Asia Pacific Education Review
https://doi.org/10.1007/s12564-024-09978-x

How to select candidates for an undergraduate degree in psychology? Combining high-school GPA and admission test score

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Received: 14 May 2023 / Revised: 13 March 2024 / Accepted: 30 May 2024

Abstract
The current study investigated whether the grade point average (GPA) of high school courses and the score on the test for admission to a bachelor's degree in Psychology—assessing logical reasoning, reading comprehension, and general knowledge—can predict student academic success (AS) and to what extent. Archival data from 5147 candidates (82.4% female) collected over six years (2010–2016) were used. For 2559 of these, indicators of AS (graduation marks, average weighted marks, completion of the degree on time, and dropout) were also available. A series of hierarchical regressions were performed, in which the high school GPA was included as the first predictor, and the scores of the three sections of the admission test were included as the second set of predictors. Findings indicated high school GPA as the best predictor of AS. However, admission test scores predicted a portion of AS that the high school GPA was not able to account for. This result indicates that the administration of the admission test, which evaluates logical reasoning, reading comprehension, and general knowledge, can add relevant information to the high school GPA, thus increasing the efficacy in the selection of candidates, who can have the best chance to earn a bachelor's degree in psychology.

Keywords Selection criteria · High-school GPA · Admission test · Academic success · Academic achievement · Psychology

Introduction

Academic success (AS) plays an important role in every person's life because successful completion of higher education has significant influences on one's vocational career. In addition to being relevant to people, AS is of utmost importance for the universities, as it provides evidence of their mission and effectiveness to society and government. Factors associated with the academic performance of university students have been largely examined across countries, and attempts have been made to systematize the predictors of college success that have been reported in the literature.

In the current literature, a multitude of student-related factors that influence their academic performance have been identified. These range from psychological factors (Hamaideh & Hamdan-Mansour, 2014; Jeffries & Salzer, 2022), such as self-esteem, anxiety, personality characteristics (Woo et al., 2015; Yusoff et al., 2013) and academic motivation (Ackerman et al., 2013; Mahdavi et al., 2023; Mahrous et al., 2023), to socioeconomic and environmental determinants, including parenting style, and peer relationships (Abar et al., 2009; Hayek et al., 2022; Joshi et al., 2003; Kim et al., 2018; Llorca et al., 2017; Pinquart & Kauser, 2018; Watson et al., 2023; Zahed Zahedani et al., 2016). Additionally, cognitive abilities such as vocabulary or logical reasoning (Busato et al., 2000; Olani, 2009). Furthermore, lifestyle habits that include physical activity and screen time, as well as sleeping and eating habits, also appear to influence academic performance

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Published online: 16 June 2024

(Hermassi et al., 2024; Niedermeier et al., 2022; Rasberry et al., 2017; Stea et al., 2014).

However, results are often inconsistent between studies, as they adopted different definitions and operationalizations of AS (York et al., 2015). Moreover, the predictors of academic achievement examined in the literature vary widely, and differences in study designs, data collection methods, sample characteristics, statistical analyses, and control variables can also influence the validity, reliability, and generalizability of the findings. Additionally, differences in cultural, institutional, and educational systems between countries can influence AS. Factors such as educational policies and teaching methods can indeed vary between countries, leading to differences in predictors of AS (Paura & Arhipova, 2014; Pusztai & Szemerszki, 2020).

To address these challenges and improve the consistency and comparability of the results across studies, researchers must first clearly define and operationalize AS. Once a precise definition of what constitutes AS is established, context and country-specific factors related to the particular course of study being examined need to be considered.

Indeed, educational systems significantly differ between countries, and even within countries, there can be significant differences in how academic programs are structured and administered. Psychology programs, in particular, often have unique admission requirements, curriculum structures, and expectations for students compared to other fields of study.

By recognizing and accounting for these variations, researchers can provide more nuanced insights into the predictors of AS within psychology programs, ultimately leading to more targeted interventions and support strategies for students in this field.

The current study aims to test whether and to what extent the two criteria (high school GPA and the score of the university admission test) adopted by the Catholic University of the Sacred Hearth (UCSC) in Milan and Brescia (Italy) to select applicants for a 3-year bachelor's degree program in psychology can predict selected indicators of AS.

To provide a comprehensive exploration of this research question and contribute to the existing body of knowledge on AS predictors within psychology programs in the Italian context, the present contribution is organized as follows: the next section reviews the existing literature and outlines possible definitions of AS, both in the national and international literature. Then, the most investigated determinants of academic achievement among university students are listed and discussed, with a particular focus on Italian students in psychology. This section ends with the specification of the study objectives. The subsequent sections describe the research methodology used in the current study, including the sample selection, data, and variables used to assess AS predictors within the bachelor's degree program in psychology at the UCSC, Cities of Milan and Brescia, Italy. Succeeding, the study results are reported and discussed, together with the strengths, limitations, and implications of this study. Then, a conclusion that summarizes the main findings, highlights its contributions to the field, and suggests directions for future research on AS predictors within psychology programs is provided.

