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Academic background as predictors of university performance in health sciences.

Antecedentes académicos como predictores del rendimiento universitario en ciencias de la salud.

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Abstract.

Introduction: Academic performance in first-year health sciences students, considering the school-to-university transition, highlights the relevance of understanding how useful secondary school academic records and learning styles are for anticipating university performance and designing early support interventions. **Objective:** To analyze the relationship between secondary school academic records, first university examination scores, and learning styles with semester academic performance among students of Nursing, Physical Therapy, Obstetrics, and Medical Technology. **Methods:** A quantitative study was conducted with 158 first-year students, predominantly female and primarily from private-subsidized mixed educational institutions in the Valparaíso region. Variables recorded included Secondary Education Grades (NEM), first university examination score, semester average grade, and learning styles assessed using the CHAEA questionnaire. **Results:** Findings from this study indicate that the primary predictor of semester average performance is the score achieved in the first university examination, while CHAEA learning styles are not significantly associated with academic performance. **Conclusion:** Secondary school academic records have limited predictive capacity for university performance, whereas first semester examination scores emerge as more sensitive early indicators for identifying at-risk students. It is recommended to strengthen initial monitoring systems and academic support programs that consider both early performance and study skills development and adaptation to the university context.

Keywords: academic records; academic performance; learning styles; first-year university students.

Resumen.

Introducción: El rendimiento académico en estudiantes de primer año de carreras de ciencias de la salud, considera que la transición escuela–universidad, se plantea la relevancia de entender qué tan útiles son los antecedentes escolares y los estilos de aprendizaje para anticipar el desempeño universitario y diseñar apoyos tempranos. **Objetivo**: Analizar la relación entre antecedentes académicos escolares, primeras calificaciones universitarias y estilos de aprendizaje con el

rendimiento semestral de estudiantes de Enfermería, Kinesiología, Obstetricia y Tecnología Médica. **Métodos**: Se realizó un estudio cuantitativo con 158 estudiantes de primer año, mayoritariamente mujeres y provenientes de establecimientos mixtos particular-subvencionados, principalmente de la región de Valparaíso. Se registraron Calificaciones de Educación Secundario (NEM), calificación de la primera evaluación universitaria, promedio semestral y estilos de aprendizaje mediante el cuestionario CHAEA. **Resultados**: Los hallazgos derivados de este estudio indican que el principal predictor del promedio semestral es el rendimiento de la primera evaluación universitaria, mientras que los estilos de aprendizaje CHAEA no se asocian significativamente con el rendimiento. **Conclusión**: Los antecedentes escolares tienen capacidad predictiva acotada sobre el rendimiento universitario, y las primeras calificaciones en la universidad emergen como indicadores tempranos más sensibles para detectar estudiantes en riesgo. Se recomienda fortalecer sistemas de monitoreo inicial y programas de apoyo académico que consideren tanto el rendimiento temprano como habilidades de estudio y adaptación al contexto universitario.

Palabras clave: antecedentes académicos, rendimiento académico, estilos de aprendizaje, primer año universitario.

1. Introduction

Early identification of students at risk of low academic performance constitutes a priority for higher education institutions, particularly in health sciences programs, where curricular demands require the progressive integration of scientific knowledge, procedural skills, and professional competencies. During the first year of university, students face significant challenges associated with adapting to new teaching methodologies, assessment systems, and higher levels of autonomy in learning. These demands may significantly influence their academic performance, retention, and curricular progression, making early performance a relevant indicator for the development of institutional strategies for student support and guidance (1-2).

Among the factors associated with academic performance in higher education, prior academic background has been widely studied. Grades obtained during secondary education—expressed in Chile as High School Grade Point Average (NEM, Notas de Enseñanza Media)—have shown a positive association with subsequent performance in higher education. This indicator is often interpreted as an indirect measure of study habits, academic engagement, and the ability to respond to sustained academic demands. Several studies have reported that students with stronger academic backgrounds tend to achieve more favorable outcomes during university training (2–4).

However, the predictive capacity of prior academic background has limitations. Differences between educational systems, unequal opportunities for prior academic preparation, and the diversity of learning contexts may influence grades obtained before entering university. Moreover, NEM reflects performance achieved in an educational context different from that of higher education and therefore does not necessarily represent the ability to adapt to the cognitive, methodological, and evaluative demands specific to university education (5-6). This situation has driven the search for indicators more closely aligned with the university context that allow early identification of students at academic risk.

