

Relationship between learning styles and academic performance of fifth graders enrolled in the medical course

Relação entre estilos de aprendizagem e rendimento acadêmico dos estudantes do quinto ano de medicina

Mario Pellón^{1,2}, Sandra Nome³, Angélica Arán⁴

ABSTRACT

Objective: The aim of this study was to determine the learning styles of fifth-year medical students who attended the ophthalmology course and to also determine the correlation with their academic performance. **Methods:** Kolb's learning style and neurolinguistic programming (NLP) questionnaires were applied and related to the final grades obtained. The variables were analyzed using Pearson's *r* test. **Results:** It revealed a relation between the variables of learning styles and academic performance ($p \leq 0.05$). According to Kolb's model, students with better performance were reflective style and according to the NLP model, students with visual style. **Conclusion:** learning styles variables from the NLP model and Kolb, acting independently of the academic performance of students in a medical career, marking the highest preference for the visual style and reflective questionnaires applied based on both models. This study is consistent with other research in this field conducted with students of the same race.

Keywords: Learning; Students; Ophthalmology; Psychological phenomena processes; Neurolinguistic programming; Questionnaires

RESUMO

Objetivo: O objetivo deste estudo foi determinar o(s) estilo(s) de aprendizagem dos estudantes do quinto ano do curso de medicina que frequentaram a disciplina de Oftalmologia e o nível de relação com o seu rendimento acadêmico. **Métodos:** Foram aplicados questionários de estilos de aprendizagem de Kolb e Programação Neurolinguística (PNL) para determinar o estilo de aprendizagem dos estudantes e estes foram relacionados com as avaliações finais obtidas. As variáveis foram analisadas através do teste *r* de Pearson. **Resultados:** Foi observado que existe relação entre as variáveis estilos de aprendizagem e rendimento acadêmico ($p \leq 0,05$). Segundo o modelo de Kolb os estudantes com estilo reflexivo obtiveram melhor rendimento e de acordo com o modelo PNL, foram os estudantes com estilo visual. **Conclusão:** As variáveis estilos de aprendizagem a partir dos modelos de PNL e Kolb atuam independentemente do rendimento acadêmico dos estudantes do curso de medicina, indicando predomínio dos estilos visual e reflexivo.

Descritores: Aprendizagem; Estudantes; Oftalmologia; Fenômenos e processos psicológicos; Programação neurolinguística; Questionários

¹Associate Professor at La Frontera University, Temuco, Chile.

²PHD student at the Morphological Sciences Program, La Frontera University, Temuco, Chile.

³Professor at the School of Education, Mayor University, Temuco, Chile.

⁴Doctor in Human Psychology, Mayor University, Temuco, Chile.

Study conducted at Mayor University, Temuco, Chile

The authors declare no conflicts of interest

Received for publication: 3/9/2012 - Accepted for publication: 24/11/2013

INTRODUCTION

Professional training in medicine improves when the professionals providing the training take an interest in learning about the cognitive processes involved in their students' learning. This kind of knowledge allows them to activate the cognitive processes that enable students to learn better, strengthen specific skills and thus ensure better professional performance in the future⁽¹⁾.

The teaching styles presented by the Kolb Model⁽²⁾ and on Bandler and Grindler's Neuro-linguistic Programming⁽³⁻⁵⁾ provide teaching strategies which promote the specific cognitive activation needed for a particular area of learning.

Experiential learning models consider that in order to learn, a person must process the information they receive based on a previous direct or concrete experience. These models have identified four learning styles: active, reflexive, theoretical and pragmatic.^(2,3) In order to learn, the student must work on or process the received information, which can be done based on a direct or concrete experience (active); on an abstract experience, obtained through reading or described by someone (theoretical); on concrete or abstract experiences which are turned into knowledge when they are thought about (reflexive); or on actively experiencing the received information (pragmatic).⁽²⁾

The model of learning styles in Neuro-linguistic Programming (NLP)⁽⁴⁾ considers that the route through which information enters the brain is vital to the preferences of the learner or teacher. According to this model, three systems can be used to represent information mentally: visual, auditory and kinaesthetic. These can be developed or formed intentionally; they can be used to varying degrees and they strengthen one another.^(4,5)

Certain studies on learning styles involving medical students agree that students tend to adopt the reflexive style of the Kolb model. A study on university students and resident physicians in Argentina confirmed that at the beginning of the course the theoretical and reflexive styles (assimilation) were more prevalent. However, at the end of the course and during post-graduation the assimilating learning style was reduced, while the converging style tended to increase.⁽⁶⁾

In line with this, a study conducted in Europe and Latin America also found that medical students had a predominance of reflexive and theoretical traits, which overcame the active and pragmatic styles.⁽⁷⁾

Another study compared the average scores for different learning styles among students from the Faculty of Medicine of Valparaíso University. On average, the result was 15.12 for the reflexive style, 13.35 for the theoretical style, 12.67 for the pragmatic style and 11.25 for the active style.⁽⁸⁾ In this study, it was considered important to include the scores for learning styles in order to improve curricular planning with regard to the teaching-learning methods used in the course.

