

## Relationship between learning styles of faculty members and orthodontic and dentofacial orthopedic residents: An analytical cross-sectional study in an accredited dental school in Latin America

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### Abstract

**Objective:** Information regarding the correlation between the learning styles of faculty members and orthodontic and dentofacial orthopedic residents is scant. The objective of this study was to evaluate the relationship between the learning styles of faculty members and orthodontic and dentofacial orthopedic residents.

**Material and Methods:** In this analytical cross-sectional study, faculty members and orthodontic and dentofacial orthopedic residents of the School of Dentistry at the Universidad de Antioquia, Medellín, Colombia completed a structured questionnaire to identify their learning styles.

**Results:** A total of 24 residents (100%) and 36 (100%) faculty members responded to the questionnaire. Residents and faculty members presented preference for the theorist and reflector styles; however, the faculty members had a higher value in the theorist style. Statistical significant Pearson correlations were identified among men residents with theorist style ( $r=0.36$ ;  $p=0.24$ ), and among men faculty members with active ( $r=0.37$ ;  $p=0.026$ ) and pragmatist styles ( $r=0.5$ ;  $p<0.0001$ ). Consequently, an association was observed among men residents with the theorist style, which persisted after adjusting for age and semester enrolled ( $OR=1.5$ ;  $p=0.03$ ). On the other hand, associations were detected among men faculty members with the active ( $OR=1.3$ ;  $p=0.02$ ) and the pragmatist styles ( $OR=1.4$ ;  $p=0.005$ ), which also remained after adjusting for age in the multivariate models.

**Conclusion:** Residents and faculty members showed a preference for the theorist and reflector styles. Besides, this paper found associations between gender and some specific learning styles: men residents were associated with the theorist style, and men faculty members were associated with the active and pragmatist styles.

**Keywords:** dental faculty, dental students, education, learning, orthodontics

### Introduction

A group of researchers envisioned the learning styles; they specified different standards and mechanisms complicating the designation of the most appropriate (1). Alonso et al. (2), incorporated a recognized one, from work established by Keefe (3), defining the learning styles as perceptive, emotional and functional idiosyncrasies that aid apprentices to differentiate, correlate and respond to their learning context. The learners are the creators of their educational development, replicating on a cyclic method from practice. The Learning Styles Questionnaire (LSQ) commended by Honey and Mumford (4) recognized a total of four learning styles: “activist, reflector, theorist and pragmatist” (Figure 1), settled on the inventory of learning styles of Kolb (5), which correspondingly specified four styles of learning (accommodating, assimilating, divergent, and convergent).

The LSQ was proved for commercial objectives and was revised, proved, and transformed into Spanish scholastic framework (2). To interpret the four styles of learning, Alonso et al. (2) conferred a scale to organize the results in five tendencies: “very high, high, moderate, low and very low.” The CHAEA survey was modified from this variation, and it was operated in health sciences curriculums (6-8). It was edited regarding difficulties discerned in the moment of its accomplishment, then the perceptive of the issues was improved conserving its essence (9). Thus, the CAMEA40 was created and proved with university pupils. To teach and to learn include a multifaceted dynamic in dental faculties, comprising the empathy between learners and mentors, the program, the theoretical-practical interface, the university environment,



and the culture (10,11). The features of the subcultures are essentials in higher education because of these surroundings can disturb the learning (11).

Dentistry contains a mixture of education options, including seminars, lectures, expositions, problem-solving cases, and practical training; thus, a variety of approaches could be adopted to profit learning (12). Conventionally, orthodontic postgraduate programs have principally applied lectures and training to improve clinical abilities. It has been postulated that as residents advance into an orthodontics program, they will develop a robust inclination for realistic rather than conceptual information and select a structured location with substantial practical learning chances. While students are commonly educated beyond interest to their specific learning styles, a perception of the traditional style of learner approaches in orthodontic and dentofacial orthopedic residents would be satisfactory to the development of an exemplary residency learning program (13).

