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Distribution of learning styles and their relationship with sociodemographic and academic variables in Dentistry students: a cross-sectional study.

Distribución de estilos de aprendizaje y su relación con variables sociodemográficas y académicas en estudiantes de Odontología: estudio transversal.

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Summary.

Introduction: Understanding learning styles in health sciences students is a relevant tool for guiding pedagogical reflection and recognizing the diversity of learning approaches. In dentistry, training progresses from theoretical stages to increasingly complex clinical scenarios, making it pertinent to analyze how these preferences are distributed throughout the educational trajectory. **Objective:** To analyze the distribution of learning styles among dentistry students at a private university in Santiago, Chile, during 2025, considering their relationship with gender, age, and academic year. **Methods:** Cross-sectional study. 177 students from first to fifth year participated (response rate: 53.8%). The Honey-Alonso Learning Styles Questionnaire (CHAEA) was administered. Internal consistency was assessed using Cronbach's alpha (α=0.592–0.729). Non-parametric tests were used for comparisons according to gender and academic year, Spearman's correlation for age, and post-hoc analysis with Bonferroni correction. Effect sizes were estimated using eta-squared (η^2). **Results:** The theoretical style was the most frequent (33.9%), followed by the reflective (28.8%), pragmatic (19.2%), and active (18.1%) styles. No significant differences were observed in the distribution of predominant styles according to gender (p=0.051), but differences were observed between academic years for all four styles (p<0.001), with large effect sizes (η^2=0.14–0.33). The greatest differences were concentrated between the third and fourth years, coinciding with the beginning of the clinical cycle. The pragmatic style showed a moderate positive correlation with age (r=0.526; p<0.001), and the theoretical style a moderate negative correlation (r=-0.432; p<0.001). **Conclusion:** Learning styles differ according to the stage of dental students' training, with greater differences observed between preclinical and clinical courses. Although the design does not allow for changes over time, the findings support the need to implement diversified and coherent pedagogical strategies at different stages of training.

Keywords: learning styles, dentistry, higher education, CHAEA, clinical competence.

Abstract

Introduction: Understanding learning styles among health sciences students is relevant for informing educational reflection and recognizing the diversity of learning approaches. In dentistry, training progresses from predominantly theoretical stages to increasingly complex clinical settings, making it important to examine how learning preferences are distributed throughout the educational trajectory. **Objective:** To analyze the distribution of learning styles among dental students from a private university in Santiago, Chile, in 2025, considering their relationship with gender, age, and academic year. **Methods:** A cross-sectional study was conducted among 177 first- to fifth-year dental students (response rate: 53.8%). The Honey-Alonso Learning Styles Questionnaire (CHAEA) was administered. Internal consistency was assessed using Cronbach's alpha (α=0.592–0.729). Nonparametric tests were used for comparisons according to gender and academic year, Spearman's correlation was used to assess associations with age, and post-hoc analyzes were performed using Bonferroni-adjusted Mann–Whitney tests. Effect sizes were estimated using eta squared (η^2). **Results:** The theoretical learning style was the most frequent (33.9%), followed by the reflective (28.8%), pragmatic (19.2%), and active (18.1%) styles. No significant differences were observed in the distribution of predominant learning styles according to gender ($p = 0.051$), whereas significant differences were found across academic years for all four learning styles ($p < 0.001$), with large effect sizes (η^2=0.14–0.33). The most pronounced differences were observed between the third and fourth academic years, coinciding with the beginning of clinical training. The pragmatic style showed a moderate positive correlation with age ($r=0.526$, $p<0.001$), whereas the theoretical style showed a moderate negative correlation ($r=-0.432$, $p<0.001$). **Conclusions:** Learning styles differ according to the stage of dental education, with the greatest differences observed between preclinical and clinical years. Although the cross-sectional design does not allow the assessment of individual changes over time, the findings support the implementation of diversified teaching strategies tailored to different stages of the educational process.

Keywords: learning styles; dental education; higher education; CHAEA; clinical competence.

