130	0.774	[-0.3, 0.5]	0.03
	SP	2959	9.10	2.00					
History	SA	81	11.42	1.73	8.42	80	<0.001	[1.2, 2.0]	0.78
	SP	1015	9.80	2.10					
Final exam performance in the subject...									
			Grade points						
Mathematics	SA	153	7.24	3.88	6.35	152	<0.001	[1.4, 2.7]	0.67
	SP	1697	5.20	3.30					
German	SA	131	7.34	3.32	-1.57	130	0.118	[-1.0, 0.1]	0.16
	SP	2982	7.80	2.80					
History	SA	81	10.36	3.43	4.62	80	<0.001	[1.0, 2.5]	0.48
	SP	1016	8.60	3.70					

M mean, SD standard deviation, CI confidence interval, g Hedges's effect size

School grade scale ranges from 6 to 1 (= excellent), grade point scale ranges from 0 to 15 (= excellent)

possible school leaving certificate with grades that correspond to their academic performance potential. DCAP-2 is able to compensate for additional academic challenges compared to DCAP-1.

To clarify the third question, the upper secondary school performance of ESS student-athletes was compared with that of the entire student population. The results confirm the assumption derived from the current state of research that student-athletes do not perform any worse academically than students at regular schools not pursuing an athletic career. The school performance of student-athletes does not provide any indication of a systematic neglect of their academic career in favour of their athletic career. An impairment of the educational and vocational opportunities available to student-athletes after finishing upper secondary school is also not evident. DCAP-1 and DCAP-2 seem to ensure the success of these students' academic career effectively.

In line with the findings of other studies (Brettschneider & Klimek, 1998; Georgakis et al., 2015; Storm & Eske,

2022), the upper secondary school performance of ESS student-athletes is significantly better than that of non-athletic students. This applies to the performance in final exams as well as to the performance in specific subjects (average over four to six semesters) and the overall academic performance.

Wartenberg et al. (2014) speak out against the general suspicion that the school performance of student-athletes at ESSs may be assessed less strictly than the performance of non-athletic students at ESSs and regular schools. They do not see any reason to doubt the fairness and professionalism of ESS teachers in this respect. Brettschneider and Klimek (1998) were able to empirically prove that ESS teachers tend to grade student-athletes' academic performance more strictly than the performance of classmates without any engagement in elite sport. The results of our study also refute the general suspicion. The final exams that student-athletes had to pass were centrally developed for the entire student population by the Ministry of Education, Youth and Sport. These final exams were held at all

upper secondary schools in the federal state of Brandenburg at the same time and under uniform conditions. The grading of the final exams is highly standardised and is carried out by several teachers acting independently of one another. Therefore, systematic differences with regard to the requirements and grading of final exams are excluded.

A plausible explanation for the better school performance of student-athletes could, however, be a higher socioeconomic status (SES) of student-athletes' families. The SES is measured based on information about the parents' occupations, educational levels and income levels. In educational research, SES is considered a well-known predictor of school performance and academic success. The higher the family's SES, the better the school performance and the higher the educational qualifications of the descendants (Hattie, 2009). It is also known that adolescents with a higher SES background are overrepresented in organised sports (Nobis & Albert, 2018), school sport programmes (Ferry & Lund, 2018), elite sports and secondary school DCAPs

(Sallen et al., 2022; Skrubbelttrang, Karen, Nielsen, & Olesen, 2020; Storm & Eske, 2022). In addition, it could be relevant that DCAP-2 users only practised individual sports without close physical contact. There is some evidence that such sports are more likely to be practised by individuals with higher SES, in contrast to team sports and sports with close physical contact (Rohrer & Haller, 2015).

Further explanations can be found in the scientific literature. Storm and Eske (2022, p. 754) consider it possible “that there is a transfer of learning and expertise from engaging in elite sport to the academic context which has a positive effect on grades”. With reference to Jonker et al. (2009), it is reasonable for them to suggest that an athletic career in elite sports gives student-athletes the discipline and skills to achieve higher academic performance compared to non-athletic students. Jonker et al. (2009) assume that self-regulatory skills appear to be among the most promising venues for further investigations analysing the association between athletic engagement and academic performance. Wartenberg et al. (2014) consider similar explanations (e.g., self-discipline, self-efficacy or conscientiousness as personality traits), while noting at the same time that no empirical studies exist to confirm this.

