



ORIGINAL ARTICLE

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Learning styles and types of multiple intelligences in dental students in their first and tenth semester. Monterrey, Mexico, 2015.

Abstract: Introduction: Nowadays the incorporation and validation of learning styles and multiple intelligences enable teachers to obtain positive results in academic performance. This new approach has allowed to appreciate personal differences in dental students and strengthen their underdeveloped aspects, improving teaching and learning skills. Objective: To compare learning styles and multiple intelligences in a sample of Mexican dental students in their first and tenth semester. Materials and Methods: A cross-sectional study using questionnaires on learning styles (Honey-Alonso) and Gardner's multiple intelligences was performed. The study was applied to 123 students in their first semester and 157 in their tenth semester at the School of Dentistry at Universidad Autónoma de Nuevo León, evaluating differences between age and sex. Results: Logical-Mathematical intelligence ($p=0.044$) and Kinesthetic-Corporal intelligence ($p=0.042$) showed significant differences between students of both semesters, with intrapersonal and interpersonal intelligences being more prevalent. Within learning styles, the prevalent were Reflexive and Theoretical, showing a significant difference between semesters ($p=0.005$). Conclusion: The most prevalent learning styles in both groups were Reflexive and Theoretical, with no difference between both sexes. The most prevalent types of multiple intelligences in both sexes and groups were interpersonal and intrapersonal.

Keywords: *Education in dentistry, Learning Styles, Multiple Intelligences, Students.*

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INTRODUCTION.

One of the factors contributing to the success or failure of students throughout their academic career is school performance, which is affected by multiple factors, including personality and learning preferences¹.

Nowadays the incorporation and validation of learning styles and multiple intelligences enable teachers and educators to optimize educational programs, appreciate personal differences among students and strengthen their

underdeveloped aspects using the basic principles of education. This has resulted in positive results in academic performance².

Learning styles are one of the most commonly used tools to develop the learning characteristics of each individual. These styles are based on personality, information processing, social interaction and educational preferences of students³. Learning styles can be classified in four models depending on the individual preference of accessing

knowledge. Active style is based on the direct experience of learning; Reflexive is based on observation and data collection, Theoretical, in drawing conclusions, and Pragmatic is focused on active experimentation and the search for abstract applications⁴.

For many years there have been several attempts to develop a tool to measure human intelligence. The latter has been defined as the ability to solve problems or create products that are valued within one or more cultural values. Gardner⁵, one of the pioneers in the theory of multiple intelligences, states that intelligence consists of different and unrelated multiple skills⁶.

Gardner's theory of multiple intelligences facilitates the application of innovative, motivating and creative knowledge building strategies⁷. Seven modular intelligences have been described that depend on each person: Musical, Kinesthetic-Corporal, Linguistic, Logical-mathematical, Spatial, Interpersonal and Intrapersonal⁸. These have been used in recent years to assess learning methods in different areas. However, today there is insufficient evidence on the use of these tools in the dental field⁹.

The aim of this study was to compare learning styles and multiple intelligences of dental students in their first and tenth semester using Gardner's Multiple Intelligences Test and Honey-Alonso's Learning Styles.

MATERIALS AND METHODS.

Study design

Cross-sectional study. Two measuring instruments were applied (dependent variables), Gardner's Multiple Intelligences Test^{10,11}, and Honey-Alonso's Learning Styles^{12,13}, in dental students in their first and tenth semester at the School of Dentistry at Universidad Autónoma de Nuevo León in January 2015.

Population

All the students in their first and tenth semester, between January and June 2015, were considered in the study; that is, a total of 123 students in their first semester and 157 students in their tenth semester: 99

men and 181 women.

Inclusion criteria included those willing to participate in the study by signing informed consent and who also met the following requirements: for Group 1 (First semester) age range of 15 to 19 years and being regular students in their first semester; and for Group 2 (Tenth semester) students from 20 to 23 years and who were taking subjects given exclusively in the tenth semester. Incomplete or unreadable questionnaires were excluded from the study.

Questionnaires

Measuring instruments were applied on the first day of college. Gardner's Multiple Intelligences Test¹¹ consisted of 35 dichotomous statements (Yes/No). The questionnaire consisted of 5 sentences for each evaluated skill (Verbal-Linguistic, Logical-Mathematical, Visual-Spatial, Kinesthetic-Corporal, Musical-Rhythmic, Interpersonal and Intrapersonal). The answer was only considered in a particular category if the statement was responded with a "Yes". The predominant or prevalent intelligence was that with the largest number of positive responses.

Honey-Alonso's Learning Style Test¹³ consisted of 80 statements, with 20 dichotomous statements (Yes/No) for each evaluated style (Active, Reflective, Theoretical and Pragmatic). The predominant style was the one with the highest number of positive responses. Independent variables of sex and semester were registered for each student.

Data analysis

The Kolmogorov-Smirnov test was performed to verify group distribution. The comparison of results between sex and semester was carried out by Student's t test with 95% confidence (IBM SPSS, version 20, USA).

RESULTS.

It was found that in the comparison of multiple intelligences by sex there were no significant differences in the predominant intelligence (Interpersonal) ($p=0.727$). The same was observed in the rest of the multiple intelligences ($p>0.05$). In learning styles a difference between sexes was observed in the Reflexive ($p=0.047$) and Pragmatic

Table 1. Multiple intelligences and learning styles by sex.

