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ORIGINAL RESEARCH ARTICLE

Socio-demographic predictors of admission to Bachelor of Physiotherapy Programme: a retrospective cohort study

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ABSTRACT

Introduction: The influence of socio-demographic variables on admission to a Bachelor of Physiotherapy Programme is a debated topic. The study investigated the socio-demographic predictors of admission test success and scores for a Bachelor of Physiotherapy Programme. Moreover, the study assessed the effects of different proportions of logical reasoning (LR) and scientific knowledge (SK) questions on the distribution of socio-demographic variables of admitted candidates.
Methods: A retrospective cohort study was conducted on applicants to the Bachelor of Physiotherapy Programme at Humanitas University, Milan, Italy, from 2016 to 2023. Logistic and linear regression models were used to investigate socio-demographic predictors of admission and test scores. Logistic regression model and chi-square test were used to investigate socio-demographic predictors and their distribution in admitted candidates of 3 cohorts selected with a different proportion of logical reasoning (LR) and scientific knowledge (SK) questions.
Results: High-school type, gender, and geographic origin were socio-demographic predictors of the Bachelor of Physiotherapy Programme test success (pseudo-R^2 = 0.06) and total score (R^2 = 0.13). A higher proportion of candidates who attended a scientific high school and males were found among admitted applicants, regardless of the proportion of LR and SK questions.
Discussion: Socio-demographic predictors of admission to the Bachelor of Physiotherapy Programme were identified, but these predictors marginally improved the model fitting or explained a small portion of the variance. These results suggested that admission outcomes were poorly predicted by socio-demographic factors considered in the current study. Admission test contents did not seem to influence the socio-demographic profile of candidates admitted to a Bachelor of Physiotherapy Programme.

Keywords: Admission criteria, Cultural and socio-economic background, Health professional education, Physiotherapy Bachelor degree, Regression analysis

What's already known about this topic?

- *Quantitative admission tests are used to select candidates for a Bachelor of Physiotherapy Programme. Test-based evaluations are preferred to minimize social or demographic inequalities in selection procedures, but socio-demographic predictors have been described for health professions education.*

What does the study add?

- *The current study identified socio-demographic predictors of admission to a Bachelor of Physiotherapy Programme, but predictive models suggested that admission outcomes were poorly predicted by socio-demographic variables considered in the current study. The study also revealed that a different proportion of logical reasoning and scientific knowledge questions did not seem to influence the socio-demographic profile of admitted candidates.*

Introduction

Access to Bachelor of Physiotherapy Programmes is regulated worldwide. Academic institutions are responsible for selection procedures, and admission tools vary across universities and countries. Such procedures are based on undergraduate students' achievements, interviews, curriculum vitae, letters of recommendation, aptitude tests, or combinations of the aforementioned methods (1-6). Despite a certain heterogeneity, admission procedures are aimed at selecting candidates who will excel as students and professionals, while ensuring equity. Additionally, admission procedures should also guarantee diversity in terms of the ethnic, cultural, and socio-economic backgrounds of candidates. In fact, diversity within a cohort is reported to improve students' educational experience and contribute to their cognitive and affective development while promoting equal opportunities (2).

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Moreover, diversity enhances cultural competency and makes healthcare providers representative of the population they serve, improving quality and inclusiveness of the healthcare system (7). However, studies have highlighted potential biases in the socio-demographic selection of some admission tools (7,8), especially for procedures based on prior academic results (9) or cognitive ability tests (10,11). In this scenario, what defines the most appropriate selective procedures for healthcare professions remains a debated topic (12).

Quantitative admission tests are widely used for selecting physiotherapy and healthcare professional students in several universities and countries. In fact, the adoption of quantitative admission tests is aimed at creating fair and reliable selection methods able to identify candidates with adequate knowledge and skills, since academic access might be biased by socio-demographic factors (1,13,14). Consistently, admission tests are often designed to assess candidates' aptitude in different domains, including logical reasoning, problem-solving skills, and scientific knowledge. Such competencies are considered essential requirements for a successful academic career, although the domains of logical reasoning, problem-solving, and scientific knowledge often contribute differently to the total score across various admission tests (1,3,9,15,16). Nonetheless, the validity and equity of quantitative admission tests in medical and healthcare academic selection are a debated issue (4,10,11), despite the widespread use of such tools.