Instead, irrespective of the educational context, the comprehension of learning styles benefits educators to monitor scholar learning appropriately (14), and it is even commended that the instructors identify their manner of learning, since it may control the method of teaching (15). Besides, persons with similar learning styles correspond enhanced (16). A distinguishing of learning styles will benefit both residents and faculty members to augment understanding more competently. Furthermore, it is significant for the professor to be skilled in recognizing the potencies and boundaries of the residents' learning experience (17).

Unfortunately, there are little data regarding the connection that may exist in the learning styles of faculty members and orthodontic and dentofacial orthopedic residents. Thus, the objective of this research was to identify the relationship between the learning styles of faculty members and orthodontic and dentofacial orthopedic residents in a higher education program.

## Material and Methods

The present research had a cross-sectional design that was authorized by the Institutional Bioethics Board (IRB03-03-19). The participants fulfilled the CAMEA40 (9) form and signed the informed consent freely, agreeing with their attendance in this investigation.

Orthodontic and dentofacial orthopedic residents enrolled in the academic period 2019-1, and their professors attended this research. The selection criteria contained: orthodontic and dentofacial orthopedic residents enrolled in the accredited programs of orthodontics and dentofacial orthopedics at the School of Dentistry of the Universidad de Antioquia; faculty members of the same programs were also included. Thus, sixty faculty members and residents confirmed the solicitation to participate. The forms were concluded in the classroom after the explanation of the research purposes.

CAMEA40 (9) developed to recognize the learning styles is constituted by two parts. Initially, the questionnaire explores topics allied to the socio-academic facts. The next

segment encloses forty brief interrogations with five chances of feedback (always, almost always, many times, sometimes and never) assigning a rate of 5, 4, 3, 2, and 1, correspondingly. The product is the computation of all the responses (They are dispersed in four columns, equivalent to each learning style).

The form is unintentionally arranged; therefore, it is presented ten issues relate to each learning style ("activist, reflector, theorist and pragmatist"). To decode them, Alonso et al. (2), advised a grading to order the products in five dispositions: "very high, high, moderate, low and very low"; for example, high pragmatist, low activist. The conformation of the survey admits that each resident/faculty member selects more than one style of learning.

## Statistical Analysis

Primarily, the descriptive statistic was managed. Then, it was used bivariate analyses (Chi-Square and Pearson correlation); also, the T-student test was executed to observe differences between groups. The Kolmogorov-Smirnov normality analysis was used to explore the data distribution. Besides, logistic regression was done, stated in ORs, complemented by confidence intervals of 95% (CI 95%) and statistical significance. P values <0.05 were contemplated statistically significant. A statistical software (SPSS version 24.0; SPSS, Chicago, IL) operated all the analyses.

## Results

A total of 24 residents (100%) and 36 (100%) faculty members answered to the CAMEA40 form that classified their learning styles. Table 2 depicts the socio-academic features of the sixty contestants. The number of females was superior in the residents' group and reduced in the faculty members' group. Besides, 50% of the residents studied at a public high school, and 63% had a job. The predilection of learning styles between the groups was contrasted (Table 3). Residents and faculty members preferred for the theorist and reflector styles; nonetheless, it was superior to the rate of the faculty members that preferred the theorist style. Differently, the pragmatist style revealed a moderate scale in the residents, whereas the faculty members had a low rate in that style.

Statistical significant Pearson correlations were identified among men residents with theorist style ( $r=0.36$ ;  $p=0.24$ ), and among men faculty members with active ( $r=0.37$ ;  $p=0.026$ ) and pragmatist styles ( $r=0.5$ ;  $p<0.0001$ ).

Bearing in mind these correlations, logistic regressions were run. Tables 4, 5, and 6 display the crude and multivariate analyses. The association among men residents with theorist style remained in the simple model (OR= 1.4;  $p=0.03$ ); this association persisted after adjusting for age and semester enrolled (OR=1.5;  $p=0.03$ ) (Table 4). Additionally, the associations among men faculty members with active (OR=1.2;  $p=0.03$ ) (Table 5) and pragmatist styles (OR=1.4;  $p=0.006$ ) (Table 6) also persisted in the crude model; these associations remained after adjustment for confounders (Tables 5 and 6).