Definition of academic success

Academic success is a crucial component of higher education institutions because it is considered an essential criterion for assessing the quality of educational institutions (Vossensteyn et al., 2015). However, in the literature, this construct is only implicitly defined, or several definitions of academic performance in higher education are reported (Urwin et al., 2010). Some might argue that AS refers to the acquisition of specific knowledge and skills demonstrated through course completion or the ability of graduates to obtain and succeed in jobs related to their university careers. In this regard, a review of the literature (York et al., 2015) found that *academic* results (in terms of the marks obtained), the *achievement of learning objectives,* and the *acquisition of skills and competencies* are the most frequent measures of AS registered internationally, followed by *career success, career satisfaction* or *achievement of professional goals,* and the *percentage of subjects earning the degree*—or, conversely*, dropout rates*—commonly registered between the first and second year of enrollment (Dante et al., 2013a; Perchinunno et al., 2021; York et al., 2015). This is not surprising, as these data are easily accessible by institutions. In Italy, most of the available literature defines AS as *the ability to complete the university course* (Clerici et al., 2014; Clerici et al., 2012; Dante et al., 2011b; Novarese & Di Giovinazzo, 2013), in particular *within the first six semesters from admission* to the degree course (Bulfone et al., 2011; Dante et al., 2015, 2013a, 2013b; De Paola & Gioia, 2013; Lancia et al., 2013) or *by March of the fourth year* of registration (Lancia et al., 2018). *Dropout rates*—meaning by this term the various types of "withdrawal" and "change of academic career" that define nonlinear university—represent another widely mentioned measure of academic (in) success frequently investigated (Cipollone & Cingano, 2007; Dante et al., 2013a; Loberto et al., 2012; Schizzerotto & Denti, 2005). The Eurostat, 2016 data highlight a significant issue with regard to university dropout rates among young Europeans, with more than 24% of students between 20 and 35 discontinuing their studies. France ranked first among European countries with the highest number of dropouts, followed by Italy and the United Kingdom (Eurostat, 2016). Despite the recent increase in the number of graduates, university dropout remains a prevalent phenomenon within the Italian system (OECD, 2019).

A*verage unweighted* (Lancia et al., 2013; Mazzetti et al., 2020; Nota et al., 2004; Novarese & Di Giovinazzo, 2013; Rania et al., 2014) or *weighted marks* according to the number of university credits (crediti formativi universitari—CFU) of each exam (Montaruli et al., 2019), the *graduation mark* (De Paola & Gioia, 2013; De Paola & Scoppa, 2011; Lancia et al., 2013, 2018; Vettori et al., 2020), the *total number of acquired CFU* (Dante et al., 2013a, 2013b; De Paola & Gioia, 2013; De Paola & Scoppa, 2011, 2015; Novarese & Di Giovinazzo, 2013; Rania et al., 2014), or the *irregularity*—seen as the failure to achieve at least 95% of the CFU required by the relative didactic system for students enrolled in the year of the course (Schizzerotto & Denti, 2005)—and the *number of exams taken* (Nota et al., 2004; Novarese & Di Giovinazzo, 2013; Rania et al., 2014) are other indicators of AS commonly reported in the Italian literature.

Predictors of academic success

As admission to higher education systems continues to increase, it is crucial to identify factors that contribute to academic achievement (Winne & Nesbit, 2010). The goal of the Europe 2020 strategy of having at least 40% of 30–34-year-olds complete higher education underscores the significance of this issue on a broader scale. In this regard, the comparative study on higher education dropout and completion in Europe (HEDOCE) sheds light on the importance of study success in higher education in various countries, including Italy. This study, which is based on an extensive review of literature and policy documents, emphasizes the high priority placed on study success on the policy agenda in almost half of the countries surveyed, with Italy being among them (Vossensteyn et al., 2015).

The Italian literature on AS in higher education suggests that several predictors could explain the variability in AS rates. Individual factors often investigated as potential predictors of AS are the *sex* and *age* of the students. Regarding sex, female students are more likely to obtain academic achievements than their male counterparts (Clerici et al., 2014; Dante et al., 2013a, 2013b; Schizzerotto & Denti, 2005). Age at the time of enrollment also affects the probability of AS, which decreases with increasing age of the students' age in more than one investigation (Bulfone et al., 2011; Clerici et al., 2014). Furthermore, a study showed that students *who attend a university far from their hometown* graduate earlier than those who study close to home (Dante et al., 2013a, 2013b). Indeed, moving to another city to study is an indirect indicator of the *socio-economic background* of families, but also a possible index of *motivation* to study, a construct widely investigated in relation to AS and dropout rates both nationally and internationally (Bargmann et al., 2022; Duchatelet & Donche, 2019; Murray, 2014; Perchinunno et al., 2021). The empirical analysis conducted by Belloc et al. (2011) reveals that students from lower-income backgrounds are less likely to drop-out of college compared to their wealthier counterparts (Belloc et al., 2011). This trend suggests that financial pressures can motivate students from lower-income families to persevere in their studies despite challenges, while students from wealthier backgrounds might have alternative options or less pressing financial concerns. The research also highlights a negative relationship between the *number of years between secondary education diploma attainment and university enrollment* and the probability of dropping out. Specifically, students who return to university after a gap in their education, often due to being employed or having other life responsibilities, are less likely to drop-out. This finding suggests that adult students may have stronger motivations to complete their degree programs, potentially driven by career advancement or personal fulfillment goals (Belloc et al., 2011).