1. Introduction

Understanding how students learn is central to optimizing educational processes in higher education, particularly in health sciences programs, where learning involves integrating theoretical knowledge, clinical skills, and attitudinal competencies (1–5). In dentistry, this need is especially relevant because professional training demands the progressive development of cognitive, psychomotor, and communication skills in increasingly complex academic and clinical contexts. In this scenario, the study of learning styles has gained interest as a tool for understanding the different ways in which students process, organize, and apply information during their training (5–6).

Learning styles are defined as relatively stable cognitive, emotional, and behavioral characteristics that influence how individuals perceive, interact with, and respond to educational environments (7). Among the most widely used models is Kolb's experiential learning theory, which describes four styles—divergent, assimilative, convergent, and accommodative—derived from the interaction between perception and information processing (8). Subsequently, Honey and Alonso adapted this model to the Spanish-speaking educational context, proposing the active, reflective, theoretical, and pragmatic styles, which are widely assessed using the CHAEA questionnaire (9). This approach has been particularly used in higher education due to its usefulness in exploring students' learning preferences and guiding more diverse and inclusive pedagogical strategies. International research has analyzed learning styles in health sciences students. In Brazil, it has been reported that recognizing learning preferences facilitates the adaptation of teaching strategies and contributes to academic performance (1), and among dental students, a predominance of active and theoretical learning styles was identified, especially in virtual learning contexts (2). In Colombia, a predominance

of the reflective learning style was observed among medical students, associated with processes of observation and critical analysis (10), while in Indonesia, differences according to gender and associations between certain styles and academic performance were reported (11). More recently, among postgraduate dental students in Mexico, a slight predominance of theoretical and reflective learning styles was described, with no significant differences according to gender (12).

In the Chilean context, available studies show a similar trend. A predominance of reflective and theoretical learning styles has been observed in Speech-Language Pathology and Kinesiology students (13), and the reflective style has been identified as frequent in nursing students (14), although another study has indicated the active style as predominant in that same field (3). In the case of Dentistry students, Sarmiento-Cornejo et al. (15) described a relatively balanced distribution of styles at the University of Valparaíso, with a slight predominance of reflective styles, a finding consistent with that reported for first-year students at the University of Chile upon entering the program (16). It is worth noting that the Chilean dental curriculum is characterized by a high proportion of clinical courses (17), which makes it especially relevant to explore how learning preferences are distributed throughout the entire educational trajectory. The concept of learning styles has been the subject of debate in the educational literature. From a critical perspective, Newton and Miah (18) and Pashler et al. (19) point out that there is no conclusive evidence that adapting teaching to individual learning styles improves academic outcomes, challenging the so-called "grid hypothesis" that has underpinned numerous pedagogical interventions based on this approach. These critiques are relevant and have contributed to rethinking how learning styles are conceptualized in higher education. More recent approaches propose understanding learning styles not as rigid categories or stable traits that determine how each student should be taught, but as preferences or tendencies that can be modified according to learning experiences and the demands of the educational environment (20-21). From this perspective, their main usefulness lies in fostering pedagogical reflection and recognizing the diversity of learning styles present in the classroom, rather than prescribing differentiated teaching strategies. According to this view, this study assumes that learning styles can coexist to varying degrees within the same student and change throughout their educational trajectory. Therefore, the Honey-Alonso Learning Styles Questionnaire (CHAEA) is used for descriptive purposes, aimed at characterizing learning preference patterns in a specific cohort rather than classifying students into mutually exclusive categories. In Chile, studies on learning styles in dental students are scarce and have focused mainly on first-year cohorts (15-16), providing a limited view of learning preferences during professional training. This limitation is particularly relevant considering that the Dentistry program is characterized by a curricular progression that moves from a predominance of theoretical content and basic sciences toward preclinical and clinical settings where problem-solving, decision-making, and patient care become more important (17). Learning preferences may vary depending on the different academic and clinical demands that students face throughout their training.