In addition, the results of a study with students entering the medical school at the Catholic University of Chile (PUC) were consistent with the literature, which generally indicates that basic sciences attract more abstract learners, whereas the arts and humanities attract more concrete learners.⁽⁹⁾ In line with this, we would expect students with abstract-reflexive skills to perform better during the theoretical stage of the course and those with concrete-active skills to perform better during the clinical and internship stages. The study concluded that 7 out of 10 students entering the medical school at PUC tend to analyse information logically, objectively and impartially. Another study

at the Autonomous University of Mexico identified the learning styles of medical students and their relation to origin, gender and change in style, and once again the reflexive style was the most common, with the active style being the least common.⁽¹⁰⁾

A comparative assessment of undergraduate students, residents and teaching professionals at the pathology course also showed that these subjects predominantly adopt a reflexive style⁽¹¹⁾.

Taking into account the importance of learning styles in the way students process information and develop specific skills, our study tried to identify the learning styles of 5th year ophthalmology students at Mayor University, Temuco, Chile.⁽¹²⁾ This will hopefully improve teaching practices by helping students activate their cognitive processes and process information⁽¹⁾, thus helping future general practitioners to make an appropriate differential diagnosis, to administer adequate treatment, and to know when to refer a patient to a specialist.

METHODS

This was a descriptive, cross-sectional, correlational study aimed at determining the learning styles of 5th year medical students in the field of ophthalmology at Mayor University, Temuco, Chile, during the second semester of 2011.

There were 26 students on the course, 19 of whom (13 women and 6 men) accepted to take part in the study. The students' learning styles according to the Kolb model were determined using the Honey-Alonso Learning Styles Questionnaire (QHAEA)⁽²⁾; another questionnaire was used to identify the dominant type of perception intelligence according to Bandler and Grindler's NLP Model^(4,5). Both were administered at the beginning of the course.

The students took three mid-term exams, representing 70% of the final grade, and one final exam, representing 30% of the final grade. Assessments were both theoretical and practical. The correlation between the variables of the learning style models and the students' final grades was analysed using Pearson's *r* test, with a significance level of 5%.

RESULTS

First we will present the distribution of the students' final ophthalmology grades (Figure 1), followed by the correlation between learning styles and academic performance. Lastly, we will present the predominant learning styles adopted by students according to the Kolb and NLP models. (Table 1).

The mean final grade was higher than 5.0. No case dispersion is seen between grades 4.4 and 5.8. Better performance tended to be achieved by students adopting the reflexive and theoretical learning styles according to the Kolb model⁽²⁾ and the visual and kinaesthetic styles according to NLP.⁽⁴⁾

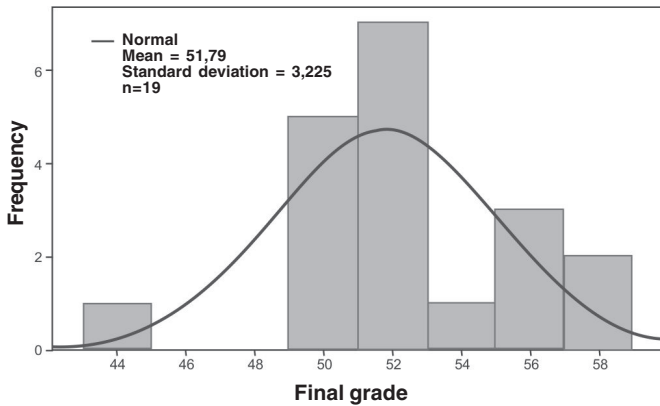
Using Pearson's correlation coefficient *r*, the learning style variables and academic performance achieved significance levels lower than 0.5. We can therefore state that both variables are independent.

The descriptive analysis of the relationship between quantitative (performance) and qualitative (learning style) variables showed that the best results tended to be obtained by students adopting the visual and kinaesthetic styles of the NLP model.

