The Unified State Exam and Academic Performance: A Three-Year Analysis of Relationships Across Selection Method and Gender in University Students

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Abstract

The primary objective of this study is to evaluate the efficiency of current university admission tests in selecting qualified students in a public university by measuring the extent to which an applicant's performance in admission tests can predict his/her academic performance after enrolling at the university. As a second aim, this study compares the academic performance of two groups of students that enrolled at the university through either an admission test or an Olympiad program. For this purpose, two distinct groups of students from a large public university were recruited in 2018. The first group enrolled at the university through the unified state exam (n = 998) and the second one did via an Olympiad (n = 465). Throughout their academic years, their performance was monitored and recorded at the end of each academic year. The data was collected through an automated survey, which gathered basic information such as the type of enrollment method, university entrance test score, the current faculty, and academic performance in various subjects. Results of regression analysis revealed that the Unified State Exam scores significantly predicted cumulative academic performance at the end of the first, second, and third academic years.

However, the strength of the link was different across the four studied faculties. Also, there was a statistically significant difference between the academic performance of Olympiad and non-Olympiad students across gender and faculty. Although these findings provide empirical evidence supporting the use of the Unified State Exam as a reliable tool for predicting future academic performance of students in public universities, we recommend that universities should not underestimate the importance of alternative pathways, such as Olympiad programs, for enrolling in higher education.

Keywords admission test, academic performance, Unified State Exam, university students, Olympiad

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University admission systems are rapidly developing all over the world. One of the crucial elements of these systems is university admission tests, also known as selection tests. In the current era, attention to university admission tests is growing in Asia (i.e., [Bai, Chi, Qian, 2014]), Europe (i.e., [Meyer et al., 2019; Migliaretti et al., 2017]), Africa (i.e., [Gebru, Verstegen, 2023; Bekele, Beza, Gedamu, Berndt, 2023]), the Middle East (i.e., [Farrokhi-Khajeh-Pasha et al., 2012; Tamimi et al., 2023]), Australia (i.e., [Puddey, Mercer, 2014]), and the United States (i.e. [Evans, Wen, 2007]). The reason behind this attention is the need to allocate the resources and facilities of universities to the most capable students, who will be able to successfully take on job positions after graduation. Although different countries may use various admission tests, there is a collective effort and intention to constantly improve the quality of these tests. Psychometricians and test developers are known as the main role players in developing these selection tests.

One of the basic functions of an admission test is to distinguish students who may be at risk of academic failure in the future from those who can successfully complete their university program at an early stage [Tinto, 1975]. Another important function is to prevent universities from investing financially (e.g., scholarships) in less academically progressive students [Schudde, Scott-Clayton, 2016]. Besides, they help to save the resources of faculty members (i.e., time or energy) by avoiding the admission and guidance of students unlikely to progress academically. Thus, an efficient admission test can minimize the university's costs in many aspects. Despite these functions, in some countries, university admission tests may also provide a second opportunity for students who have received low grades in school or come from disadvantaged socio-economic backgrounds, reducing inequality. In some European countries (e.g., [De Visser et al., 2017; Booij, van Klaveren, 2017; Niessen, Meijer, Tendeiro, 2018]) and the United States [Atkinson, Geiser, 2009], more specific versions of uni-

versity admission tests have been developed and used, known as curriculum sampling tests; these allow different faculties to assess candidates' abilities based on small-scale versions of required courses from the educational programs that they wish to enroll in. This was supported by prior studies, which showed that a positive performance in such tests could be a good indicator of future academic performance [Niessen, Meijer, Tendeiro, 2016; Bacon, Bean, 2006]. As each faculty may have its own admission rules and criteria, these tests help faculties evaluate candidates according to their own educational standards and requirements. A faculty-specific admission exam may aim to measure not only applicants' academic abilities but also their motivation and interest [Gandil, Leuven, 2022].

Consistent with the scientific progress in psychometrics and test development in Russia, attention to the precision of university admission tests has increased (e.g., [Prakhov, Yudkevich, 2019]). In most Russian public universities, including HSE University, admission has traditionally been based either on the Unified State Exam scores or on Olympiad results. Although these two admission forms have been operational for over a decade, their relations with post-entrance performance has not been comprehensively or systematically studied in the Russian Federation. Given that HSE University is one of the leading universities in the Russian Federation and receives a large number of applications annually, studying the predictive value of its admission system is of particular interest. Thus, this study will focus on the efficiency of enrollment methods at this university. The primary aim is to uncover the link between Unified State Exam performance and subsequent academic performance among students admitted through this exam. A secondary aim is to compare the academic performance of students enrolled through the Unified State Exam with the performance of those admitted through the Olympiad over three consecutive years.