In Italy, access to Bachelor of Physiotherapy Programmes is exclusively based on quantitative admissions tests. Admission test is preferred over an interview or letters of recommendation since it is considered a reliable approach in terms of equity (4). Undergraduate achievements are not considered due to large disparities between quality and curricula among high schools (3,17,18). The Italian Ministry of University and Research (MUR) allows universities to develop their own admission tests, which evaluate scientific knowledge such as mathematics, physics, biology, and chemistry, as well as logical and reasoning skills. Universities determine the number of questions for each subject in their quantitative test, based on the theoretical foundation that admission test success is determined by candidates' cognitive abilities and preparation achieved through their high school education or individual learning activities. In addition, the number of questions for subjects may vary across years and among universities. The variability of admission test contents reflects the commitment of MUR and universities to improve the selection process, although the best academic selection method is still debated in Italy.

Indeed, in addition to selecting candidates who will excel as physiotherapists, admission tests to Bachelor of Physiotherapy Programmes should also ensure equal opportunities to applicants, avoiding inequalities deriving from socio-demographic factors (19). In this context, the detection of socio-demographic predictors of admission test success may help universities to better define selection procedures and identify quantitative admission test contents able to minimize social or demographic inequalities. Moreover, the knowledge of potential modifiable predictors of admission (e.g., high school type) might help students to make scholastic choices that facilitate the likelihood of being admitted to a Bachelor of Physiotherapy Program.

Socio-demographic predictors of quantitative admission test success have been described in students applying to Medical and Health Sciences Schools in Australia and New Zealand, revealing that lower socio-economic status, higher age at test, and female gender were associated with lower admission test scores (20). Similarly, socio-economic background has been reported to positively predict access to Medical School in the United States and Canada (21,22). Finally, literature data also revealed an influence of socio-demographic factors such as income, high school, and gender in the selection process for health professions education in the Netherlands and the United Kingdom (2,8,9). Against this background, the influence of socio-demographic variables on physiotherapy admission test results has never been investigated. Furthermore, when considering heterogeneity in the proportion of questions related to scientific knowledge and logical reasoning in admission tests across different institutions, the impact of test contents on the socio-demographic profile of admitted candidates also deserves to be explored.

Thus, the current study aimed to 1) investigate socio-demographic predictors of a Bachelor of Physiotherapy Programme admission test success and scores, and 2) investigate the effects of different proportions of scientific knowledge and logical reasoning questions included in the admission test on the distribution of socio-demographic variables of admitted candidates. We hypothesized that socio-demographic variables would partially predict candidates' success and scores on an admission test for a Bachelor of Physiotherapy Programme. Moreover, we expected that variations in the proportions of scientific knowledge and logical reasoning questions within the admission test would influence the socio-demographic features of admitted candidates.

Methods

Study design and participants

The study had a retrospective cohort design based on anonymized data of Italian candidates who applied to enter the Bachelor of Physiotherapy Programme at Humanitas University, Milan, Italy. Socio-demographic features and test scores of candidates between 2016 and 2023 were extracted from the databases of Humanitas University.

Socio-demographic variables

The predictive role of socio-demographic variables, including gender, age, geographic origin, and secondary school, on admission test success and scores was investigated. Candidates' geographic origin was expressed as Northern, Central, or Southern Italy. This categorization is adopted in demographic and socio-economic surveys in Italy, based on differences in terms of history, culture, and socio-economic status of the population in the country (23). High school attended by candidates was categorized into "scientific high school" (SHS), "non-scientific high school" (Classical, Linguistic, Artistic, Musical, Human Science high

school—NSHS), and "technical-professional institutes" (TPI). SHS and NSHS aim to educate students with *"[…] a rational, creative, planning and critical attitude, […] and knowledge, skills and competences consistent with […] the continuation of higher education studies […]"* (24). SHS differs from NSHS in that it has a higher number of hours and courses focused on scientific subjects (e.g., mathematics, physics, chemistry, biology, and informatics). TPI offers specific subjects aimed at preparing students to face the world of work, alongside providing courses of general culture and scientific knowledge. The aforementioned high-school education cycles last 5 years and allow students to apply for a Bachelor of Physiotherapy Program.