In this regard, early university assessments have emerged as potential early markers of future academic performance (7–10). Unlike prior academic records, these assessments reflect student performance under real university conditions, incorporating elements related to academic adaptation, time management, study strategies, and the ability to respond to new teaching and assessment methodologies. Recent studies suggest that the first grades obtained at the beginning of university education may constitute one of the most robust indicators for predicting subsequent performance and identifying students who require timely academic support (8–10).

On the other hand, educational research has extensively explored the influence of learning styles on academic performance. Models derived from Honey and Alonso (11) propose that students exhibit differentiated preferences for processing information, which can be grouped into active, reflective, theoretical, and pragmatic styles. Although these categories have been used to characterize the diversity of learning approaches present in the classroom, evidence regarding their relationship with academic performance remains inconsistent. While some studies have reported positive associations between certain learning styles and academic outcomes, others have found no significant relationships, suggesting that factors such as self-regulation, executive functions, class attendance, and study habits may have greater explanatory power regarding university performance (12–14). Overall, the available evidence suggests that prior academic background, early university assessment experiences, and learning styles may all contribute to explaining student academic performance. However, most studies have analyzed these factors independently, and there is limited evidence comparing their predictive capacity simultaneously within the same student population, particularly among first-year health sciences students. This limitation hinders the identification of which indicators have greater practical utility for early detection of academic risk and for the design of student support strategies.

Therefore, the aim of this study was to compare the predictive capacity of prior academic background (NEM), learning styles, and performance on the first university assessment on first-semester academic performance among health sciences students.

2. Methods

2.1 Study design.

This study employed quantitative, observational, descriptive, and cross-sectional design. It was conducted at Universidad Viña del Mar, Chile, within the Faculty of Life Sciences, including the programs of Nursing, Kinesiology Obstetrics, and Medical Technology. The sample consisted of 158 students enrolled in the first semester of professional training during the 2025 academic year. These programs were selected due to their higher proportion of students from public (18.4%) and private (81.6%) educational backgrounds.

2.2 Data collection.

The Honey-Alonso Learning Styles Questionnaire (CHAEA) was administered to assess students' learning styles. This instrument has demonstrated content validity and high reliability and has been validated in Chile (15). It consists of 80 dichotomous (YES/NO) items, scored as 1 and 0, respectively, with a maximum possible score of 80 points. The questionnaire includes 20 items corresponding to each learning style: active, reflective, theoretical, and pragmatic. Higher scores in each dimension indicate a stronger preference for that learning style. The instrument was administered prior to the first assessment of the semester. Students' prior academic background, including high school grade point average (NEM), was obtained from official records of the Ministry of Education. Grades from the first university assessment and students' semester grade point averages were obtained from institutional university records. The grading scales used in secondary and higher education are comparable, as both are reported on the Chilean 1.0–7.0 scale.

2.3 Data analysis.

Descriptive statistics (means, standard deviations, medians, and ranges for all continuous variables) were used. Normality was assessed using the Shapiro–Wilk test. Variance was analyzed using the Friedman test, along with Spearman correlation and multiple linear regression analyses. A statistical significance level of $p < 0.05$ was established for all tests. Data was analyzed using JASP statistical software, version 0.96.

2.4 Ethical considerations.

The study followed all institutional protocols, and informed consent was obtained from all participants. Students were informed about the study methodology, their right to participate and withdraw voluntarily, and the protection and confidentiality of their data, which were used exclusively for research purposes by the principal investigator.

3. Results

The sample comprised 158 students, of whom 72% were female and 78% came from mixed-type (government-subsidized private) schools (table 1). A total of 73% of the sample was from the Valparaíso region. The distribution across programs was relatively homogeneous: Nursing (36%), Kinesiology (22%), Obstetrics (24%), and Medical Technology (13%). The mean high school grade point average (NEM) was 5.72 ± 0.41, while the mean score on the first university assessment was 4.71±0.92, and the mean semester grade point average was 4.77±0.89. The NEM mean (5.72±0.4) was significantly higher than both the first university assessment (4.71±0.9) and the semester GPA (4.76±0.9) (Wilcoxon test, $p<0.001$). The first two variables showed a normal distribution, whereas the semester GPA exhibited a non-parametric distribution (Kolmogorov-Smirnov, μ =.405, μ=.694, μ=.006). Regarding learning styles, the active style showed the highest mean score (15.40±2.35), corresponding to 42% of students, followed by the theoretical style (15.22±2.54), representing 26% of the sample. The reflective style accounted for 17% and the pragmatic style for 6%, while 6% of students were classified as mixed and 3% as multimodal. The distribution of learning styles followed a non-parametric pattern (Kolmogorov-Smirnov, μ =.308, μ=.006, μ=<.001, μ=.034).