1. Literature review

A modern university cannot attract or select talented students without modernizing its admission system. This was the primary rationale for the reform of admission tests that began in many European universities in the early 1990s [McGrath et al., 2014]. Another reason is that these days the role of universities has slightly changed as they are expected not only to select qualified students for research and teaching purposes but also to contribute to economic growth [Ibid.]. These changes urge universities to pay more attention to psychometric principles when developing university admission tests. The ultimate goal of these tests is to predict students's future academic success in graduating from a university based on their performance in the admission tests [Yousafzai, Jamil, 2019; Stemler, 2012].

Different universities, based on their resources and requirements, may use different admission systems. Admission systems are divi-

ded into open (e.g., in Austria, Italy, and France) and selective ones (e.g., in Australia, Finland, Ireland, the UK, and the U.S.). According to Sargent et al. [2012], an open admission system refers to a system in which applicants gain automatic access to higher education after completing secondary school and obtaining a certificate, and a selective admission system is a system in which graduation from school and obtaining a school certificate is not enough, and candidates must meet additional requirements to be admitted to higher education institutions. In this regard, Oppedisano [2009] suggests that open admission systems lead to higher dropout rates due to greater uncertainty. The reason behind this is that in such systems, students choose to enroll at a university without estimating their prospects of success in a particular field. In other words, universities with open admission systems may fail to provide students with precise information about the probability of their success before enrollment. According to Sargent et al. [2012], countries with open admission systems have lower graduation rates compared to those with selective admission systems, which is further proof that universities adopting selective admission systems may be preferred to those having open admission systems.

In most universities with selective admission systems, standardized admission tests are designed and used to guide students toward advanced paths in higher education. The main function of these tests is to select the most prepared applicants for various university programs. Additionally, scientific evidence demonstrates that admission test scores can predict academic performance, reduce academic failure and dropout rates, and increase the likelihood of successful degree completion (e.g., [Mwandigha et al., 2018; Ferrão, Almeida, 2018]). Research on the effectiveness of admission exams in predicting academic performance is conducted worldwide. For example, studies have tested the predictive validity of the U.S. SAT (Scholastic Aptitude Test), one of the two most prominent university entrance exams in the U.S. [Burton, Ramist, 2001; Kobrin et al., 2008]. Another example is Sweden's standardized test (SweSAT), mostly used for applicants who do not come from a common path to comply with entry requirements for higher education [Orr, Gwosć, Netz, 2011].

Notably, Rothstein [2004] shows that SAT scores are closely related to applicants' demographic characteristics and the schools they graduated from. When controlling for these demographic characteristics, the SAT's contribution to predicting academic performance reduces significantly. According to statistics, in EU countries, the likelihood of obtaining a university degree is statistically associated with socioeconomic status. Students from the wealthiest 25% of the population have a 75% chance of getting a degree, compared to just 25% for those in the poorest 20% of the population [Koucky et al., 2010]. Subsequently, this difference leads to underrepresentation of disadvantaged students in higher education, as supported by Italian data [Caroleo, Pastore, 2012].

Two scientific approaches explain the use of university admission tests as reliable predictors of future academic performance; those are the Cattell-Horn-Carroll (CHC) theory of cognitive abilities and the predictive validity model. The CHC theory proposes that human cognitive abilities influence both performance and intelligence constructs. This theory hypothesizes that these cognitive abilities can drive individuals to learn, solve problems, adapt to new settings, and achieve significant academic success [Jensen, 1998; Sackett, Borneman, Connelly, 2008]. According to CHC, cognitive abilities are considered the foundation of intelligence. Empirically, this theory is recognized as the most comprehensive theory for understanding cognitive ability structures [Flanagan, Dixon, 2014]. The predictive validity model, which is primarily used for behavioral constructs, suggests that admission test performance can predict actual academic performance [Van der Staay et al., 2009]. An admission test with stronger predictive power better represents future academic performance. Both theories rationalize the assessment of applicants' intellectual abilities through designed admission tests with a view to, first, confirming the presence of required intellectual capabilities, and second, prioritizing applicants with the highest intellectual abilities for university admission.

Currently, Russia is employing a standard selective admission system; however, universities may require additional entrance examinations for specific scientific fields when necessary. In Russia, this selective admission test is known as the Unified State Examination (USE), which is a centrally administered standardized examination. It serves as both a secondary school graduation requirement and a university entrance examination. USE is conducted across all Russian regions, and it has identical task types and procedures for all students. Since 2009, it has been the only form of school graduate assessment and the main university entrance examination. The test covers several subjects, including mathematics, the Russian language, a foreign language (English, German, French, Spanish, and Chinese), physics, chemistry, biology, and some other subjects. The exam in each subject is held on a scheduled date, and all applicants must take it offline. Test duration ranges from three to four hours, depending on the subject. Universities use USE results to select students based on their composite scores across different subjects. Each university and its faculties have their own benchmarks and lists of subjects required.

The association between admission tests results and subsequent university performance has received significant research attention in Russia. Although several studies have analyzed this association (e.g., [Poldin, Silaev, 2011; Peresetsky, Davtyan, 2011; Kantorovich et al., 2011; Khavenson, Solovieva, 2014]), they have several limitations. First, most studies were conducted during the early implementation phase of the Unified State Examination (USE) in Russia, when the USE was either in its experimental stage or immediately after its introduction.