Admission tests scores

Humanitas University admission tests consisted of 2-hour multiple-choice tests composed of 100 questions of logical reasoning (LR) and scientific knowledge (SK), including biology, chemistry, mathematics, and physics. The number of questions per subject varied between 2016 and 2023. In particular, the total number of LR questions was equal to the number of SK questions from 2016 to 2018 (LR/SK: 50/50 in test A), the number of LR questions was greater than the number of SK questions from 2019 to 2022 (LR/SK:70/30 in test B) and the number of LR questions was lower than the number of SK questions in 2023 (LR/SK: 40/60 in test C). The admission test score was computed as the algebraic sum of correct answers (+1.5 points), incorrect answers (-0.5 points), and unanswered questions (0 points). Candidates were ranked according to their total scores and admitted to the Bachelor of Physiotherapy Programme sequentially, from the highest-ranked candidate down to the final available place on the course, which varied between 20 and 50 places depending on the year.

Admission test results were considered as binary (admitted, non-admitted) or continuous (LR, SK, and total scores) outcomes. Specifically, admitted (AD) candidates were defined as applicants who were offered a place according to their position in the ranking and available places independently of their enrolment, while non-admitted (NA) candidates were defined as applicants who were not offered a place.

When considering continuous outcomes, LR, SK, and total scores were separately considered. Since the number of questions of LR and SK varied from 2016 to 2023, as well as the minimum and maximum achievable scores in terms of LR and SK, scores were converted into a percentage of the maximum achievable score through a linear transformation. Specifically, total, LR, and SK scores ranged from 0% (minimum score obtained with 100% of wrong answers) to 100% (maximum score achieved with 100% of correct answers).

Statistical analysis

Normality of data distribution was checked using the Shapiro–Wilk test, and since the data were non-normally distributed, non-parametric tests were adopted. Missing data were handled using a complete-case analysis, and a sensitivity check was also carried out.

First, socio-demographic predictors of the binary outcome (AD, NA) were investigated. Chi-square test was used to compare the distribution of socio-demographic variables between AD and NA candidates. Then, logistic regressions were used to investigate potential independent socio-demographic predictors of admission to the Bachelor of Physiotherapy Program. Finally, a multivariate logistic regression model with forced entry method was used to build a comprehensive model including all independent socio-demographic predictors of admission to the Bachelor of Physiotherapy Programme. Since test type varied across years, test type was included as a control variable in the model to account for variations in the number of LR and SK questions. The ratio between the number of applicants and the number of available places was considered as a second control variable to account for year fluctuations. Discrimination, calibration, and collinearity of the model were also assessed.

Subsequently, socio-demographic predictors of admission test scores in terms of total LR and SK scores were investigated. Mann-Whitney or Kruskal-Wallis tests were used to compare admission test scores in sub-groups of participants with different socio-demographic features. Then, linear regression models were used to investigate potential independent socio-demographic predictors of total, LR, and SK scores. A multifactorial predictive model including all independent socio-demographic predictors of admission test scores and control variables such as test type and candidates/places ratio was implemented, after verifying OLS assumptions in the presence of non-normally distributed and bounded outcomes.

Finally, Chi-square tests were used to investigate the effects of changes in admission test contents in terms of the proportion of LR and SK questions on the socio-demographic characteristics of AD and NA candidates. Additionally, the effect of changes in LR/SK proportion (test type) on admission was investigated through a multivariate logistic regression, modelling the effect of test type and the interaction between test type and socio-demographic variables in determining admission. The statistical level of significance was set at alpha = 0.05.