The *tendency to procrastinate*—defined as the lag time between the closing day of enrollment in the degree course and the actual day on which the student enrolls in relation to the total number of days available—is often studied in relation to the AS. Regardless of the type of degree, those who enroll late appear to have a higher probability of withdrawing during the first year of the academic course than those who enroll promptly, as well as a lower chance of earning a bachelor's degree. Furthermore, with the same average mark, those who enroll late show lower performance than those who do not tend to procrastinate, as they obtain fewer credits and pass fewer exams. Among the former, there are also fewer total flushes, probably because they undertake a lesser number of exams (and therefore are less committed to the university course) or reject a smaller number of marks in exams (and probably are less ambitious) than their counterpart.[1] Furthermore, those who enroll late paying the fine have a higher probability of withdrawing and much lower performance than those who enroll within the deadline (Clerici et al., 2014; Dante et al., 2015; Dante et al. 2013a; Novarese & Di Giovinazzo, 2013).

Furthermore, a recent study encompassing administrative data from the entire population of Italian students and using machine learning algorithms to predict dropout students enrolled in bachelor's degree programs concluded that the total number of acquired CFU represents the strongest predictor of dropout during the first year of study. Of particular interest is the higher predictive capability demonstrated by the models in southern Italian universities. This is significant given the severity of the dropout issue in these regions,

[1] In Italy students have more than one exam dates for each exam and the possibility to reject the exam mark if not satisfied with the result.

as well as the comparatively disadvantaged socioeconomic conditions compared to the central and northern regions of Italy. This suggests that factors influencing dropout rates can vary across different regions in Italy, possibly due to differences in socioeconomic backgrounds and institutional settings (Delogu et al., 2024). These findings are in line with those presented earlier by Cannistrà et al. (2022) for the Milan Polytechnic (Politecnico di Milano—PoliMi), a best-ranked Italian public university for students in engineering, architecture, and design majors (Cannistrà et al., 2022).

Students are also likely to abandon the university for *family and personal events* (changes of residence, illness, economic problems, etc.) (Loberto et al., 2012; Schizzerotto & Denti, 2005; Uy et al., 2015). A further set of causes concerns the *need to find a job* and the consequent difficulty in reconciling study and work commitments, mainly in individuals holding a vocational school diploma rather than in high school students (Dante et al., 2011b).

Another reason for dropout in the studies is represented by *choice errors*, due to a lack of information on the degree program, gaps in previous school preparation, and learning difficulties. Furthermore, *disappointments related to the university course* considered not rigorous and professionalizing or supporting, and *school climate deficiencies* represent further determinants of AS reported in the literature (Belloc et al., 2011; Burgalassi et al., 2016; Dante et al., 2011b; Di Pietro, 2004; Meggiolaro et al., 2017).

The construct of a school climate encompasses physical, social, and academic aspects (Loukas, 2007). The physical dimension refers to factors such as the appearance of the school building and classrooms, the size of the school, the ratios between students and teachers, and the availability of resources. The social dimension includes the quality of interpersonal relationships between students and teachers, the levels of social comparison among students, and the extent to which students, teachers, and school staff contribute to decision-making processes within the school. Lastly, the academic dimension involves factors such as the quality of teaching, expectations of AS held by both students and teachers and teachers' monitoring of student progress. In this regard, results from a recent longitudinal study conducted in Rome, Italy, suggest that a higher perception of positive school climate predicts higher academic performance, while a higher perception of negative school climate predicts higher risk behaviors one year later (Lunetti et al., 2022).

Despite the above-mentioned and other important factors that could influence AS, universities usually select students for inclusion in the degree program based on their high school GPA and/or their performance on an admission test (Zahner et al., 2012). Indeed, at an international level, *high school GPA* is recognized as the best single predictor of AS (Diseth et al., 2010), accounting for approximately 30% of the variance in first year college GPA (Atkinson, 2001; Kobrin et al., 2008; Zahner et al., 2012). One likely explanation is that high school GPA is based on repeated sampling of performance over time and in many different academic settings. Another possible explanation is that both high school GPAs and college GPAs are based on similar academic evaluations (e.g., quizzes, term papers, labs, class participation, exams), so prior performance on these types of tasks will be predictive of later performance on the same task types (Geiser & Santelices, 2007).