Since that time, both the test content and administration procedure have significantly changed. Second, the research predominantly focused on first-year academic performance, because of limits to data availability and difficulties in long-term data collection. Third, the studies failed to account for important contextual and non-cognitive applicant characteristics (i.e., gender, major, or faculty). Fourth, several papers used a five-point grading scale, one with limited score dispersion, as their primary academic performance indicator. Prior research has also relied on simple statistical analysis and mainly focused on first-year outcomes. Considering a potential delayed effect is possible, the subsequent academic years should be studied as well. Admittedly, a number of studies used econometric methods to analyze the relationship between students' academic success and their USE results, including the studies conducted at the HSE university [Kantorovich et al., 2011; Poldin, Silaev, 2011; Khavenson, Solovieva, 2014]. However, our research addresses these gaps by investigating the association between USE scores and academic performance across three consecutive years of university study.

The second method of enrollment in Russian Federation universities is through Olympiad programs. The government and universities initiate these programs to find students who have particular abilities or talents in 24 academic subjects (such as language, math, biology, and law). According to recent statistics, every year a large number of schoolchildren participate in all Olympiad competitions, and a shortlist of final Olympiads winners is compiled[1]. All the winners receive incentive payments from the Russian government, and they are allowed to pursue their studies in a university in the field of study they wish, free of charge. As follows from our literature review, there are few studies that have found students who enrolled in a university through Olympiads to perform better academically than those enrolled through admission tests [Gordeeva et al., 2013].

Notably, enrollment in a university is not always based on admission tests or Olympiads. For example, in some countries, such as Sweden [Wikström, Wikström, 2017], there is another form of enrollment which is based on school grades (not admission tests or Olympiad); however, selection based on school grades is recommended only for non-competitive academic fields. Another example can be found in Singapore, where admission to a university academic discipline is based on non-academic qualities of students, such as possessing particular talents or skills or a distinguished record of extracurricular activities [Kamis, Pan, Seah, 2022]. What makes this study novel is that we intend to compare the academic performance of two groups

[1] Sobyanin S. Moscow School Students Won Half of Prizes at All-Russian Olympiad: https://www.mos.ru/en/mayor/themes/39299/9518050/#:~:text=The%20All%-2DRussian%20Olympiad%20is,key%20independent%20indicator%20of%20education (accessed 08.05.2025).

of students who enrolled at the same university by passing either the admission test or contending against other students through a competition program called Olympiads in Russia. In both groups, each student actively obtained a place at the university. This is considered the second aim of this study.

2. Method

2.1. Procedure

This study is a part of a larger project in which the academic performance of admitted students is annually monitored and recorded in a large Russian public university, known as HSE University. Thus, the relevant authority granted researchers permission to conduct this study. In addition, all participants signed general written consent forms prior to their enrollment at the university, and they agreed to transfer their data to the university. HSE University, with more than 50,000 undergraduate and graduate students, is one of the leading universities in the Russian Federation. Currently, HSE University selects students for the educational programs via two admission methods, known as the Unified State Examination (USE) and the Olympiads. Approximately 60% of applicants annually are admitted to this university through university admission tests, and about 40% are admitted through national Olympiads (https://www.hse.ru/figures/#top10). Data on the results of the Unified State Exam as well as contextual characteristics of applicants, and their academic performance are collected annually through HSE ASAV. In this system, students' academic performance, known as cumulative performance, at the end of each academic year is collected.

2.2. Participants

The sample included 1463 university students, except for those with missing information, who enrolled at the university through either the Unified State Exam (n = 998) or the Olympiad program (n = 465) in 2018. The USE tests are compiled by The Federal Institute of Pedagogical Measurement. More specifically, 998 students (male: 589, female: 409) were enrolled at this university through the Unified State Exam. The students were from the Faculty of Economics (n = 500), Law (n = 226), Computer Science (n = 380), and Mathematics (n = 357). Also, 465 students (male: 318, female: 147) enrolled through the Olympiad program. The Olympiad students were distributed in the Faculty of Economics (n = 104), Law (n = 117), Computer Science (n = 195), and Mathematics (n = 49). The above are the four major faculties of the target university with the highest number of admitted students through the Unified State Exam and Olympiad, providing a large sample to test the research hypotheses.

2.3. Measures

2.3.1. Admission test enrollment

The Unified State Exam results are used as a measure in the pre-enrollment stage. The Unified State Exam is composed of three subjects for the faculty of math and computer science and four subjects for the

faculty of law and economics. The average score of these subjects was used in the current study. According to the results, the applicants are ranked from those who obtained the maximum scores to those with the lowest scores. All last-year high school students in Russia are required to take the unified exam in order to receive a high school certificate and to enroll at university. All students attend the unified exam on a specific date, and that lasts for three to four hours. Approximately half of the university places are filled by this method of selection. Nearly 50% of top performers in this exam, out of all applicants, qualify to obtain a study place free of charge in a given educational program of this university.