Ethical considerations

Participants' anonymity was ensured through the assignment of a serial number to each participant, and the study protocol was approved by the Territorial Ethical Committee Lombardy 5, Rozzano, Milan, Italy (protocol number: PU-AD-PR2025, approval date: February 28, 2025). Applicants to the Bachelor of Physiotherapy Programme of Humanitas University gave a written consent for the use of personal information for statistical or scientific purposes during the admission test registration procedures, in compliance with the provisions of the Italian Legislative Decree 281/1999 and subsequent amendments.

Results

Distribution of socio-demographic variables

Three thousand four hundred seventy-eight candidates applied to the Bachelor of Physiotherapy Programme at Humanitas University, Milan, Italy, between 2016 and 2023. Candidates with incomplete socio-demographic information

were excluded after complete-case analysis and sensitivity checks (Supplementary Materials 1). Therefore, 2713 candidates were included in the study cohort, and a place was offered to 279 of those applicants (AD: 10.3%). Higher proportions of males and SHS students were found in AD candidates compared to NA candidates. Differences in terms of high school and age in gender subgroups were also detected. Distributions of socio-demographic variables in the cohort are reported in Tables 1 and 2.

Socio-demographic predictors of admission

High-school type, geographic origin, and gender resulted as independent predictors of admission to the Bachelor of Physiotherapy Program. The multivariate logistic regression model revealed high-school type, gender, and geographic origin as predictors of admission (Table 3 and Supplementary 2). In particular, female candidates, applicants who attended NSHS and TPI, and candidates from Southern Italy showed less likelihood of admission. Moreover, candidates applying to test A showed a higher likelihood of admission. Pseudo-R^2 values of the model were low (R^2-McFadden = 0.04, R^2-Nagelkerke = 0.06). Sensitivity check of missing data handling is reported in Supplementary Materials 1.

Distribution of admission test scores

Higher total and SK scores were found in males, while a higher LR score was detected in females. SHS students achieved higher total and SK scores than NSHS and TPI students. NSHS students revealed a higher SK score than TPI students, while TPI students obtained a higher LR score than SHS students. Candidates from Southern Italy revealed lower total and SK scores than candidates from Northern and Central Italy. No correlation between test scores and age at test was found. The distribution of test scores is shown in Table 4.

Socio-demographic predictors of admission test scores

All socio-demographic variables were identified as independent predictors of LR, SK, and total scores. After assessing model assumptions (Supplementary materials 3), the multifactorial model revealed that high-school type was a predictor of total and SK test scores. Specifically, higher scores were positively associated with a previous career at SHS. Geographic origin contributed to determining total and SK scores, since Northern origin was positively associated with better test results than Southern origin. Test type also revealed an influence on admission test scores. In particular, test A resulted in higher total, LR, and SK scores than test B, and with higher LR and SK scores than test C. Gender showed a significant effect in predicting total score, with male gender associated with better results. Gender by high school interaction showed a significant effect restricted to the female subgroup who attended TPI, which resulted in being associated with lower total and SK scores. Variability attributed to regressors in the models was $R^2 = 0.129$, $R^2 = 0.208$, and $R^2 = 0.137$ for total, LR, and SK scores, respectively (Table 5 and Supplementary materials). Sensitivity check of missing data handling is reported in Supplementary Materials 1.