On the contrary, high school GPAs were also found to increase the probability of university withdrawal in Italy in more than one investigation (Belloc et al., 2011; Perchinunno et al., 2021). The authors interpreted this result as stemming from the notion that individuals with a strong educational foundation are more sensitive to underperformance at the university level, despite the lack of confirmation from the majority of related studies. Indeed, Pietro and Cutillo (2008) further verified that Italian students with higher high school GPAs are less likely to drop-out of university (Di Pietro & Cutillo, 2008).

Furthermore, to address concerns about differences in grading standards between high schools, college admission offices commonly consider *admissions test scores* in addition to high school GPA as indicators of college readiness and AS (Zahner et al., 2012; Zhang & Tsang, 2015). International evidence suggests that high school GPA predictions of AS are more accurate than those based on admission test scores. However, predictions based on high school GPA and admission test scores jointly are more accurate than those based on high school GPA alone (Noble & Sawyer, 2004; Zahner et al., 2012). The complementarity of high school GPA and admission test score is also corroborated by the absent-to-low correlation between these two variables (Sulphey et al., 2018).

Although in Italy the *high school GPA* (Clerici et al., 2012, 2014; Dante et al., 2015, 2013a, 2013b; Schizzerotto & Denti, 2005) and the *score on the admission test* to the degree program (Bulfone et al., 2011; Dante et al., 2011b; Lancia et al., 2013; Mazzetti et al., 2020) have been and continue to be at the center of most studies documenting the predictors of AS (Dante et al., 2011a, 2011b; Dante et al., 2013a), evidence about the utility to integrate the high school GPA with admission test scores when selecting candidates for undergraduate courses is less consistent. This lack of evidence depends on most studies investigating only one of the two criteria (high school GPA or admission test score) as a predictor of AS. In a study by Migliaretti et al. (2017) conducted on a sample of Italian candidates, the admission test was shown to predict AS in the first year of the School of Medicine of Turin (Migliaretti et al., 2017).

To our knowledge, only the study by Lancia et al. (2013) jointly considered the predictive power of high school GPA

and admission test score in the Italian context. The authors concluded that adding the admission test score to the high school GPA does not offer a statistically significant contribution to the predictive model. However, these results contrast with those of other Italian studies in which the admission test was shown to be a significant predictor of AS (Bulfone et al., 2011; Dante et al., 2011b).

Overall, the literature indicates that academic achievement is influenced by a combination of factors rather than a single isolated factor. Studies conducted in the Italian context affirm the presence of a diverse range of internal and external factors that strongly correlate, either positively or negatively, with AS.

Given this complex scenario, there has been considerable discourse on how governments can mitigate the occurrence of university dropouts. This debate has primarily focused on evaluating the efficacy of measures affecting access to university programs, including the implementation of selection mechanisms aimed at admitting students with relatively high abilities.

Given the conflicting data and the lack of available evidence on the role of both the high school GPA and the score on the admission test score in predicting AS of psychology students in Italy, the current study was designed to retrospectively examine the role of the selection criteria for applicants to a bachelor's degree program in Psychology in predicting their academic achievement.

Specifically, this study aims to investigate whether the admission test score—which assesses the logical reasoning, reading comprehension, and general knowledge of the students—adopted to select candidates for the undergraduate psychology course at the UCSC can predict AS over their high school GPA. In other words, the purpose of this study is to verify whether the admission test (and which of its sections) can explain a portion of AS variance that is not explained by the high school GPA.

Methods

Participants and procedures

The current study uses archival data received from the UCSC administrative offices. In particular, selected information from students enrolled in the three-year bachelor's degree in psychology at the UCSC (Cities of Milan and Brescia, Lombardy, Italy) was used for this study. The Ethics Committee of the Catholic University of Milan waived the need for ethics approval of this study because the institution gave permission for the information in the repository to be used for the purposes of the research, and analyses were performed on anonymized data.

Data obtained at the time of the request concern candidates for students at the bachelor level for the academic years (a.y.) 2010–2011 to 2015–2016, who were expected to complete their degree in 3 years, from 2013 to 2018. In other words, data on high school GPA and admission test results were recorded from 2010 to 2015, while indicators of AS for the students who enrolled at UCSC were recorded from 2013 to 2018 (i.e., at the end of the 3-year academic program). As reported in Table 1, data on 5147 students taking the admission test between 2010 and 2015 were provided. Candidates were mainly female (82.4%) and were 20 years old on average (range: 18–69; M = 20.55 years; SD = 4.42). A measure of AS was available for 2559 (out of 5147) students enrolled at the UCSC.