2.3.2. Olympiad enrollment

It refers to enrolled students admitted through various Olympiad programs, who were asked to indicate the type of Olympiad they won. We used this to term the respective enrollment method.

2.3.3. Academic performance

The cumulative academic performance scores of students at the end of the academic year were used. A rating is a sorted roster of students, which shows how successful they are in doing various courses from their core curriculum within a set period. There are two kinds of academic performance ratings. Current ratings compare students' learning outcomes over the course of six months (for either two modules or one semester). This serves as a present, in-class performance indicator. It is updated as recent courses taken within the last six months (usually, five to eight courses) are factored in. Cumulative ratings, in turn, compare students' academic attainments during the entire period of their study at HSE University. This is a cumulative indicator. Twice a year, the cumulative rating incorporates recent courses along with those taken by students since the 1st year. Therefore, before their graduation, students' cumulative ratings will show their results across all curriculum elements: courses, term papers, projects, and the like. (at least 30 curriculum elements for Bachelor's students). For each student, the grade in each curriculum element is multiplied by the respective credit value; and the products are added up. For instance, over the last six months, a student has studied English (4 credits), Calculus (5 credits), and History (3 credits). The student, therefore, receives the following grades: 8, 7, and 10, respectively. This student's indicator is calculated as follows: $4 \times 8 + 5 \times 7 + 3 \times 10 = 97$. The cumulative rating includes all results — for both the optional elements and electives, regardless of whether a student wants either of them factored into the rating. Since the cumulative rating reflects all of a student's academic activities, several students in the cumulative rating may be above their peers, leading the current rating. In this study, the cumulative rating is used as an indication of academic performance.

2.3.4. Demographic characteristics

In our research, the basic demographic characteristics of the students were used to provide a detailed picture of the samples studied. These characteristics include the student's gender, age, admission year, educational program, and the faculty.

2.3.5. Data analysis

Various statistical methods were used to clean the data, test for normality, and analyze associations between the research variables. Data analysis was carried out in several stages. First, the data was analyzed for outliers and completeness. Second, correlation analysis was carried out, which provided an overall picture of the relationship between the study variables. A regression analysis was used to measure the extent to which the Unified State Exam may predict academic performance. Statistical analysis was performed using multiple statistical programs, including SPSS, JASP, and JAMOVI.

3. Results

3.1. Descriptive statistics

Table 1 demonstrates the descriptive statistics of the Olympiad and non-Olympiad students enrolled at HSE University in 2018. In this table, the distribution of Olympiad and non-Olympiad students based on gender, enrollment method, and a combination of gender and enrollment method is demonstrated. As the table shows, most of the students were enrolled in the faculty of economics (n = 500). The lowest number of students enrolled in the faculty of law (n = 226). According to the results of the Unified State Exam, most students enrolled in the faculty of economics (n = 396) and the least enrolled in the faculty of law (n = 109). According to the Olympiad results, the highest number of students are from the faculty of computer science (n = 195), and the lowest number are from the faculty of mathematics (n = 49). Also, the number of male students that enrolled at the university through Olympiad programs was almost twice the corresponding number of female students (318 : 147).

Table 1. **Descriptive statistics of Olympiad and non-Olympiad students enrolled at the university (n = 1463)**

Faculty	Gender			Selection method			Gender × Selection method				
	Male	Female	Total	Non-Olympiad	Olympiad	Total	Non-Olympiad males	Non-Olympiad females	Olympiad males	Olympiad females	Total
Economics	270	230	500	396	104	500	199	197	71	33	500
Law	86	140	226	109	117	226	37	72	49	68	226
Computer Science	297	83	380	185	195	380	135	50	162	33	380
Mathematics	254	103	357	308	49	357	218	90	36	13	357
Total	907	556	1463	998	465	1463	589	409	318	147	1463

As can be seen, the distribution of students based on gender and enrollment method varies across the four studied faculties. For exa-

mple, in the faculty of economics, students enrolled through the Unified State Exam are outnumbered by those who did through the Olympiad.

3.2. Correlation results

Table 2 provides a correlation matrix between the Unified State Exam scores and the cumulative academic performance after enrolling at the university. As the table shows, there is a statistically positive correlation between Unified State Exam scores and cumulative academic performance in the first year, cumulative academic performance in the second year and cumulative academic performance in the third year in the four faculties under study.

Table 2. **Correlation between academic performance of non-Olympiad students (*n* = 998)**

		First year	Second year	Third year
Economics (*n* = 396)	1st year performance	1		
	2nd year performance	.951**	1	
	3th year performance	.897**	.967**	1
	Unified exam scores	.650**	.601**	.555**
Law (*n* = 109)	1st year performance	1		
	2nd year performance	.951**	1	
	3th year performance	.916**	.984 **	1
	Unified exam scores	.626**	.578**	.543**
Computer science *n* = 185)	1st year performance	1		
	2nd year performance	.930**	1	
	3th year performance	.856 **	.962**	1
	Unified exam scores	.273**	.371**	.365**
Mathematics (*n* = 308)	1st year performance	1		
	2nd year performance	.934**	1	
	3th year performance	.883**	.971**	1
	Unified exam scores	.474**	.506**	.491**

Note. **correlation is significant at the 0.01 level (2-tailed).