Effects of admission test contents on socio-demographic variables of admitted and non-admitted candidates

A higher proportion of candidates who attended SHS was detected in AD candidates when compared to NA candidates in all test cohorts (Figure 1A), while gender distribution varied

TABLE 1 - Distribution of socio-demographic variables

Variables	Admitted candidates	Non-admitted candidates	Total	p-value
Gender	N° (%)	N° (%)	N°(%)	<.001[i]
Female	87 (31)	1,075 (44)	1,162 (43)	
Male	192 (69)	1,359 (56)	1,551 (57)	
Total	279 (100)	2,434 (100)	2,713 (100)	
High school	N° (%)	N° (%)	N° (%)	<.001[i]
SHS	208 (74)	1,312 (54)	1,520 (56)	
NSHS	44 (16)	671 (28)	715 (26)	
TPI	27 (10)	451 (18)	478 (18)	
Total	279 (100)	2,434 (100)	2,713 (100)	
Geographic origin	N° (%)	N° (%)	N° (%)	0.051[i]
Northern Italy	251 (90)	2088 (86)	2,339 (86)	
Central Italy	12 (4)	95 (4)	107 (4)	
Southern Italy	16 (6)	251 (10)	267 (10)	
Total	279 (100)	2,434 (100)	2,713 (100)	
Age	Median (IQR)	Median (IQR)	Median (IQR)	0.502[ii]
	20 (2)	20 (2)	20 (2)	

SHS = Scientific High School; NSHS = Non-Scientific High School; TPI = Technical Professional Institute; [i]$\varkappa^2$ test; [ii]Kruskal-Wallis test.

TABLE 2 - Distribution of socio-demographic variables according to gender

Variables	Females	Males	Total	p-value
High school	N° (%)	N° (%)	N° (%)	<.001[i]
NSHS	504 (43)	211 (14)	715 (26)	
SHS	506 (44)	1,014 (65)	1,520 (56)	
TPI	152 (13)	326 (21)	478 (18)	
Total	1,162 (100)	1,551 (100)	2,713 (100)	
Geographic origin	N° (%)	N° (%)	N° (%)	0.069[i]
Northern Italy	1,020 (88)	1,319 (85)	2,339 (86)	
Central Italy	36 (3)	71 (5)	107 (4)	
Southern Italy	106 (9)	161 (10)	267 (10)	
Total	1,162 (100)	1,551 (100)	2,713 (100)	
Age	Median (IQR)	Median (IQR)	Median (IQR)	<.001[ii]
	20 (2)	20 (3)	20 (2)	

SHS = Scientific High School; NSHS = Non-Scientific High School; TPI = Technical Professional Institute; [i]$\varkappa^2$ test; [ii]Kruskal-Wallis test.

TABLE 3 - Socio-demographic predictors of admission

Global multivariate model	p-value <.001	R^2 McFarren = 0.04	R^2 Nagelkerke =0.06
	p-value	Odds Ratio	CI 95% (lower-higher)
High School			
NSHS/SHS	0.003	0.427	0.245-0.744
TPI/SHS	<.001	0.464	0.294-0.731
Gender			
Female/Male	0.023	0.681	0.489-0.948
Interaction gender*high school			
(F/M) * (NSHS/SHS)	0.677	1.169	0.565-2.417
(F/M) * (TPI/SHS)	0.109	0.356	0.101-1.258
Geographic origin			
Central/Northern	0.977	1.009	0.540-1.883
Southern/Northern	0.009	0.498	0.294-0.843
Age at test	0.446	0.983	0.943-1.026
Test type			
B test / A test	0.021	0.541	0.321-0.911
C test / A test	0.024	0.374	0.159-0.878
Candidates/places ratio	0.002	1.226	1.076-1.396

CI = Confidence interval; SHS = Scientific High School; NSHS = Non-Scientific High School; TPI = Technical Professional Institute.

between AD and NA in cohorts exposed to test A and test B (Fig. 1B). Multivariate logistic model confirmed that male gender and SHS were positively associated with test success (Female/Male: OR = 0.630, CI_{95} = 0.428-0.927, p = 0.019; NSHS/SHS: OR = 0.528, CI_{95} = 0.329-0.848, p = 0.008; TPI/SHS: OR = 0.418, CI_{95} = 0.242-0.720, p = 0.002), while test type did not result as associated with test outcome (Test A/Test B: OR = 1.025, CI_{95} = 0.695-1.511, p = 0.902; Test C/Test B: OR = 1.147, CI_{95} = 0.733-1.796, p = 0.548) (Supplementary materials 4). Analyses of interaction between test type and gender and between test type and high school as independent predictors of admission revealed no evidence of difference in terms of probability of a high school or gender subgroup to be admitted (Supplementary materials 4).