Table 1 Available data for each academic year

Academic Year	Candidates who took the test	Enrolled students
2010/11	862	420
2011/12	897	424
2012/13	843	442
2013/14	866	439
2014/15	878	420
2015/16	801	414
Total	5147	2559

Measures

Selection criteria

From 2010 to 2015 candidate students were selected for enrollment in the bachelor's degree in psychology at the UCSC were selected using two criteria: their high school GPA and their admission test result, each weighing 50% of the final score.

High-school GPA

In Italy, high school GPA ranges from 60 to 100. As the "100 cum laude" is also a possible score, "100 cum laude" was recoded in 101. Furthermore, since candidates who completed high school in 1998 or before had a GPA ranging from 36 to 60 (according to the previous school systems), scores, in these cases, were recoded using the following formula: score * 100/60.

Admission test score

From 2010 to 2015 the admission test for the bachelor's degree in psychology at the UCSC consisted of three sections: logical reasoning (composed of six sub-sections: verbal analogies, classification, quantitative reasoning, synonyms, contraries, and metaphors), comprehension of

Table 2 Description of the selection criteria mean level (SD) over the academic years

	2010	2011	2012	2013	2014	2015	ANOVA
High-school GPA	76.32 (11.06)	75.70 (10.92)	75.61 (10.60)	75.83 (10.41)	75.73 (10.52)	75.81 (10.33)	$F(5, 4966) = 0.473$; $p = .80$
Logical reasoning	62.55 (12.56)	52.94 (13.33)	52.71 (12.66)	53.62 (11.79)	49.44 (11.86)	48.85 (10.76)	$F(5, 5141) = 138.41$; $p < .001$, $\eta^2 = .12$
Reading comprehension	61.77 (12.69)	64.82 (13.07)	53.20 (15.20)	51.60 (13.60)	58.58 (14.11)	52.05 (13.31)	$F(5, 5141) = 142.75$; $p < .001$, $\eta^2 = .12$
General knowledge	40.45 (16.73)	48.70 (16.42)	45.81 (15.51)	45.19 (16.13)	46.19 (14.56)	44.36 (12.76)	$F(5, 5141) = 26.88$; $p < .001$; $\eta^2 = .03$

the language and general knowledge. The score obtained in each part was calculated as the number of correct answers (1 point for each correct answer) divided by the number of total questions. This fraction was then multiplied by 100 so that the score obtained in each part of the admission test (logical reasoning, reading comprehension, and general knowledge) ranges from 0 to 100.

Academic success

As reported in the literature, AS is operationalized in different ways across studies. For the current study, all the indicators available from the UCSC administrative offices were considered:

Graduation mark

In Italy, when students complete their bachelor's degree they are evaluated on a scale from 66 to 110. We recoded "110 cum laude" in 111.

Average weighted marks

In Italy, students are expected to pass an exam achieving a score greater than or equal to 18/30, and "30 cum laude" counts as 31. The average of the marks achieved for the different exams is weighted according to the CFU.

Completion of the degree on time

We distinguished between students who completed the university program in 3 years (completion = 1) from those who took more than 3 years to complete the bachelor's degree (completion = 0).

Dropout

We distinguished between students who withdrew from the university course (dropout = 1) and students who did not (dropout = 0) as an indicator of academic failure.

Statistical analysis

We first described the collected variables separately for each academic year and verified if these variables changed significantly over time. For quantitative variables (high school GPA, logical reasoning, reading comprehension, general knowledge, graduation mark, and average weighted marks), we compared mean levels across years using a one-way ANOVA. For dummy variables (completion of the degree on time and dropout) we compared frequencies over academic years using the Chi-Square Test (Sharpe, 2015).

After describing the variables, regression techniques were applied to verify whether the criteria adopted by the UCSC to select candidates for admission to the graduate psychology programs (high school GPA, logical reasoning, reading comprehension, and general knowledge) were capable of predicting AS indicators. For quantitative indicators of AS (graduation mark and average weighted marks), a linear regression was performed for each indicator. Instead, for dummy indicators of AS (completion of degree on time and dropout) a binary logistic regression was performed for each indicator (Sperandei, 2014). In both cases, hierarchical regressions were performed to separately test the predictive power (R-square) of the high school GPA and the ability of the three sections of the admission test (logical reasoning, reading comprehension and general knowledge) to explain the variance of the dependent variables above and beyond the previously entered.

IBM SPSS Statistics software (version 25.0) was used to analyze the data (IBM Corp., 2017).