Analyzing students from different academic years simultaneously allows for a more comprehensive view of the distribution of learning styles and the exploration of potential differences associated with academic progression—information that cannot be obtained from studies restricted to a single cohort. In this context, the present study sought to answer the following research question: How are learning styles distributed among dentistry students, and what relationship do they have with gender, age, and academic year? The objective was to analyze this distribution among students at a private university in Santiago, Chile, during the year 2025, adopting a dynamic and non-deterministic perspective on learning styles.

2. Methods

A quantitative, non-experimental, descriptive-correlational, cross-sectional study was conducted to analyze the distribution of learning styles and their relationship with sociodemographic

and academic variables among dentistry students in 2025. The population consisted of 329 students enrolled in the first through fifth years of the dentistry program at a private university in Santiago, Chile. Sixth-year students were excluded because this year comprises an exclusively clinical internship, structurally different from the rest of the program, which would have hindered comparability between groups. A non-probability convenience sampling method was used. Inclusion criteria were: enrollment in the first through fifth year and pursuing dentistry as their first university experience, in order to homogenize the sample and prevent prior university education from influencing learning preferences. Students who had dropped out or were on medical leave during the data collection period were excluded.

The minimum sample size was estimated for Spearman's rank correlation analysis, considering a 95% confidence level, 80% statistical power, and a moderate effect size ($r = 0.3$), resulting in a minimum of 84 participants. Considering a 15% non-response rate, the expected sample size was 97 students. Of the 329 enrolled students, 177 completed the instrument, representing a response rate of 53.8%, which significantly exceeds the estimated minimum threshold, thus strengthening the power of the analyses. However, given the voluntary nature of participation, self-selection bias cannot be ruled out, and therefore the results should be interpreted with caution regarding their representativeness.

The Honey-Alonso Learning Styles Questionnaire (CHAEA) (9) was used for data collection. This instrument consists of 80 dichotomous items distributed across four dimensions: active, reflective, theoretical, and pragmatic. The questionnaire has demonstrated validity and reliability in Spanish-speaking university students (22-23). In addition to the CHAEA, sociodemographic and academic variables were recorded: age, gender, and academic year. Recruitment took place between October and November 2025 via emails sent by the faculty's academic office. Students received information about the study's objectives and subsequently a link to a Google Form containing the informed consent form and the questionnaire. Access to the form required authentication with an institutional email address, which limited the possibility of duplicate responses. Participation was anonymous and voluntary.

Statistical analysis was performed using Stata 19.5 (StataNow SE, Stata Corp LLC, 2025). The internal consistency of the four dimensions of the CHAEA was assessed using Cronbach's alpha coefficient using data from the studied sample. Qualitative variables were described using absolute frequencies and percentages; quantitative variables, using median and interquartile range (IQR). The normality of the CHAEA scores was assessed using the Shapiro-Wilk test, and in the absence of a normal distribution, non-parametric tests were employed. In addition to analyzing the scores obtained in each of the four dimensions of the Honey-Alonso Learning Styles Questionnaire (CHAEA), a categorical variable called predominant learning style was constructed. For each participant, the dimension with the highest score among the active, reflective, theoretical, and pragmatic styles was identified and assigned as the predominant style. No ties were observed in the maximum score between dimensions, so the classification was unambiguous for all students. This classification had a purely descriptive purpose and allowed for characterizing the distribution of learning preferences in the sample. The association between age and learning styles was assessed using Spearman's correlation; differences according to gender, using the Mann-Whitney U test; Comparisons between academic years were performed using the Kruskal-Wallis test, supplemented by post-hoc Mann-Whitney analysis with Bonferroni correction to identify which pairs of years showed significant differences (adjusted threshold: $p < 0.005$, equivalent to 0.05/10 pairs). In addition to p-values, effect sizes for comparisons between academic years were estimated using eta-squared (η^2) derived from the Kruskal-Wallis test, in order to assess the practical magnitude of the observed differences. Effect sizes were interpreted using the proposed cut-off points for eta square (η^2): small (0.01), moderate (0.06) and large (≥0.14). Given the strong correlation between age and academic year

in this sample, their associations with learning styles were analyzed in a complementary manner, not as independent effects. A significance level of $p < 0.05$ was considered for all other analyses.