Table 1. Sample Characteristics

Gender	**n**	**%**
Women	120	72%
Male	38	23%
Type of School Establishment		
Subsidized private (Priv. sub.)	124	78%
Private	5	3%
Public	29	18%
Program		
Nursing	60	36%
Kinesiology	37	22%
Obstetrics	40	24%
Medical Technology	21	13%
Origin		
Antofagasta Region	9	6%
Tarapacá Region	1	1%
Atacama Region	1	1%
Coquimbo Region	7	4%
Valparaíso Region	116	73%
Metropolitan Region	4	3%
OHiggins Region	10	6%
Maule Region	2	1%
Ñuble Region	2	1%
Aysén Region	2	1%
Magallanes y la Antártica Chilena Region	4	3%
Average Grades		
	Subsidized	Private Public

	private		
High School Grade Point Average (NEM) (1.0–7.0)	5.7 ± 0.40	5.9 ± 0.72	5.7 ± 0.39
First University Test Average (1.0–7.0)	4.8 ± 0.94	4.7 ± 0.95	4.4 ± 0.97
Semester Grade Point Average (1.0–7.0)	4.8 ± 0.97	4.8 ± 0.12	4.7 ± 0.65
Learning Styles CHAEA			
	n	**%**	**Mean**
Active	67	42%	15.40 ± 2.35
Reflective	27	17%	14.92 ± 2.12
Theoretical	41	26%	12.85 ± 3.04
Pragmatic	9	6%	15.22 ± 2.54

The analysis of variance (ANOVA) revealed that there were no statistically significant differences in academic indicators according to the educational institution of origin. For the semester average, no significant differences were observed ($F_{(2, 155)} = 0.117$, p=0.889), while for the mean High School Grade Point Average (NEM), the results were also non-significant ($F_{(2, 155)} = 0.328$, p=0.721). In both analyses, between-group variability was considerably lower compared to residual variability. This indicates that the type of educational institution has minimal influence on students' academic performance, with academic results showing homogeneous behavior across groups (figure 1).

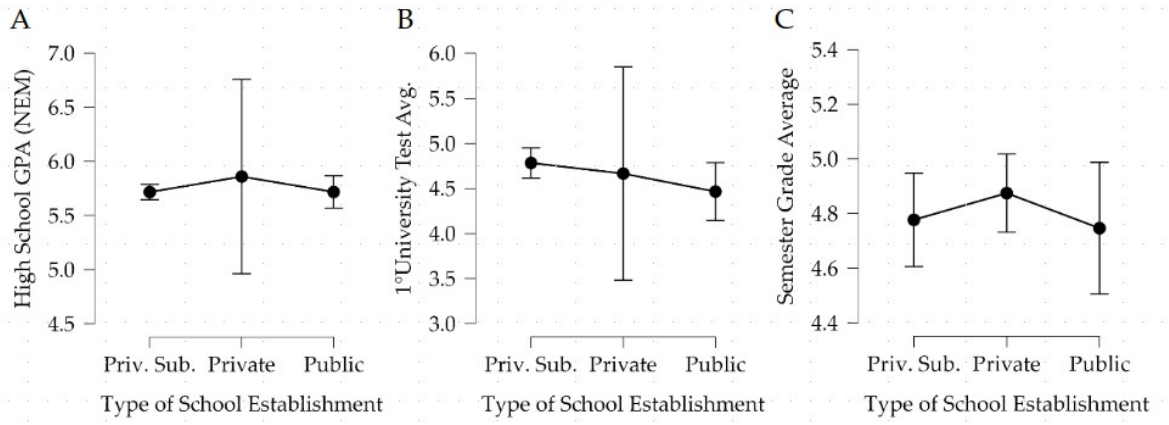

Figure 1. Academic Grade Variance by Educational Institution.

Conover post hoc comparisons revealed significant differences between the NEM average and the 1st Assessment average, as well as between the NEM average and the Semester average (p<0.001 for both contrasts, even after Bonferroni and Holm corrections), indicating that high school grades are higher than those obtained during the first university semester. In contrast, no significant differences were found between the 1st Assessment average and the Semester average (p = 0.082; pBonf = 0.246; pHolm = 0.082). The correlation between the NEM average and the 1st University Assessment average was weak, with a rho value of (158) =0.206, p valor = 0.010 (figure 2a). The correlation between the NEM average and the Semester average was also weak, rho (158) =0.270, p valor = < 0.001 (figure 2b). Regarding the correlation between the 1st University Assessment average and the Semester average, the data revealed a strong relationship, with (158) =0.756, p valor = < 0.001 (figure 2c).