TABLE 4 - Admission test scores of the total cohort

Variables	Total score Median (IQR)	LR sub-score Median (IQR)	SK sub-score Median (IQR)
Gender			
Female	68 (27)	60 (18)	58 (29)
Male	74 (25)	59 (19)	60 (26)
p-value (Mann-Whitney)	*<.001*	*0.025*	*0.010*
High school			
SHS	77 (24)	59 (20)	64 (24)
NSHS	65 (27)	60 (17)	53 (27)
TPI	63 (27)	61 (16)	49 (28)
p-value (Kruskal-Wallis)	*<.001*[1]	*0.012*[2]	*<.001*[1,3]
Geographic origin			
Northern Italy	72 (26)	60 (19)	60 (27)
Central Italy	71 (23)	59 (19)	63 (30)
Southern Italy	66 (30)	60 (17)	54 (27)
p-value (Kruskal-Wallis)	*<.001*[4,5]	*0.655*	*<.001*[4,5]

LR = Logical Reasoning; SK = Scientific Knowledge; SHS = Scientific High School; NSHS = Non-Scientific High School; TPI = Technical Professional Institute
[1]Significant differences between SHS and NSHS (p<.001) and between SHS and TPI (p<.001) in post-hoc analysis. [2]Significant differences between SHS and TPI (p<0.05) in post-hoc analysis [3]Significant differences between NSHS and TPI (p<0.05) in post-hoc analysis. [4]Significant differences between Northern Italy and Southern Italy in post-hoc analysis (p<.001). [5]Significant differences between Central vs Southern Italy in post-hoc analysis (p<.005).

TABLE 5 - Socio-demographic predictors of admission test scores

Global multivariate model	Total score			LR sub-score			SK sub-score		
	R	**R^2**	**p-value**	**R**	**R^2**	**p-value**	**R**	**R^2**	**p-value**
	0.359	**0.129**	**<.001**	**0.456**	**0.208**	**<.001**	**0.370**	**0.137**	**<.001**
	β	**F**	**p-value**	**β**	**F**	**p-value**	**β**	**F**	**p-value**
High School		*43.67*	*<.001*		*1.35*	*0.258*		*44.70*	*<.001*
NSHS/SHS	−8.32		<.001	1.50		0.135	−9.09		<.001
TPI/SHS	−9.23		<.001	0.86		0.322	−8.77		<.001
Gender		*6.25*	*0.012*		*1.11*	*0.293*		*1.28*	*0.259*
Female/Male	−2.41		0.012	0.78		0.293	1.09		0.259
Interaction gender*high school		*12.77*	*<.001*		*0.83*	0.436		*12.28*	*<.001*
(F/M) * (NSHS/SHS)	−1.36		0.435	−1.66		0.210	−0.70		0.685
(F/M) * (TPI/SHS)	−9.96		<.001	−0.07		0.963	−9.91		<.001
Geographic origin		*19.53*	*<.001*		*0.31*	*0.735*		*11.96*	*<.001*
Central/Northern	−0.84		0.633	1.05		0.448	−0.96		0.585
Southern/Northern	−7.15		<.001	0.03		0.755	−5.51		<.001
Age at test	−0.15	*2.14*	*0.144*		*0.09*	0.755	−0.19	*3.51*	*0.061*
	–								
Test type		*16.61*	*<.001*		*92.85*	<.001		*12.63*	*<.001*
B test / A test	−5.67		<.001	−13.07		<.001	2.78		0.024
C test / A test	−3.51		0.121	−12.69		<.001	9.43		<.001
Candidates/places ratio	0.48	*2.09*	*0.149*	−1.15	*21.52*	<.001	−2.72	*67.34*	<.001

LR = Logical Reasoning; SK = Scientific Knowledge; SHS = Scientific High School; NSHS = Non-Scientific High School; TPI = Technical Professional Institute.