The study was approved by the relevant ethics committee under file number 25-075. The confidentiality and anonymity of the participants were guaranteed during all stages of the research.

3. Results

Analyses based on predominant style should be interpreted as a descriptive simplification intended to facilitate the general characterization of the sample and not as an exhaustive representation of each student's learning preferences.

3.1. Sample characteristics and instrument reliability

One hundred and ninety surveys were received between November and December 2025. After applying the inclusion and exclusion criteria, a total of 177 students were included in the final analysis. The majority of participants were female (62.7%), and the mean age of the group was 20.4 years (± 1.9, SD). Detailed sociodemographic and academic characteristics of the sample are presented in Table 1.

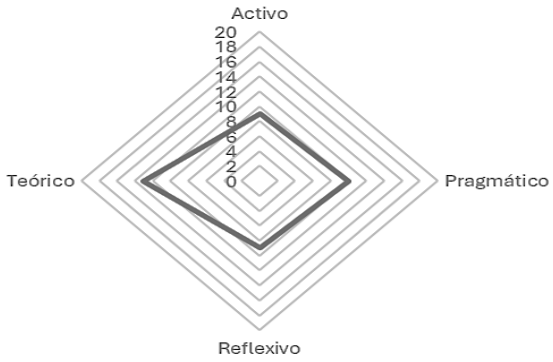
Table 1. Distribution of students according to gender and academic year.

Variables		Frequency (n)	Percentage (%)
Gender	Female	111	62.71
	Male	64	36.16
	Other	2	1.13
Academic year	First	50	28.25
	Second	35	19.77
	Third	38	21.47
	Room	33	18.64
	Fifth	21	11.86
Total		177	100.00

Note. The "Other" category (n=2) is presented for descriptive purposes only and was not included in the comparative analyses by gender due to its small size.

The internal consistency assessment of the CHAEA questionnaire yielded Cronbach's alpha coefficients of 0.653 for the active dimension; 0.638 for the reflective dimension; 0.592 for the theoretical dimension; and 0.729 for the pragmatic dimension. Overall, the learning style profile, assessed using the median raw scores (Figure 1), showed a relatively balanced distribution across the four dimensions, with a slight predominance of the theoretical style.

Figura 1. Perfil de medianas de los estilos de aprendizaje.



3.2. Descriptive analysis of predominant learning styles

When students were categorized according to their predominant learning style, the theoretical style was the most frequent (33.9%), followed in descending order by the reflective (28.8%), pragmatic (19.2%), and active (18.1%) styles. The distribution of these frequencies according to gender and academic year is shown in Table 2. No statistically significant differences were observed in the distribution of styles according to the participants' gender ($p = 0.051$), although the data suggest a marginal trend where men showed a higher proportion in the theoretical style (42.2% vs. 29.7%) and women higher values in the reflective style (31.5% vs. 21.9%). Conversely, statistically significant differences were identified when analyzing the distribution of predominant styles according to academic year ($p < 0.001$). Descriptively, a marked predominance of the theoretical style was observed in the early years of the degree, which gives way to a greater concentration of the pragmatic and active styles in the higher courses.

Table 2. Percentage distribution of learning styles in Dentistry students according to gender and academic year.