Table 3 presents the correlation of cumulative academic performances among Olympiad students in three consecutive years. As the table shows, there is a positive association between cumulative academic performance in the first and second years and between the first and third years in the four faculties under study.

Table 4 shows the results of regression analysis between the Unified State Exam scores and the academic cumulative performance in the four major faculties. According to the table, in the faculty of economics, the Unified State Exam scores predicted the cumulative academic performance in the first, second, and third academic years; however, the Unified State Exam scores more accurately predicted the academic performance in the first academic year ($\beta = .650$, $p < .000$) and less so in the third academic year ($\beta = .555$, $p < .000$).

Table 3. **Correlation between academic performance of Olympiad students in different faculties (*n* = 465)**

		First year	Second year	Third year
Economics (*n* = 104)	1st year performance	1		
	2nd year performance	.948**	1	
	3th year performance	.909**	.972**	1
Law (*n* = 117)	1st year performance	1		
	2nd year performance	.885**	1	
	3th year performance	.909**	.911 **	1
Computer science (*n* = 195)	1st year performance	1		
	2nd year performance	.960**	1	
	3th year performance	.913 **	.974**	1
Mathematics (*n* = 49)	1st year performance	1		
	2nd year performance	.954**	1	
	3th year performance	.885**	.964**	1

Note. **correlation is significant at the 0.01 level (2-tailed).

Table 4. **Regression analysis between USE scores and academic performance (*n* = 998)**

Faculty	Outcome	Model					
			B	Std.	Beta	*t*	Sig.
Faculty of Economics	1st year performance	USE	.022	.001	.650	16.626	.000
	2nd year performance	USE	.019	.001	.601	14.920	.000
	3th year performance	USE	.016	.001	.555	13.113	.000
Faculty of Law	1st year performance	USE	.021	.002	.626	8.310	.000
	2nd year performance	USE	.020	.003	.578	7.228	.000
	3th year performance	USE	.017	.003	.543	6.535	.000
Faculty of Computer Science	1st year performance	USE	.011	.003	.273	3.756	.000
	2nd year performance	USE	.015	.003	.371	5.379	.000
	3th year performance	USE	.015	.003	.365	5.296	.000
Faculty of Mathematics	1st year performance	USE	.024	.003	.474	9.256	.000
	2nd year performance	USE	.024	.002	.506	10.249	.000
	3th year performance	USE	.024	.002	.491	9.794	.000

Similar results were obtained in the faculty of law. Although the Unified State Exam scores predicted cumulative academic performance in all academic years, the predictions were more correct for the first year ($\beta = .626$, $p < .000$) than for the second ($\beta = .578$, $p < .000$) and the third year ($\beta = .543$, $p < .000$).

The analysis of results in the faculty of computer science suggested that Unified State Exam scores can predict the cumulative academic performance from the first to the third academic year; nevertheless, these scores more accurately predicted cumulative academic performance in the second year ($\beta = .371$, $p < .000$) than in the first ($\beta = .273$, $p < .000$) or third year ($\beta = .365$, $p < .000$). Similar findings were obtained in the faculty of mathematics. There, the prognostic value of the Uni-

fied State Exam scores was higher for the cumulative academic performance in the second academic year (β = .506, $p < .000$) than for that in the first (β = .474, $p < .000$) or third (β = .491, $p < .000$) academic year.

3.3. Independent *T*-test results

Table 5 compares the cumulative academic performance between two groups of students, Olympiad and non-Olympiad, that enrolled at the university in 2018. These comparisons are performed at the end of the first, second, and third academic year. As the table shows, in the faculty of economics, there is a significant difference between Olympiad (M = 7.451, SD = 1.134) and non-Olympiad (M = 7.206, SD = 1.089) students with regard to the first-year cumulative performance, and this difference is statistically significant (t = –1.986, p = .048). Also, there was a considerable difference between Olympiad (M = 7.470, SD = 1.140) and non-Olympiad (M = 7.111, SD = 1.048) students in the second academic year (t = –3.048, p = .002). Similarly, in the third academic year, the Olympiad students (M = 7.520, SD = 1.111) performed better than the non-Olympiad ones (M = 7.192, SD = .948; t = –2.972, p = .003).