**Table 1.** Socio-academic characteristics in 60 residents and faculty members

Parameter	Residents (n=24)	Faculty members (n=36)	P-value
Age (years)	29±2.9 <sup>a</sup>	45±9 <sup>a</sup>	<0001 <sup>c</sup>
Gender			
Female	17 (71%) <sup>b</sup>	16 (44%) <sup>b</sup>	NS <sup>d</sup>
Male	7 (29%) <sup>b</sup>	20 (56%) <sup>b</sup>	0.04
GPA <sup>e</sup>	4.23±0.2 <sup>b</sup>	-----	-----
Public high school	12 (50%) <sup>b</sup>	-----	-----
Job (yes)	15 (63%) <sup>b</sup>	35 (97%) <sup>b</sup>	0.001 <sup>c</sup>

<sup>a</sup>Values are presented as a mean±standard deviation, <sup>b</sup>Values are presented as number and percentage, <sup>c</sup>Statistically significant differences between faculty members and residents. <sup>d</sup>NS=not statistically significant, <sup>e</sup>GPA=grade point average

**Table 2.** Mean values and rating scale of the learning styles in residents and faculty members

Learning Style	Residents (n=24)	Rating scale	Faculty members (n=36)	Rating scale	P value
Activist	23±4.5	l	23±4	l	NS
Reflector	31.6±4	m	32.6±4	m	NS
Theorist	33±4.3	m	35±4.8	h	NS
Pragmatist	27.6±4.6	m	26±5.2	l	NS

Values are presented as a mean±standard deviation, Rating scale: very high (vh), high (h), moderate (m), low (l) y very low (vl). NS= not statistically significant

**Table 3.** Multivariable regression analysis for men residents and the theorist learning style

Variable	Crude OR (95% CI)	P Value	Adjusted* (95% CI)	P Value
Theorist learning style	1.4 (1.2-1.8)	0.03	1.5 (1.2-2.3)	0.03
Age (years)			0.8(0.4-1.2)	NS
Semester			0.7 (0.3-1.4)	NS

\*Adjusted for age and semester enrolled. NS= Not significant association

**Table 4.** Multivariable regression analysis for men faculty members and the active and pragmatist learning styles

Learning style	Crude OR (95% CI)	P Value	Adjusted* (95% CI)	P Value
Active learning style	1.2 (1.1-1.5)	0.03	1.3 (1.1-1.6)	0.02
Age (years)			1.0 (0.9-1.1)	NS
Pragmatist learning style	1.4 (1.2-1.7)	0.006	1.4 (1.2-1.7)	0.005
Age (years)			1.1 (0.9-1.1)	NS

\*Adjusted for age. NS: Not significant association

**Figure 1.** Features of learning styles (4)

## Discussion

Whereas residents are habitually educated without interest in their learning styles, comprehension of their traditional structure in a specific group such as orthodontic and dentofacial orthopedic residents could be advantageous to the formation of a representative residency education process (13). The career selected by the resident could be a relevant point that can impact the learning styles, affecting enormously the changeability in learning (16). The habituation of residents and faculty members with their learning styles can spread understanding of their fortes in learning and consider the necessity to intensify their less usual styles (3). Likewise, when faculty members know the learners' inclinations, it is more reasonable to find approaches that permit residents to learn more competently (6).

The CAMEA40 was effected in university students (9, 17, 18), and it was adjusted into the Italian language (19).

To our knowledge, no research has contrasted learning style predilections between faculty members and residents in a dentistry residency program. This research depicts that residents and faculty members preferred the theorist and reflector styles; nevertheless, the faculty members had a higher value in the theorist style, but without significant differences. An investigation in a residence program of internal medicine revealed that faculty members and students chose the reflector style (20). Moreover, the theorist and reflector styles were selected among neurosurgeons, neurosurgery residents, and neurology residents (21). When the similar learning style is mutual, a pedagogical relation is expected, and educational success could rise (20). Scholars have denoted that precise contextual needs, such as educational specialization, demand faculties for professional obligations, and malleable aptitudes, influence the learning styles of residents and faculty members (21).