Results

Descriptive statistics

First, the trend of both the selection criteria (high school GPA and the scores of each of the three sections of the admission test) and the AS indicators (graduation mark, average weighted marks, completion of the degree on time, and dropout) was described across six years (2010–2015) of enrollment of students. As reported in Table 2, the

Table 3 Description of the indicators of AS over the academic years

	2010	2011	2012	2013	2014	2015	
	M (SD)						ANOVA
Graduation marks	102.60 (6.22)	102.68 (6.37)	102.58 (6.61)	102.59 (6.41)	103.57 (5.78)	103.06 (5.35)	$F(5, 1810) = 1.29$; $p = .27$
Average weighted marks	23.14 (8.20)	23.05 (7.09)	23.19 (8.11)	22.97 (8.36)	23.86 (7.49)	23.87 (7.05)	$F(5, 2472) = 1.48$; $p = .19$
	%						χ^2
Completion of the degree on time	74.8	82.1	71.3	78.6	79.7	76.0	$\chi^2(5) = 14.99$; $p = .01$; V = .01
Dropout	27.9	23.1	29.6	26.9	21.4	20.3	$\chi^2(5) = 16.31$; $p = .006$; V = .08

Table 4 Relationship between selection criteria and AS indicators

	Graduation mark	Average weighted marks	Completion of the degree	Dropout
N	1764	2403	2078	2482
R^2	.167	.036	.031	.016
High-school GPA	.406***	.182***	.037***	− .024***
	Graduation mark	Average weighted marks	Completion of the degree	Dropout
R^{2a}	.072	.025	.012	.007
ΔR^{2b}	.071	.025	.011	.007
Logical reasoning	.158***	.070**	.009	− .005
Reading comprehension	.070**	.067**	.000	− .004
General knowledge	.134***	.083***	.011**	− .008*

Standardized beta are reported. *$p < .05$; **$p < .01$; ***$p < .001$

[a]The contributions of the three components of the admission test scores in explaining AS without controlling for High-school GPA. To obtain these R2 we run regression models where the three components of the admission test scores (Logical reasoning, Reading comprehension, General knowledge) were the only predictors of AS

[b]The contributions of the three components of the admission test scores in explaining AS above and beyond High-school GPA. This ΔR^2 is obtained through the hierarchical regression model

average level of high school GPA obtained by students who underwent the admission test slightly varied from 75 to 76 (out of 100) over the years, i.e., it was quite stable over time. Instead, the scores obtained by the students at the three parts of the admission test significantly changed over the years: while for reading comprehension and general knowledge, the overall trend was not clear, the scores obtained by candidates in the logical reasoning section decreased over time.

Furthermore, the performance on the admission tests poorly correlated with high school GPA. In particular, high school GPA was significantly but slightly associated with logical reasoning scores ($r = 0.277$; $p < 0.001$; $N = 4972$), reading comprehension ($r = 0.232$; $p < 0.001$; $N = 4972$) and general knowledge ($r = 0.169$; $p < 0.001$; $N = 4972$) at the admission test.

Regarding the AS indicators, the average level of graduation marks obtained by the students at the end of their bachelor's degree and the weighted average of their marks were stable over time. Instead, the percentage of students who graduated on time was significantly lower than expected by chance for those enrolled in 2012, while the percentage of people who withdrew from the university was significantly higher than would be expected by chance for students enrolled in 2012 and lower than would be expected by chance for students enrolled in 2015 (Table 3).

Predictors of academic success

The current study aimed to verify whether and to what extent the criteria adopted by the UCSC to select candidates (high school degree, scores obtained at the three sections of the entrance exam) were predictive of their AS. Therefore, we performed a series of hierarchical regressions to first test the predictive power of the high school GPA and then verify if the admission test can explain a

portion of AS variance that is not explained by the high school GPA.

As reported in Table 4, high school GPA was the only selection criterion that was able to significantly predict all indicators of AS taken into account. In particular, the GPA candidates obtained at the end of their high school predicted 16.7% of their final graduation grade, 3.6% of their average weighted marks, 3.1% of the likelihood of graduating on time, and 1.6% of the probability of not dropping out.

Regarding the admission test, it should be noted that it significantly predicted some indicators of AS, but showed lower predictive power than the high school GPA. In particular, the admission test predicted 7.2% of the final graduation grade, 2.5% of their average weighted marks, 1.2% of the probability of graduating on time, and 0.7% of the probability of not dropping out. Even if the predictive power is lower than the high school GPA's predictive power, hierarchical regression results show that the contribution of the three components of the admission test score to explaining the AS goes above and beyond the contribution of the high school GPA. In particular, the portion of the AS variance that the three components of the admission test score can explain when they are the only predictors considered (R^2) is pretty identical to the portion of the incremental variance of the AS that they can explain above and beyond the one explained by the high school GPA (ΔR^2; see Table 4). This means that the admission test and the high school GPA map different skills and candidates and consequently can predict different (i.e., nonoverlapping) portions of AS variance.

However, the three sections of the admission test had a different power to predict AS as measured by different indicators: General knowledge significantly predicted the highest number of AS indicators (4 out of 4); Logic reasoning and reading comprehension were, instead, able to predict future graduation mark and average weighted marks only (2 indicators out of 4), with the reading comprehension section presenting beta coefficients lower than logical reasoning's one.