Variables		**Asset n (%)**	**Pragmatic n (%)**	**Thoughtful n (%)**	**Theorist n (%)**	**p**
Gender	Female	25 (22.5)	18 (16,2)	35 (31.5)	33 (29.7)	0.051
	Male	7 (10,9)	16 (25.0)	14 (21.9)	27 (42.2)	
Academic year	First	9 (18.0)	1 (2.00)	9 (18.0)	31 (62.0)	< 0.001*
	Second	5 (14,3)	1 (2,9)	12 (34,3)	17 (48.6)	
	Third	7 (18,4)	2 (5,3)	22 (57.9)	7 (18,4)	
	Room	4 (12,1)	21 (63.6)	4 (12,1)	4 (12,1)	
	Fifth	7 (33,3)	9 (42.9)	4 (19,1)	1 (4,8)	
Total		32 (18,1)	34 (19,2)	51 (28.8)	60 (33.9)	

Note. The gender category "Other" (n=2) was excluded from the comparative analyses due to the small size of the subgroup.
(*) Chi2 test, $p< 0.05$ statistically significant

3.3. Comparative analysis of continuous scores and associations

Analysis of continuous scores using the Kruskal-Wallis test confirmed statistically significant differences in the four dimensions of learning styles according to academic year, as shown in Table 3. The theoretical style showed a decreasing pattern throughout the curriculum, declining from a median of 17 points in the first and second years to 7 points in the fourth and fifth years. Conversely,

the pragmatic style exhibited low scores in the initial years (median of 7 points) that increased markedly in the fourth year (median of 17 points). According to conventional interpretation criteria, the effect sizes for the differences between academic years were large for all four learning styles (ranging from 0.14 to 0.33). This demonstrates that the observed variations have high practical relevance in addition to their statistical significance, with this phenomenon being particularly pronounced in the pragmatic and theoretical dimensions.

Table 3. Comparison of the median learning style scores by academic year using the Kruskal-Wallis test.

Learning style	1st year (n=50) Md (RIC)	2nd year (n=35) Md (RIC)	3rd year (n=38) Md (RIC)	4th year (n=33) Md (RIC)	5th year (n=21) Md (RIC)	χ^2 (df=4)	p	η^2
Asset	7.5 (5–11)	8 (7–12)	13 (10–15)	7 (4–9)	10 (8–17)	27.91	< 0.001	0.14
Pragmatic	7 (5–9)	7 (5–10)	13 (10–15)	17(10-18)	13 (9–17)	59.83	< 0.001	0.33
Thoughtful	9 (7–12)	9 (5–18)	16 (13–18)	7 (4–8)	8 (5–10)	46.01	< 0.001	0.25
Theorist	17 (12–18)	17 (8–18)	13.5 (11–15)	7 (4–10)	7 (4–9)	48.78	< 0.001	0.27

Note. Md: median; IQR: interquartile range; χ^2: Kruskal-Wallis statistic; df: degrees of freedom. Statistical significance was considered at $p < 0.05$. (η^2): eta squared (η^2) derived from the Kruskal-Wallis test.

Post-hoc comparisons using the Mann-Whitney U test with Bonferroni correction (adjusted critical threshold $p<0.05$) allowed us to pinpoint the year pairs where these differences are concentrated (Table 4). The comparisons confirm that the most marked change occurs during the transition between the third and fourth academic years, coinciding with the start of the clinical rotation. In the theoretical style, this transition involved a statistically significant decrease that stabilizes in the fifth year. For the pragmatic style, the increase between the third and fourth years was very close to the strict adjusted threshold, also showing significant differences compared to the first and second years. The reflective style reached its highest score in the third year, differing significantly from the first, fourth, and fifth years. Finally, the active dimension also showed its most pronounced difference during the transition from the third to the fourth year, exhibiting a less linear pattern throughout the rest of the academic trajectory.

Table 4. Post-hoc comparisons (p-value).