		Female		Male		Value p
		Mean	S.D.	Media	S.D.	
Intelligences	Verbal-Linguistic	2.61	1.30	3.04	1.09	0.736
	Logical-Mathematical	2.59	1.30	2.50	1.34	0.876
	Visual-Spatial	2.67	1.22	2.48	1.16	0.602
	Kinesthetic-Corporal	3.10	1.17	3.28	1.03	0.100
	Musical-Rhythmic	3.21	1.27	3.14	1.16	0.465
	Interpersonal	3.83	1.11	3.97	1.16	0.727
	Intrapersonal	3.83	0.97	4.03	0.93	0.135
Styles	Active	11.26	3.41	12.20	3.08	0.307
	Reflexive	14.54	3.97	15.01	3.23	0.047
	Theoretical	13.56	3.32	13.94	3.14	0.486
	Pragmatic	13.20	3.72	13.60	2.84	0.012

Table 2. Multiple Intelligences and learning styles by semester.

		1º		10º		Value p
		Mean	S.D.	Mean	S.D.	
Intelligences	Verbal-Linguistic	2.82	1.05	2.94	1.14	0.339
	Logical-Mathematical	2.65	1.45	2.44	1.22	0.044
	Visual-Spatial	2.59	1.19	2.52	1.19	0.987
	Kinesthetic-Corporal	3.26	1.19	3.18	1.00	0.042
	Musical-Rhythmic	3.20	1.19	3.14	1.21	0.944
	Interpersonal	3.94	1.08	3.90	1.20	0.138
	Intrapersonal	3.96	0.93	3.96	0.98	0.667
Styles	Active	11.84	2.97	11.89	3.43	0.089
	Reflexive	15.28	2.84	14.49	3.93	0.005
	Theoretical	13.80	2.85	13.81	3.47	0.340
	Pragmatic	13.47	2.79	13.45	3.47	0.147

($p=0.012$) styles, being predominant in women (Table 1).

As for the comparison of intelligences per semester, it was found that the predominant intelligence in both groups was Intrapersonal. Reflexive was the predominant learning style in both groups (Table 2).

DISCUSSION.

Today there are various instruments for assessing learning styles that allow to highlight academic skills preferred by students.

Bhali *et al.*¹⁴ found that the predominant learning styles of fourth year medical students were Reflexive (46.8%) and Pragmatic (27.3%). These data are consistent with the results of this study, although Theoretical style was slightly

higher than Pragmatic, with no significant differences between them.

Health professionals, including dentists, require the Theoretical learning style in order to optimize their academic results. This style is defined as organized, objective, structured and methodical. Borracci *et al.*¹⁵ evaluated the learning styles of medical students in their first and final year and graduate students. They found that the predominant style was Reflexive and Theoretical in the three groups. However, with older groups an increasing trend was observed towards the Active style, at the expense of Reflexive.

There is now a greater concern from dental educational institutions to identify the learning styles of their students and optimize their educational programs¹⁶. Several studies

have reported that the predominant learning styles in first-year students are Theoretical (35.4%) and Active (25%). Reflective style was placed below the average, in disagreement with the findings of this study¹⁷.

As for Multiple Intelligences in relation to the variable sex, women obtained positive results in Logical-mathematical, Visual-Spatial, and Musical-Rhythmic, while men had higher scores on Intrapersonal, Interpersonal, Kinesthetic-Corporal, and Verbal-Linguistic intelligence. This differs from the study by Furnham *et al.*¹⁷, who found that male students had better results in all types of intelligence, except Interpersonal. Neto *et al.*¹⁸ found that Verbal and Interpersonal intelligence predominated in women, again in disagreement with the results of this study.

Although there is insufficient evidence regarding this topic in dentistry today, many authors have suggested the application of Gardner's Multiple Intelligences model to dental programs¹⁹.

Estilos de aprendizaje y tipos de inteligencias múltiples en estudiantes de primer y décimo semestre de odontología. Monterrey, México, 2015.

Resumen: Introducción: Hoy en día la valoración de estilos de aprendizaje e inteligencias múltiples permiten a profesores obtener un resultado favorable en el rendimiento académico. Estos permiten apreciar las diferencias personales de los estudiantes de odontología y apoyar los dominios menos desarrollados, mejorando las habilidades de enseñanza y aprendizaje. Objetivo: Comparar los estilos de aprendizaje e inteligencias múltiples de una muestra de estudiantes mexicanos de primer y décimo semestre de odontología. Materiales y métodos: Se realizó un estudio transversal aplicando los cuestionarios de estilos de aprendizaje (Honey-Alonso) y de Inteligencias múltiples de Gardner. El estudio fue aplicado en 123 alumnos de primer semes-

It is necessary to evaluate students and teachers using learning styles and multiple intelligences tools to optimize dental education programs, with the aim of obtaining favorable results in academic performance.

CONCLUSION.

Within the limitations of the study, it can be concluded that the predominant learning styles in both groups were Reflexive and Theoretical with no sex differences. The predominant Multiple Intelligences in both sexes and groups were Interpersonal and Intrapersonal.

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tre y 157 alumnos de décimo semestre de la Facultad de Odontología de la Universidad Autónoma de Nuevo León, evaluando sus diferencias entre edad y sexo. Resultados: La inteligencia Lógico-Matemática ($p=0,044$), como en la Kinestésica-Corporal ($p=0,042$) presentaron diferencias significativas entre semestres, siendo predominantes las inteligencias Intrapersonal e Interpersonal. Dentro de los estilos de aprendizaje, los estilos predominantes fueron el Reflexivo y el Teórico, presentando diferencia significativa entre semestres ($p=0,005$). Conclusión: Los estilos de aprendizaje predominantes en ambos grupos fue el Reflexivo y Teórico sin diferencias entre sexo y la Inteligencia Múltiple predominante en ambos sexos y grupos fue Interpersonal e Intrapersonal.

Palabras clave: Educación en odontología, Estilos de aprendizaje, Inteligencias múltiples, Estudiantes.

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