Discussion

To address the misplacement of students in higher education, community colleges are called to redesign the way they assess the college readiness of incoming students. Indeed, for students, successful completion of higher education courses has significant implications for their lives. Academic success also plays a vital role for institutions, as it is often used as a metric of institution performance. Moreover, of course, academic achievement is important for the families of the students and for the future of the whole society, which largely depends upon a well-educated citizenry.

The current study tested whether and to what extent the criteria used at the UCSC to select candidates for the bachelor's degree in Psychology can predict the AS of students. Data from six different cohorts (candidates who participated in the admission test from 2010 to 2015) were analyzed, allowing the description of the change in the selection criteria (high school GPA, logical reasoning, reading comprehension, and general knowledge) as well as in the AS indicators (graduation mark, average weighted marks, completion of the degree on time, and dropout) during the six academic years considered for admission.

Interestingly, most of the variables investigated were stable over time. For example, the mean level of high school GPA candidates reported when registering for the admission test, as well as the graduation grade enrolled students obtained at the end of their bachelor's degree, did not change over time, suggesting similar students' performance.

At the same time, the mean level of logical reasoning obtained by the candidates during the admission test decreased over the academic years, suggesting the need to monitor and strengthen the students' logical ability of the students throughout their school career.

Since logical reasoning involves multiple functions, such as working memory, attention, and metacognition, we postulate that this trend could reflect a decreased students' acquisition of operational learning strategies (that is, workload management, study methodology, motivation and commitment, emotion, and time management), probably due to school curricula programs that focus on the ability to remember and recall information expressed by numerical grades. According to available evidence, overload of memory would negatively interact with the speed and ability of logical reasoning and would be associated with varying degrees of subsequent decrease in performance accuracy and reduced activation of brain regions central to both task performance and suppression of negative affect (Verschueren et al., 2005; Yun et al., 2010). In particular, errors in logical reasoning tasks would be independent of the performance in other cognitive assignments and not representative of the individual's cognitive capacity (Thompson & Markovits, 2021).

The other two variables that presented a change over time were the two qualitative indicators of AS: completion of the degree on time and dropout. In particular, 2012 students were less likely to complete the degree on time and more likely to withdraw from the university. We speculate that this outcome could be the effect of the acute sovereign debt crisis that Italy faced between July 2011 and June 2012 (Sacchi, 2016). The economic strain that the Italian families encountered in that period may indeed have required some students to withdraw from the university because they or their families were unable to pay the university tuition.

Additionally, we found that the percentage of dropouts was lower for students enrolled in 2015, but we believe that this result might depend on the methodology used. Since the available indicators of the AS were updated at the end of 2018, a higher number of years was taken into account for those enrolled, for example, in 2010 (that is, eight years) compared to students enrolled in 2015 (that is, three years). In other words, students enrolled in 2010 had more years (and chances) to withdraw from university than students enrolled in 2015.

After investigating the change in these variables over the years—receiving interesting insights—we focused on how the selection criteria adopted to select candidates can predict their future AS, namely, the main objective of the current study. In particular, we found that both high school GPA and admission test score were effective in predicting AS. The high school GPA was somewhat a more accurate predictor of AS (i.e., especially when operationalized in terms of the final graduation mark) than the admission test score. These findings are in line with those of previous studies (Allensworth & Clark, 2020; Burton & Ramist, 2001; Geiser & Santelices, 2007; Hodara & Lewis, 2017), which concluded that high school GPA is a powerful tool for gauging students' likelihood of succeeding in college. Among them, a recent investigation that examined a sample of 55,084 students who graduated from Chicago Public Schools with varying academic profiles between 2006 and 2009 showed that students' high school GPA is five times higher than their admission test scores to predict college graduation (Allensworth & Clark, 2020).

In fact, while admission test scores are based on a single sitting, high school GPA is built on a repeated sampling of student performance over time. It is also a measure of a variety of skills and challenges through multiple formats (i.e., term papers, labs, final exams), and prior performance in such activities during high school would be, therefore, predictive of later performance. Indeed, high school GPA and college GPA measure educational achievement and are shown to mirror other shared personal characteristics such as effort, attendance, conformity, and motivation (Linnenbrink & Pintrich, 2002; Steinmayr et al., 2019). On the contrary, admission tests measure a limited set of skills, and students can prepare for these tests in narrow ways that may not translate into better preparation to succeed in college. However, admission test scores are widely perceived as more reliable and objective indicators of academic performance than students' high school GPAs, because they are judged based on the same tasks under the same conditions.

According to international studies (Noble & Sawyer, 2004; Zahner et al., 2012), this study showed that the admission test score can account for a portion of the AS that is not explained by the high school GPA, thus adding predictive value to high school GPA and offering admissions officers a tool to better distinguish between applicants who are likely to perform well or poorly in college. Indeed, while the high school GPA is readily available from the university—and offers an efficient and economical way to select candidates—the admission test score is clear and easy to interpret.