Table 5. **Independent *t*-test of academic performance of Olympiad vs non-Olympiad students (*n* = 1463)**

Faculty	Academic year	Enrolment method	*N*	Mean	*SD*	*f*	*Sig*	*t*	*df*	Sig (2-tailed)
Economics	First	USE	380	7.206	1.089	.075	.785	–1.986	478	.048
		Olympiad	100	7.451	1.134					
	Second	USE	395	7.111	1.048	.108	.742	–3.048	497	.002
		Olympiad	104	7.470	1.140					
	Third	USE	388	7.192	.948	2.770	.097	–2.972	486	.003
		Olympiad	100	7.520	1.111					
Law	First	USE	109	7.436	1.057	7.181	.008	–.808	224	.420
		Olympiad	117	7.543	.939					
	Second	USE	106	7.589	1.061	8.615	.004	–1.372	217	.172
		Olympiad	113	7.772	.909					
	Third	USE	104	7.714	1.001	6.372	.012	–1.439	212	.152
		Olympiad	110	7.897	.860					
Computer Science	First	USE	177	7.364	.902	8.747	.003	–.947	360	.344
		Olympiad	185	7.464	1.104					
	Second	USE	183	7.313	.914	9.293	.002	–1.334	370	.183
		Olympiad	189	7.455	1.114					
	Third	USE	185	7.320	.905	9.288	.002	–.895	378	.371
		Olympiad	195	7.413	1.107					
Mathematics	First	USE	297	7.736	.951	.256	.613	2.061	343	.040
		Olympiad	48	7.435	.859					
	Second	USE	308	7.684	.926	.210	.647	1.392	352	.165
		Olympiad	46	7.483	.851					
	Third	USE	304	7.676	.962	.628	.429	1.461	349	.145
		Olympiad	47	7.460	.827					

In the faculty of law, although Olympiad students gained higher scores in cumulative academic performance in all three years, there was no significant difference in the cumulative performance between Olympiad and non-Olympiad students in the first, second, or third academic years. Similar results were found in the faculty of computer science. In this faculty, Olympiad students performed better in all three academic years, but there was no statistical difference between the two groups in terms of cumulative academic performance.

The results in the faculty of mathematics were surprisingly dissimilar. In this faculty, although there was a difference between Olympiad students (M = 7.435, SD = .859) and non-Olympiad students (M = 7.736, SD = .951) in terms of first-year cumulative academic performance. The non-Olympiad students demonstrated higher performance than the Olympiad students did (t = 2.061, p = .040). Also, in the second academic year, non-Olympiad students (M = 7.684, SD = .926) obtained higher scores on cumulative academic performance than the Olympiad students did (M = 7.483, SD = .851), but the difference was not statistically significant (t = 1.392, p = .165). This finding also repeated in the third academic year, in which non-Olympiad students (M = 7.676, SD = .962) performed better than Olympiad students (M = 7.460, SD = .827) but the difference in cumulative academic performance was not significantly significant (t = 1.461, p = .145).

Table 6 presents an in-depth inspection of the difference between Olympiad and non-Olympiad students across gender. This is because gender is considered a variable that may potentially influence results. This is because, according to Rothstein (2004), the performance in standardized admission tests (i.e., SAT) can vary across gender. Also, according to the same study, background factors (i.e., socioeconomic status) may differently affect the academic performance of male and female participants. As it can be seen, in the faculty of economics, there is a significant difference between the academic performance of male and female students who enrolled at the university through the Unified State Exam in the first (t = 2.536, p = .012), second (t = 2.828, p = .005), and third year (t = 3.180, p = .002). The scores of female students in all three years were higher than those of male students. In addition to this, there was no significant difference between the academic performance of male and female students that enrolled at this faculty through the Olympiad program.

In the faculty of law, as Table 6 shows, there is also a significant difference between the academic performance of male and female students who enrolled at the university through the Unified State Exam. The values for the first (t = 3.729, p = .000), second (t = 3.637, p = .000), and third year (t = 4.036, p = .000) were significant. In addition, for those admitted through Olympiad programs, there was a significant difference between male and female students in terms of their academic performance only in the first (t = 2.278, p = .025) and third years (t = 2.131, p = .035).

Table 6. **Independent *t*-test of academic performance of Olympiad (*n* = 465) vs non-Olympiad students (*n* = 998) across gender**