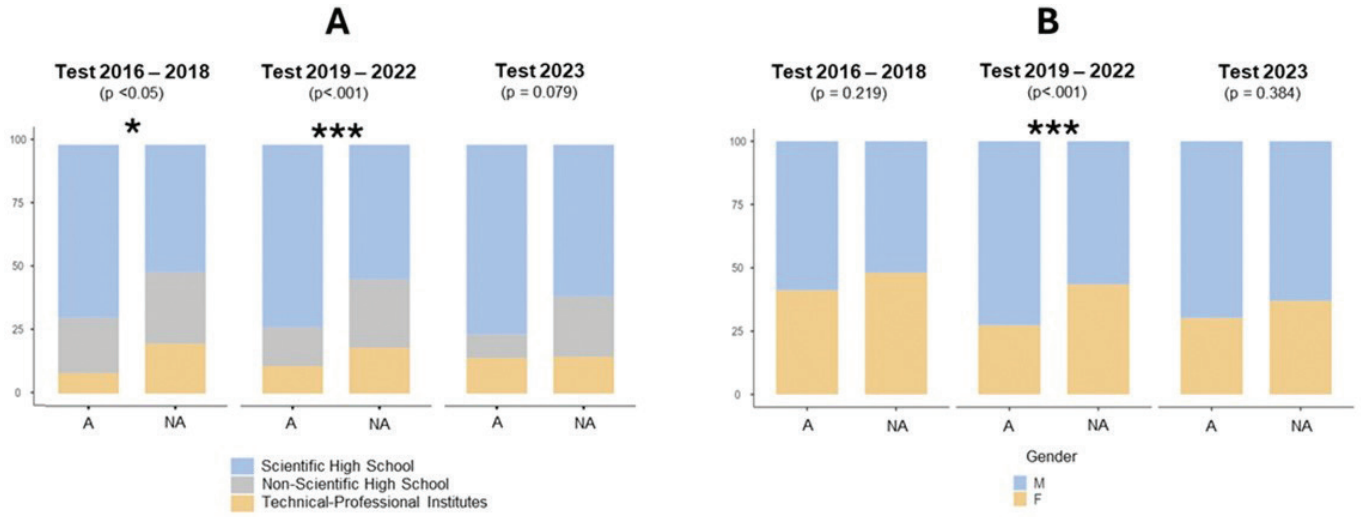

FIGURE 1 - Distribution of high school type (A) and gender (B) among cohorts exposed to different proportions of admission test contents.

AD = Admitted candidates; NA = Non-admitted candidates. M = male; F = female. *p < 0.05; **p < 0.001; ***p < 0.001 ($\varkappa^2$ test).

Discussion

The study revealed that high-school type, gender, and geographic origin were significant but limited socio-demographic predictors of admission to the Bachelor of Physiotherapy Programme. In fact, socio-demographic factors included in our models marginally improved the model fitting or explained a small portion of the variance, suggesting that admission test success and scores were poorly predicted by socio-demographic predictors considered in the current study. Indeed, the lack of information on additional socio-demographic variables (e.g., prior academic achievement, socio-economic status, parental education, or school quality) hinders the opportunity to draw conclusions about the overall fairness of the admission process. Studies in the medical and nursing educational field have reported that socio-economic status was also associated with admission outcomes, in addition to gender, age at test, and high school (20-22). However, it is worth noting that the predictive ability of socio-demographic factors resulted in a similar level of explained variance reported in the current investigation (20). The role of personal features such as time spent on admission test preparation and individual knowledge and confidence with the test format deserves to be also considered as potential influencing factors. A higher proportion of candidates who attended an SHS was found in admitted candidates, and candidates who attended SHS revealed higher total and SK scores than those who attended NSHS and TPI. Moreover, attendance at a SHS predicted both the likelihood of admission to the Bachelor of Physiotherapy Program and higher total and SK test scores, although the predictive ability of our models was low. These results supported the hypothesis that high school type may influence admission test results. Literature data have highlighted that SHS curricula specifically prepare candidates to adequately face university admission tests (7,8,11,24). This is consistent with our findings and with previous studies reporting that applicants who attended British Grammar Schools (comparable to Italian SHS) achieved higher scores in the Quantitative Reasoning section of the UK Clinical Aptitude Test (25-27). The effect of incorporating other selective tools (e.g., interviews and soft-skills tests) deserves investigation to further minimize the impact of high school curricula in admission procedures (28).