Pair	Asset	Thoughtful	Theorist	Pragmatic
1st vs 2nd	0.184	0.584	0.849	0.875
1st vs 3rd	<0.001*	<0.001*	0.001*	<0.001*
1st vs 4th	0.144	0.002*	<0.001*	<0.001*
1st vs 5th	0.048	0.290	<0.001*	<0.001*
2nd vs 3rd	0.004*	0.008	0.039	<0.001*
2nd vs 4th	0.009	0.002*	<0.001*	<0.001*
2nd vs 5th	0.319	0.171	<0.001*	<0.001*
3rd vs 4th	<0.001*	<0.001*	<0.001*	0.008
3rd vs 5th	0.364	<0.001*	<0.001*	0.651
4th vs 5th	0.004*	0.149	0.789	0.126

Note. Mann-Whitney test with Bonferroni correction: $p < 0.005$ (adjusted threshold = 0.05/10 pairs). Values marked with (*) remained statistically significant after Bonferroni correction.

Spearman's rank correlation analysis revealed significant associations between chronological age and scores for certain learning styles (Table 5). A moderate positive correlation was observed

with the pragmatic style and a moderate negative correlation with the theoretical style. The active style showed a weak positive association, while the reflective style did not show a significant link. It is crucial to consider that, given that chronological age showed a very high positive correlation with the academic year in this sample, these associations should be interpreted as complementary to the analyses by curriculum level and not as independent explanatory effects.

Table 5. Association between age and learning style scores using Spearman correlation.

Learning Style – Age	Correlation coefficient (ϱ)	p-value
Asset	0.165	0.027
Pragmatic	0.526	< 0.001
Thoughtful	0.063	0.404
Theorist	-0.432	< 0.001

Note. ϱ: Spearman's correlation coefficient. Statistical significance set at $p<0.05$.

4. Discussion

The main finding of this study was the identification of significant differences in learning styles according to the stage of training of dentistry students, particularly during the transition between the third and fourth academic years. This milestone coincides precisely with the start of the clinical cycle at the institution studied. Until the third year, theoretical and reflective learning styles predominated, while from the fourth year onward, a significant increase in pragmatic and active learning preferences was observed, accompanied by a simultaneous decline in the theoretical style. This pattern is consistent with the findings of Venturelli and Watt (17), who describe health sciences training as a progressive process that moves from the purely conceptual to the practical, and with Parra *et al.* (13), who point out that learning styles are malleable and can be modified based on academic experience. The observed temporal coincidence suggests that the demands of care environments, characterized by immediate problem-solving, clinical decision-making, and the application of procedural skills, coexist with a greater presence of action-oriented styles and practical application.

When analyzing the overall distribution of the sample, a general predominance of the theoretical style was observed, followed by the reflective style, while the active and pragmatic styles were less frequent. This configuration shows clear similarities with previous research in the health sciences (24-25). In medical students, for example, a high presence of the theoretical and reflective styles has been reported, which has been associated with the need for intensive conceptual analysis in the early stages of training (1, 10). In the Chilean context, various health science studies agree that students tend to prioritize observation, analysis, and reflection before acting (14-17). Although the reflective style exhibited a high frequency in the present study, it was not the absolutely predominant style, which could reflect variations specific to the institutional context or the particular profile of the cohort evaluated. Furthermore, unlike the literature that describes a fully balanced distribution in dentistry (15), these data show more marked nuances. It is essential to emphasize that the classification into a "predominant style" should be interpreted under a strictly descriptive logic and as a methodological simplification, since students are not rigid structures and may simultaneously present high scores in more than one dimension of the CHAEA instrument.

Regarding gender, no significant differences were observed in the distribution of learning preferences. While this finding is consistent with Hernández-Antonio *et al.* (8), who also reported no

gender variations in dental students, it differs from the findings of Marantika (11). This discrepancy could be explained, at least in part, by disciplinary and methodological differences between the two studies: while Hernández-Antonio et al. (8) evaluated a specific clinical population, namely postgraduate dental students, using Kolb's model, Marantika (11) analyzed a population from a different disciplinary field, not related to the health sciences, which limits the direct comparability of the findings. Added to this are possible contextual, cultural, and institutional differences between the populations studied. Taken together, these elements suggest that gender has a limited and inconsistent influence on learning styles, and that its actual impact is strongly modulated by the disciplinary, cultural, and methodological context of each study. The accumulated evidence, being heterogeneous, suggests that educational experiences and curricular demands play a significantly greater predictive role than biological sex.