Faculty	Enrolment method	Academic year	Gender	*N*	Mean	*SD*	*f*	*Sig*	*t*	*df*	Sig (2-tailed)
Economics	USE	First	Female	189	7.349	.9688	10.963	.001	2.536	376	.012
			Male	189	7.066	1.1877					
		Second	Female	197	7.260	.9132	15.671	.000	2.828	391	.005
			Male	196	6.963	1.1576					
		Third	Female	195	7.343	.8112	19.239	.000	3.180	384	.002
			Male	191	7.039	1.0541					
	Olympiad	First	Female	30	7.623	1.1080	.070	.791	.989	98	.325
			Male	70	7.378	1.1459					
		Second	Female	33	7.650	1.1033	.019	.890	1.094	102	.276
			Male	71	7.387	1.1548					
		Third	Female	32	7.618	1.0746	.074	.787	.604	98	.548
			Male	68	7.474	1.1338					
Law	USE	First	Female	72	7.692	1.0082	1.325	.252	3.729	107	.000
			Male	37	6.938	.9825					
		Second	Female	70	7.843	1.0168	.300	.585	3.637	104	.000
			Male	36	7.094	.9789					
		Third	Female	68	7.983	.9271	.091	.763	4.036	102	.000
			Male	36	7.205	.9477					
	Olympiad	First	Female	68	7.708	.8356	2.962	.088	2.278	115	.025
			Male	49	7.314	1.0334					
		Second	Female	67	7.866	.7875	5.861	.017	1.331	111	.186
			Male	46	7.635	1.0572					
		Third	Female	65	8.040	.7260	8.917	.003	2.131	108	.035
			Male	45	7.690	.9958					
Computer Science	USE	First	Female	46	7.600	.8555	.869	.352	2.085	175	.039
			Male	131	7.281	.9070					
		Second	Female	50	7.562	.8354	1.219	.271	2.284	181	.024
			Male	133	7.220	.9277					
		Third	Female	50	7.536	.8691	.001	.979	1.993	183	.048
			Male	135	7.240	.9086					
	Olympiad	First	Female	32	7.784	1.0435	.049	.825	1.811	183	.072
			Male	153	7.398	1.1081					
		Second	Female	33	7.718	1.0899	.015	.903	1.498	187	.136
			Male	156	7.399	1.1152					
		Third	Female	33	7.739	1.0159	.366	.546	1.868	193	.063
			Male	162	7.347	1.1167					
Mathe-matics	USE	First	Female	87	8.029	.9021	.511	.475	3.481	295	.001
			Male	210	7.614	.9469					
		Second	Female	90	8.000	.8467	3.040	.082	3.927	306	.000
			Male	218	7.554	.9284					
		Third	Female	86	7.956	.9661	.376	.540	3.233	302	.000
			Male	218	7.566	.9407					

Table 6 of content

Faculty	Enrolment method	Academic year	Gender	*N*	Mean	*SD*	*f*	*Sig*	*t*	*df*	Sig (2-tailed)
Mathematics	Olympiad	First	Female	13	7.862	.6400	2.767	.103	2.180	46	.034
			Male	35	7.276	.8842					
		Second	Female	12	7.933	.7235	1.193	.281	2.251	44	.029
			Male	34	7.322	.8432					
		Third	Female	13	7.888	.6914	1.658	.204	2.296	45	.026
			Male	34	7.296	.8245					

In the faculty of computer science, a significant difference between the academic performance of male and female students was found only for those who enrolled at the university through the Unified State Exam, not Olympiad programs. As shown in Table 6, this difference was significant in the first (t = 2.085, p =.039), second (t = 2.284, p = .024), and third (t = 1.993, p = .048) academic years.

In the faculty of mathematics, the results were more consistent for the two groups of students admitted. According to the results in Table 6, there is a significant difference between the academic performance of male and female students who enrolled at this faculty through the Unified State Exam at the end of the first (t = 3.481, p = .001), second (t = 3.927, p = .000), and third (t = 3.233, p = .000) academic years. For those who enrolled through Olympiads, there was also a significant difference in the first (t = 2.180, p = .034), second (t = 2.251, p = .029), and third (t = 2.296, p = .026) academic years.

4. Discussion

This study examined how strongly university admission tests can predict successful academic performance of students after enrollment in a public university as well as how the academic performance of students may differ between Olympiad and non-Olympiad students across faculties. According to the findings, students' performance in the Unified State Exam could predict their academic performance in consecutive academic years. Monitoring the academic performance of students enrolled at the university demonstrated that positive performance in the Unified State exam predicted positive academic performance in the consecutive academic years of 2019, 2020, and 2021 in the four faculties under study. This finding is consistent with the predictive model, which hypothesizes that a sample of performance in a test can predict future performance of individuals [Van der Staay et al., 2009]. Also, it is supported by the theory of cognitive abilities [Jensen, 1998; Sackett, Borneman, Connelly, 2008], which states that individuals with cognitive abilities have better problem-solving skills and demonstrate better academic achievement.

However, regression coefficients pattern in all years was not similar in non-Olympiad students. More specifically, although USE scores

strongly predicted academic performance in the first year, their predictive power declined over the second and third academic years in the faculties of law and economics. This could be related to motivational factors (e.g., a lack of interest, mismatch of personality with the field of education, or a lack of skills to meet academic standards), the difficulty of subjects, or the volume of assignments and workload they experience in the second and third years compared to the first year.

In contrast, in the faculties of computer science and mathematics, the USE scores predicted steady improvements in academic performance between the first and third year. This indicates USE scores were stronger predictors of academic performance as students progressed toward graduation. An explanation for this could be related to the effect of practice. As most subjects in these two faculties teach technical and practical skills related to computer science or math (e.g., coding, algorithms and databases, programming, and machine learning), students gain more opportunities to repeat, practice and improve their technical skills as they approach graduation. In other words, they become skilled by practicing over time and that may explain their stronger academic performance in the last year compared to that in the first academic year. There may be another explanation, namely, the degree of similarity between the university and school subjects. Disciplines studied in the faculties of economics and law, especially in the first and second years, show less likeness to school subjects than those studied in the faculties of computer science and mathematics.