The theorist and reflector styles were also chosen for literature (9), pharmacy (6), and medicine pupils (7). Consequently, personnel with a tendency in the theorist style (Figure 1) desire to estimate troubles from several outlooks; they prefer to observe, questioning the material with less predisposition to automatic learning. Reflectors (Figure 1) are likewise eyewitnesses, serene, critical, also demonstrate an exceptional personality concerning the learning process (7).

Richard et al. (22) reported that the majority of residents and faculty in an orthopedic residency program preferred the pragmatist style. Also, Engels and de Gara (23) found that the predominant learning styles of the general surgery residents and general surgery faculty were a pragmatist and active styles. In this study, the pragmatist style was observed in residents on a moderate scale, while faculty members had a low value in that style. It was explained that pragmatist was more successful in problem-based learning curriculums in medical scholars (24).

This research found that the activist style was observed in residents and faculty members in a low scale; these findings confirm those reported in students of dental campuses from

other cultural backgrounds (25, 26). Nevertheless, researchers founded diversified products of leading learning styles among faculty and students of different health programs (27). Various cultures around the world showed that the context and their customs influence learning styles (11). Furthermore, it was found that Hispanic-Latino presented a distinctive learning style predilections because their learning styles and environmental contexts comprise peculiarities (28). No specific learning style is consistently concomitant with improved learning consequences. This circumstance is possibly due to the adaptable capacities of university scholars (13).

Interestingly, this paper found associations between gender and some specific learning styles. The theorist style was related to men residents; this association continued after adjusting for age and semester enrolled. Moreover, associations among men faculty members with active and pragmatist styles also continued in the multivariate analysis, after adjusting for age. Hughes et al. (13) described that age and gender did not stamp a peculiarity in the learning styles prevalent in the orthodontic community in the United States and Canada. Nonetheless, two recent types of research informed that male and females depict distinctive inclinations for learning styles in medical pupils in Asian universities (29, 30).

Besides, it was documented that women more feasible than men learn progressively (31). This information is crucial, considering that female orthodontic resident is increasing (32). Additionally, it has been reported that cultural multiplicities may create a distinction in the predilections of learning styles, considering reasoning and intercommunication varieties (11, 27). The facts mentioned above could justify the findings observed in this research.

The augmentation of further cognitive aptitudes associated with specific postures to learning has the potentiality to transform a more prosperous autonomous student. Considering the knowledge of the specific fortitudes and boundaries as learners, faculty members will convert more attracted to learn and subsequently turn into persistent learners (1), which is crucial for orthodontic and dentofacial orthopedic curricula.

The boundaries of this study included the cross-sectional design that eludes temporal causality. Besides, the participants studied are not a representative sample of the nation; nevertheless, the Universidad de Antioquia compile a relative volume of the applicants from diverse areas of the country. Additionally, all the faculty members and residents respond to the questionnaire.

These conclusions also noticeably provide to the scarcity of researches in dental curricula correlated preferences in learning styles of faculty and residents and their concurrent qualities. More reports investigating learning styles in orthodontic and dentofacial orthopedic curricula are essential to juxtapose these findings with diverse cultural backgrounds.



## Conclusion

In the present research, residents and faculty members showed a preference for the theorist and reflector styles. Besides, this paper found associations between gender and some specific learning styles: Men residents were associated with the theorist style, and men faculty members were associated with the active and pragmatist styles. These specific regional and cultural findings could warrant to create policies in the learning-teaching method and institute significant antecedents to formulate guidelines and educational schemes in orthodontic and dentofacial orthopedic programs. Imminent investigations to validate these outcomes will be esteemed.

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**Author's Contributions:** The correspondent author conceived the idea, carried out the design, and supervised the findings of this work. The correspondent author and co-authors verified the analytical methods and wrote the manuscript. All authors discussed the results and contributed to the final manuscript.

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