Regarding age, the results showed significant positive associations with the pragmatic style and negative associations with the theoretical style. However, given that in this sample chronological age is closely linked to the academic year completed, these results should be interpreted in a complementary manner and with extreme caution, avoiding attributing an independent causal effect to them. The positive correlation with the pragmatic style is more likely explained by the progressive integration into dental clinics and the accumulation of practical experience than by a biological maturation process derived from age *per se* (17). From an educational perspective, these variations between training stages suggest the relevance of progressively diversifying teaching strategies. In the preclinical cycles, methodologies such as seminars, case-based learning, and guided discussion can enhance the dominant theoretical and reflective styles. Conversely, the transition to clinical courses would benefit from action-oriented strategies, such as high-fidelity simulation, supervised procedural training, and real-time decision-making.

Limitations of the study

Among the main limitations of this research is its cross-sectional design. By capturing information at a single point in time, the findings only allow for the description of associations and do not establish causal relationships or confirm intraindividual student development. An alternative and equally plausible interpretation is the "cohort effect," where the observed differences could reflect pre-existing characteristics or profiles of the different groups upon entering university. Therefore, the idea of an adaptive transition is proposed here as a working hypothesis that requires testing through future longitudinal studies.

The non-probability convenience sampling conducted at a single private institution limits the external validity of the data. This is compounded by a response rate of 53.8%, which, while considered acceptable, introduces a latent risk of self-selection bias, where students with higher motivation or specific academic profiles may have participated voluntarily to a greater extent. Furthermore, the sample size was originally calculated to detect overall associations using Spearman's rank correlation coefficient; since a specific power calculation was not performed for post-hoc comparisons across the five academic years, the precision of the between-group contrasts should be evaluated with caution, despite the moderate to large effect sizes obtained.

At an instrumental level, the use of a self-report test like the CHAEA can be affected by social desirability bias. Furthermore, it was not feasible to assess the characteristics of non-participants or control for confounding variables such as prior academic performance or teachers' pedagogical styles. A critical psychometric element to consider is that the Theoretical style subscale exhibited lower internal consistency than the other dimensions (α=0.592). Although this value approaches the acceptable threshold for exploratory phases and coincides with previously reported psychometric weaknesses of the instrument, it introduces variability and may affect the precision of the estimates.

Consequently, all findings related to the Theoretical dimension should be analyzed with strict caution.

The small size of the subgroup with non-binary gender identities (n=2) prevented their inclusion in the inferential statistical analyses, limiting the representativeness of the sample's diversity. It is imperative to emphasize that this study distances itself from essentialist views or the controversial instructional "grid hypothesis," which posits that learning improves by blindly adapting instruction to the learner's style. The results presented here should not be interpreted as an argument for compartmentalizing teaching into specific styles, but rather as a critical description of dynamic and contextual preference patterns observable within a particular cohort.

5. Conclusions

- This study shows that the dental students evaluated exhibit significant variations in their learning preferences, which are clearly concentrated during the transition from the preclinical to the clinical cycle, characterized by an increase in practical and active learning styles at the expense of theoretical ones. However, due to the cross-sectional design used, these patterns should not be categorized as a definitive intraindividual evolution, and the latent influence of differences between cohorts (cohort effect) should be considered. It is important to note that these results come from a sample obtained through non-probability convenience sampling in a single private institution, so their external validity is limited and they should not be directly extrapolated to other student populations or educational contexts.
- It is also concluded that variables such as age and academic year are deeply intertwined due to the collinearity inherent in curriculum progression. It is emphasized that the findings associated with theoretical learning style should be interpreted with particular caution and methodological prudence given the margins of internal consistency observed in this subscale. It is suggested that future research adopt longitudinal and multivariate designs to evaluate the real impact of changes in these preferences on the effective development of professional competencies.

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Data Availability Anonymized data supporting the results of this study will be available upon request to the corresponding author.

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