We calculated a multiple linear regression model to predict the effect of high school grades and the first university assessment average on the semester average. The regression equation was statistically significant: $F_{(2,155)} = 83.76$, $p < .001$. The R2 value was 0.52, indicating that 52% of the university semester average can be explained by the model with high school grades and first university assessment average as predictor variables. Specifically, the first university assessment average variable ($\beta = 0.67$, SE = 0.06, t = 12.08, $p<.001$) had a significant effect on the semester average, while the NEM average had a partial effect ($\beta = 0.22$, SE = 0.10, t = 1.77, p.079). Additionally, Spearman rank correlation analysis was performed, which showed no significant associations between each of Kolb's learning styles (active, reflective, pragmatic, and theoretical) and the semester grade average. The Spearman coefficients reported for each style were negative, of low magnitude, and non-significant (active: $\rho = -0.076$, p=0.343; reflective: $\rho = -0.103$, p=0.197; theoretical: $\rho = -0.019$, p=0.810; pragmatic: $\rho = -0.024$, p=0.767). In contrast, correlations among the learning styles themselves were all significant and of moderate to high magnitude ($p<0.001$), suggesting a strong interrelationship between the styles in the sample, independent of their association with academic performance.

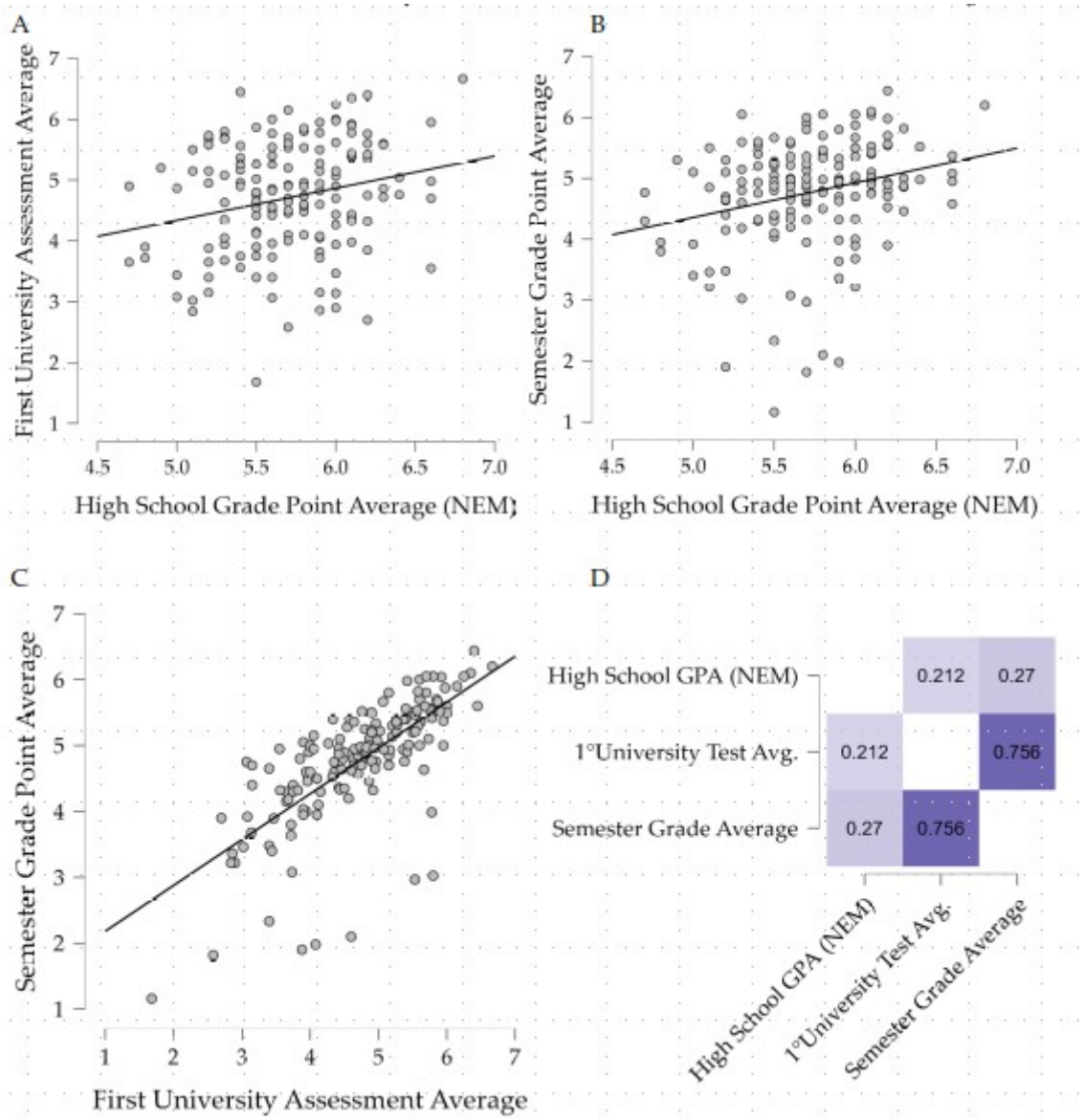

Figure 2. Correlation Analysis: NEM, First Assessment, and Semester Average.