As suggested by Hoffman and Lowitzki (2005), these two criteria might be complementary. High-school GPA is considered a measure of achievement, while the admission exam score is a measure of aptitude and ability. Indeed, according to the literature (Mazzetti et al., 2020; Sirigatti et al., 1997; Vettori et al., 2020), the results of the present study showed that the performance on the admission test was poorly correlated with high school GPA.

Still, the finding that high school GPA matters over and above admission test scores—as confirmed by the results of this investigation—suggests that grades would capture some elements about students that test scores do not. In this regard, Bowen et al., (2009) speculated that high school GPA "reveal qualities of motivation and perseverance, as well as the presence of good study habits and time management skills" and "often reflect the ability to accept criticism and benefit from it and the capacity to take a reasonably good piece of one's work and reject it as not good enough" (p. 124) (Bowen et al., 2009). As noted elsewhere, high school GPA would, therefore, relate to both cognitive and noncognitive components of AS (i.e., study skills, attendance, work habits, time management, help-seeking behaviors, metacognitive strategies, and social and academic problem-solving skills) that allow students to successfully manage new environments and meet new academic and social demands (Conley, 2005; Farkas, 2003), while the admission test score would mainly be representative of cognitive components (i.e., content knowledge and core academic skills) of academic performance (Noble & Sawyer, 2002).

The result of this study also indicated that the three sections comprising the admission test are different from the AS of students' AS. Specifically, items that assessed the general knowledge were the most effective in predicting AS followed by items of logical reasoning. Finally, reading comprehension appeared to be the least relevant skill to predict AS. This may depend on reading comprehension being the smoother test among the ones assessed. Indeed, according to descriptive analysis, reading comprehension scores were those with the highest average levels throughout academic years.

It is worth noting that the predictive power of the selection criteria is different according to how AS is operationalized. For example, the admission test can predict 7% of the final graduation mark, while it can predict only 1% of the students' ability to graduate on time. This confirms the importance of paying attention to how AS is defined and operationalized (York et al., 2015) and adopting different indicators of AS when possible.

Limitations, strengths, and implications of the study

Although a strength of the current study is the realism and face validity of the context, findings generalizability is limited to students from a single private university in Milan and Brescia, Italy. Furthermore, the cross-sectional study design does not allow us to conclude any causal associations between factors in the cohort. Nonetheless, the results are strengthened by studying a homogenous population in a large sample size. However, despite the original sample being made up of more than 5000 candidates, regression analyzes were performed on a sample of approximately 2500 individuals. This was due to the fact that, as far as academic achievement is concerned, we only had data relating to the students who enrolled at the university after having taken the entrance exam. Second, even though the logical reasoning section of the admission test is made up of six parts (verbal analogies, classification, quantitative reasoning, synonyms, contraries, and metaphors), only its total score was made available for analysis. Therefore, we could not investigate whether the different aspects of logical reasoning had different predictive power. Investigating which of the items that assess logical reasoning is most effective in predicting AS should be the objective of future studies.

Also, the use of convenient predictors and measures of AS can be considered a further limitation of this study. Additional research should aim to capture a broad range of factors relevant to understanding of the issues that could impact AS. This may involve incorporating multiple indicators of academic achievement, such as standardized test scores, individual, cognitive, and psychological determinants, and self-reported school climate to provide a more holistic assessment.

The results of this study have practical utility for admission boards and counselors, as they shed light on the role of GPA and admission test scores in predicting AS. In particular, the research indicates that relying solely on high school GPA for student selection is not advisable. While high school GPA can significantly predict academic success, universities can enhance their selection process by considering both high school GPA and an entrance exam. The latter provides an objective, standardized evaluation of all students, capturing aspects of academic potential not reflected in high school GPA, which may be influenced by the school attended. However, universities should also recognize that high school GPA remains a strong predictor of academic success and should not disregard it in favor of entrance exams alone. This knowledge can inform policies and practices aimed at promoting higher education completion rates, including student support services, college readiness initiatives, and funding allocations.

Conclusions

The current study verified the variance of the different selection criteria (high school GPA, logical reasoning test score, reading comprehension test score, and general knowledge test score) adopted by the UCSC to select students for the bachelor's degree in psychology can predict the AS (graduation mark, average weighted marks, completion of the degree on time and dropout). The main findings of this study indicate that the high school GPA is the best predictor of AS. At the same time, the admission test can predict a portion of AS that the high school GPA is not able to account for. This indicates that universities should consider different selective admission procedures for an effective selection of high school students for the university psychology program. Early prediction of student performance can help universities offer timely actions to improve the success rate, therefore confirming the relevance of their mission.

Funding Open access funding provided by Università Cattolica del Sacro Cuore within the CRUI-CARE Agreement.

Declarations

Competing interest The authors did not report any potential competing interest.

Ethical approval The Ethics Committee of the Catholic University of Milan waived the need for ethics approval of this study because the Institution gave permission for the information in the repository to be used for the purposes of the research, and analyses were performed on anonymized data.

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