Males were found to achieve a higher total score than females in the current study, and gender was found to be a significant but limited predictor of admission to the Bachelor of Physiotherapy Program. However, it is worth noting that most of the male candidates have attended SHS, while most of the females have attended NSHS in our study cohort. Therefore, differences in high school preparation might have affected the association between gender and admission outcomes. In fact, interaction between female gender and high school influenced total and SK scores only for TPI students, suggesting that school preparation may play a greater role than gender differences in quantitative test performance. Thus, caution is warranted when considering gender as a socio-demographic influencing factor on admission test results.

Geographic origin resulted as an additional predictor of admission, with candidates from Northern Italy achieving higher total and SK scores compared to applicants from Southern Italy. These findings may reflect the quality gap observed in scholarly results between teenage students from Northern and Southern Italy (29). However, it is worth acknowledging that a low number of subjects from Southern Italy might have affected our findings, and further research is needed.

The current study also investigated the effect of changes in admission test contents on the distribution of socio-demographic variables among admitted candidates. Different admission test contents in terms of the proportion of LR and SK questions revealed no evidence of a difference in terms of the socio-demographic profile of admitted candidates, and higher proportions of candidates who attended a SHS and males were found among admitted compared to

non-admitted candidates, independent of the contents of the test.

Participants who attended SHS were over-represented in all test cohorts, independent of the relative proportion of LR and SK questions included in the test. It is reasonable to speculate that higher scientific knowledge was expected among students who attended SHS due to the predominance of scientific subjects in the curricula. Additionally, good performance in logical reasoning may reflect the effects of mathematical studies on logical skills (30,31). This finding may explain why increasing the proportion of LR questions did not alter the socio-demographic variables related to high school education. On the other hand, a higher proportion of male candidates in the admitted group was detected for cohorts selected with test A and test B, but it is also worth highlighting that our predictive model excluded the interaction between gender and test type from influencing admission results. Finally, it is worth acknowledging that LR/SK analysis was constrained by the data structure, since the effects of test type cannot be fully separated from the year cohort effects.

Some limitations of the current study need to be underlined. First, the sample size was not estimated *a priori*. However, the regression model included 7 predictors, 2713 applicants, and 279 candidates who were offered a place (10.3%). The events-per-variable ratio was 40, resulting in a substantially higher value than the thresholds of 10-20 events-per-variable described for a reliable coefficient estimation (32,33). Second, the missing data distribution resulted in being different among study cohorts, with the majority of missingness in 2017 and 2019. However, a sensitivity check of complete-case analysis was adopted in order to assess the impact of missing data on the regression models. Third, some socio-demographic predictors of admission test success reported in the literature (e.g., socio-economic status, high school grade point average, prior academic achievement, parental education, or school quality) were not included in our models, and data were collected from applicants to a single Italian University, limiting the generalizability of our findings.

Conclusions

High-school type, gender, and geographic origin predicted admission to the Bachelor of Physiotherapy Programme, but these predictors marginally influenced admission outcomes. In addition, a higher proportion of candidates who attended a SHS and males were found in admitted applicants compared to non-admitted candidates, independent of the proportion of LR and SK questions. Finally, the lack of information on additional socio-demographic variables hinders the opportunity to draw conclusions about the fairness of admission procedures. Future studies are needed to extend this investigation to additional Bachelor of Physiotherapy Programmes in Italy to analyze a more representative sample of admission test candidates and investigate whether additional unexplored socio-demographic factors might influence admission test results.

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