Strengths and limitations

This is one of the first studies to look at the school performance of upper secondary student-athletes based on highly valid data from school report cards. In addition, the study is novel and unique due to the differentiated consideration of inter-subject, subject-specific and final exam-specific performance indicators. Furthermore, the longitudinal design of the first part of the study facilitates greater insight into the development of student-athletes' school performance and its relationship with their enrolment in different DCAPs. Moreover, by including three cohorts of student-athletes, it was possible to obtain unusually large sub-samples of student-athletes enrolled in DCAPs. The inclusion of differentiated school performance data from the

federal state's entire student population should also be emphasized as a strength.

Besides these strengths, limitations of the present study should also be considered. Firstly, it was unfortunately not possible to take into account student-athletes' engagement and achievements in elite sport. This information was not recorded in either the internal ESS documents or the official school report cards. Although the simultaneous consideration of the development of both academic and athletic achievements promises to serve as a particularly comfortable starting point for evaluating the effectiveness of DCAPs, realising this ideal in dual career research continues to be a major challenge (Ryba et al., 2016; Storm & Eske, 2022). Even if the sporting achievements could not be directly taken into account in the study, the status as ESS student-athletes expresses the fact that the study participants were highly engaged and successful athletes who have fulfilled the sporting criteria for remaining at an ESS every year up to the end of schooling.

Second, the study was limited to looking at the academic performance of people who achieved the highest possible school leaving certificate (general higher education entrance qualification). No statements could be made here about the academic careers of student-athletes who switched to another educational pathway during the higher education entrance qualification phase (e.g., limited higher education entrance qualification), switched schools or dropped out of school.

Third, we considered self-determined student-athletes who make their own decisions for or against an educational pathway and enrolment in DCAPs. At the same time, the ESS and sports associations also decide which student-athletes have access to ESS and DCAPs. Under these uncontrollable study conditions—beyond experimental studies with randomised comparison groups—only indications of causal relationships can be identified. It is all the more important in future studies to 1) combine quantitative and qualitative methods, and 2) carry out more complex analyses in which a well-founded selection of factors influencing school and athletic performance

development is taken into account (Ryba et al., 2016; Sallen et al., 2023).

Finally, and importantly, it should be noted that school grades are the result of a complex grading process based on different reference norms and influenced by a large number of factors. Grades only provide limited information about what students have actually achieved and are able to achieve in the academic context (Brookhart et al., 2016). Following the example of international educational research (e.g., OECD PISA studies), it is advisable to investigate the question of the effectiveness of DCAPs with instruments to assess school performance objectively (Sallen et al., 2023; Niehues, Gerlach, Wendeborn, & Sallen, 2022).

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Funding. This work was jointly supported by the Ministry of Education, Youth and Sport of the Federal State of Brandenburg (Germany), the German Olympic Sports Confederation and the German Federal Institute of Sport Science (grant number: 071102/16-21).

Author Contribution. All authors were principal investigators of a third-party-funded research project (“Evaluation of dual career support services for student-athletes at elite sport schools in the federal state of Brandenburg”) to which the present study is linked. J. Sallen was responsible for conception and implementation of the study. J. Sallen led the data collection and data analysis. T. Wendeborn contributed to the data collection. The first draft of the manuscript was written by J. Sallen and all authors commented on previous versions of the manuscript. The manuscript was read and approved for publication by all authors.

Funding. Open Access funding enabled and organized by Projekt DEAL.

Declarations

Conflict of interest. J. Sallen, T. Wendeborn and E. Gerlach declare that they have no competing interests.

The study was approved by the Ministry of Education, Youth and Sport of the federal state of Brandenburg (Germany) and the ethics committee of the University of Potsdam (Germany). All research procedures were

in line with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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