The results of the t-test between the two groups revealed important issues. First, the academic performance of Olympiad students was significantly higher than that of their non-Olympiad peers in the faculties of law, economics, and computer science over all the three years of study. This finding is consistent with the previous studies, which found that Olympiad students performed better academically than non-Olympiad students (e.g., [Gordeeva et al., 2010]). In addition, the study by Kim and Kee [2012] suggested that although Olympic medical students outperformed their peers academically, the difference in their performance diminished as they reached the final year of the program. An exception was the faculty of mathematics, where non-Olympiad students outperformed Olympiad students academically. It appears that students who enrolled in this faculty through state exams exhibited higher academic performance than those admitted through Olympiads. One explanation for this finding could be that the admission tests are well matched with the specifications and requirements of the syllabus and expectations of the teaching staff in this faculty. Another explanation could be that the entry requirements of this faculty include special knowledge and skills. Thus, since Olympiad students do not need to take the entrance exam, they are not involved in the preparation process for this exam as non-Olympiad students are. We also assume that the overrepresentation of non-Olympiad stu-

dents compared to Olympiad students in this faculty could be a reason for this finding.

We should note that gender played a crucial and complex role when comparing Olympiad and non-Olympiad students in terms of cumulative academic performance. Consistently across the faculties of economics, law, computer science, and mathematics, female Olympiad students demonstrated higher academic performance than their male Olympiad counterparts. Similar results with lower mean values were observed between non-Olympiad female and male students. In contrast, in the faculty of mathematics, female students performed better than male ones in both Olympiad and non-Olympiad groups, the performance mean of both male and female students who enrolled through the USE being higher than that of students admitted through Olympiads. Although some studies suggest that female students with stronger pre-university academic performance have better academic records [Davoudi et al., 2017], this does not fully explain the finding. On the other hand, Wirt [2011] refers to the study of Price [2001], and suggests that "female Olympians in STEM (science, technology, engineering, and math fields) felt more encouraged and supported in their interest in science by their parents, teachers, peers, and friends", which may contribute to this observed difference.

5. Research and practical implications

This study provided additional empirical evidence about the strength of the link between university admission tests and future academic performance in a culturally diverse context. In addition, unlike previous studies, which focused only on first-year academic performance, this study tested the strength of the link between admission tests results and subsequent academic performance over three consecutive academic years, demonstrating that the USE serves as an objective predictor not only of first-year performance but also of later academic stages. The results can be used to design tailored support systems or interventions based on faculty-specific findings. An assessment of the efficacy of the Olympiad program as an alternative enrollment method suggests the need to pay more serious attention to alternative paths into higher education institutions. In addition, according to the results, test developers need to pay more attention to the factors influencing USE results and attempt to assess the efficacy of these tests over time. This study also reveals that although Olympiad students do not have to take the USE to enroll at university, in most cases they still demonstrate higher academic performance upon enrollment compared to those who enrolled through the USE. This implies the role of uninvestigated factors that are beyond the scope of this research (e.g., gender, socio-economic status, passion, motivation, personality, or cognitive traits) and may additionally contribute to understanding why Olympiad students had higher academic performance. This

provides grounds for future studies to test the potential role of these factors in other universities and countries.

6. Limitations and suggestions

This study has some limitations that should be addressed. First, each faculty selects students based on the USE results in different subjects. Thus, it may not be entirely fair to compare faculties based on USE scores; however, we can compare a student's academic performance across consecutive years with that of his or her peers within the same faculty. Second, this study did not include international students enrolled in various faculties. Although considering international students could have made the results more comprehensive, we excluded them as their proportion is quite low. We encourage future studies to address this issue. Third, due to financial constraints, we included only one public university in this study. We suggest future studies include more universities. Fourth, our research did not look at the role of family income in the USE results. As previous studies have suggested that family income may positively influence exam performance, this factor should be considered in the future. Finally, regarding students who both participated in Olympiads and took the USE, but chose to use their exam results for university enrollment, we made sure they were not included in the Olympiad student group. This is another factor future studies should take into consideration.

7. Conclusions

This study presents new insights for university test developers and researchers in this field to monitor how admission tests can predict academic performance of students over time and prevent wasting universities' finance and facilities. Our findings reveal that although the current admission tests appear to be useful in predicting future performance of students, which is indeed an optimal goal of each university, the tests do not seem to be equally effective for all faculties or educational programs. This may urge higher education institutions and universities to constantly consult with the different faculties, and collect their suggestions and feedback for redesigning and upgrading their current admission tests. This study also highlights the importance of periodic assessment of entrance tests, which should be monitored, revised, and improved annually. Lastly, although Olympiad students in most faculties demonstrated higher performance, non-Olympiad selection of students in the faculty of mathematics clearly leads to better academic results.

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