Regarding the multiple linear regression analysis that included learning styles as predictors of the semester average, no relevant explanatory capacity was observed ($F_{(4.153)} = 0.698$, $p = 0.594$). The learning style coefficients were non-significant (Active: B = 0.001, p = 0.967; Reflective: B = −0.064, p = 0.131; Theoretical: B = 0.005, p = 0.894; Pragmatic: B = 0.017, p = 0.558), indicating that in the study sample, learning styles according to Kolb's model were not systematically associated with academic performance.

4. Discussion

The findings have important implications for teaching and student support in health sciences faculties, particularly in Spanish-speaking contexts and can be summarized as follows: the main predictor of semester GPA is performance on the first university assessment, whereas CHAEA learning styles are not significantly associated with academic performance (8, 15). Regarding prior academic background, our findings are consistent with the literature indicating that, for early warning systems and predictive models in higher education, indicators centered on initial academic performance are generally more accurate than entry credentials for identifying at-risk students (16-17). Likewise, the strong association between the first assessment and semester GPA is consistent with studies highlighting the value of early assessments in anticipating course failure, academic delay, and dropout risk (7–9, 18). With respect to differences from other studies focused on school background, the strong correlation between the first university assessment and NEM supports the interpretation that the first assessment rapidly captures the student's adaptation to the university context (18). By contrast, other studies have emphasized the ability of secondary school grades to predict performance in health sciences higher education (4, 19–21). Our findings confirmed that prior school performance retains a weak role in university academic performance (2-3). A plausible explanation for this discrepancy lies in the effect of "self-selection homogenization": students admitted to health sciences programs at this institution come from a relatively restricted NEM range (5.7 ± 0.40), which reduces explainable variance and attenuates the predictive power of this indicator compared with studies including programs with more heterogeneous admission profiles.

Regarding learning styles, our results differ from studies reporting positive associations between certain style profiles and performance in specific contexts (21-22). In this cohort, no significant associations were found between scores on the four CHAEA dimensions and semester GPA, nor was there any relevant explanatory capacity when learning styles were included in regression models. This lack of association suggests that, at least in this context, learning styles carry less weight than other academic and contextual factors in explaining performance. This is consistent with recent reviews questioning teaching approaches based on students' learning styles as a strategy to improve academic performance (12-13, 23).

For health sciences educators, these results highlight the importance of designing, planning, and providing feedback on early assessments to enable timely detection of academic risk and guide student support strategies (7-8, 18, 24). Likewise, the absence of a relationship between learning styles and performance suggests that teaching efforts should prioritize strategies that foster self-regulated learning and efficient time management (14, 25-26).

Future studies should examine early academic indicators alongside motivational, psychosocial, and contextual variables through longitudinal models that allow academic performance to be tracked the student's educational trajectory.

This study has several limitations that should be considered when interpreting the results. First, its cross-sectional design prevents the establishment of causal relationships between learning styles and academic performance. In addition, the data were obtained exclusively from a single Chilean university and were restricted to students enrolled in health sciences programs, which

limits the generalizability of the findings to other educational institutions, geographic regions, or academic disciplines (1). The study also did not include important sociodemographic and contextual variables that could have functioned as covariates, such as age, academic workload, part-time employment, or intrinsic student motivation (5, 27-28). Finally, although the CHAEA questionnaire has been validated, it relies on self-report and may therefore be influenced by response bias or limited self-awareness regarding learning processes (15).

5. Conclusions

- Secondary school academic records have limited predictive capacity for university performance, whereas first semester examination scores emerge as more sensitive early indicators for identifying at-risk students.
- It is recommended to strengthen initial monitoring systems and academic support programs that consider both early performance and study skills development and adaptation to the university context.
- In this study, the first university assessment played a predominant role in semester GPA among first-year health sciences students. These findings support that early performance indicators within the university context are more useful than entry grades for identifying at-risk students and guiding support decisions. In contrast, the learning styles measured using the CHAEA questionnaire were not significantly associated with academic performance.

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