This implies that study participants with a visual style perform better in the ophthalmology course, followed by those

Figure 1

Distribution of final grades of 5th year medical students in the ophthalmology course at Mayor University, Temuco, Chile



whose mental representations of information are done kinaesthetically.

As shown in figure 2, the highest final grades were obtained by students adopting the reflexive style (15.3), followed by the theoretical style (14.1).

The learning styles questionnaire showed that the visual style of the NLP model⁽⁴⁾ was the most common among students, with 47%, followed by the kinaesthetic and auditory styles, with 28% and 24%, respectively. (Figure 3).

DISCUSSION

In the university training of doctors in the field of ophthalmology, specific skills need to be developed for correctly diagnosing eye conditions. This implies that visual learning abilities need to be improved so that general practitioners can contribute to patients' health and avoid the risks resulting from incorrect or late diagnosis. For this, the use of virtual reality can be of great help,⁽¹³⁾ as clinical fields become scarcer and more limited in use.

Table 1

Pearson's correlation coefficient between learning style variables based on the Kolb model⁽³⁾ and the ophthalmology grades of 5th year medical students at Mayor University, Temuco, Chile.

Correlations		Final grade	Active style	Reflexive style	Theoretical style	Pragmatic style
Final grade	Pearson Correlation	1,000	0,307	0,344	-0,091	0,174
	Sig. (two-tailed)		0,201	0,150	0,711	0,477
	N	19,00	19	19	19	19
Active style	Pearson Correlation	0,307	1	-0,220	-0,383	0,431
	Sig. (two-tailed)	0,201		0,365	0,105	0,065
	N	19	19	19	19	19
Reflexive style	Pearson Correlation	-0,344	-0,220	1	0,601**	0,259
	Sig. (two-tailed)	0,150	0,365		0,007	0,284
	N	19	19	19	19	19
Theoretical Style	Pearson Correlation	-0,091	-0,383	0,601**	1	0,209
	Sig. (two-tailed)	0,711	0,105	0,007		0,391
	N	19	19	19	19	19
Pragmatic Style	Pearson Correlation	0,174	0,431	0,259	0,209	1
	Sig. (two-tailed)	0,477	0,065	0,284	0,391	
	N	19	19	19	19	19

(**) The correlation is significant for a (two-tailed) significance level of 0.01.

Figure 2

Distribution of grades according to Kolb's learning styles

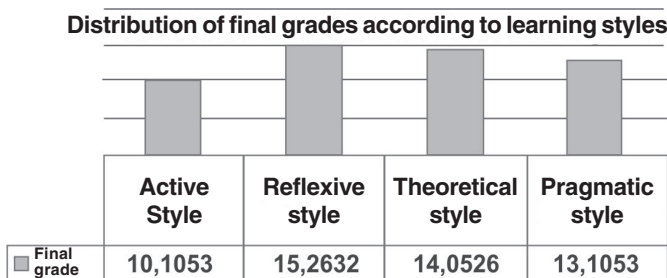
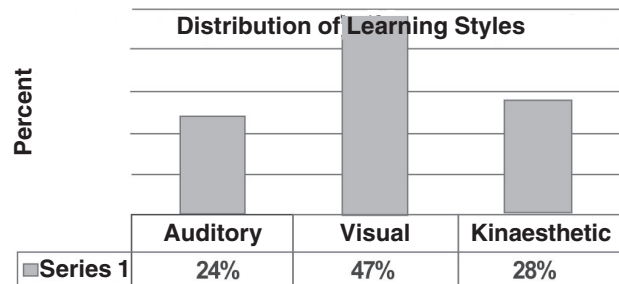


Figure 3

Distribution of learning styles according to the Neuro-linguistic Programming (NLP) model



In terms of methodology, teaching staff do not always use information which would allow them to know their students based on this perspective^(4,6,14) and to identify the factors enabling the activation of cognitive processes to develop the abilities needed for a good ophthalmic examination. This is relevant because of the high number of patients who visit emergency services with eye conditions which were not diagnosed in time by the general practitioner, thus worsening the clinical evolution of the disease.

Considering the learning styles of the Kolb model, the study's conclusions are in line with previous similar studies as regards the high prevalence of the reflexive style among medical students. Such students perceive information in an abstract way but proceed reflexively, i.e. they tend to respond through assimilation and analysis, with a focus on divergent thinking. Through this learning style they adopt the position of observers, analysing their experiences from different points of view. This makes them cautious, observing all the implications of any action before they act.

The theoretical style was the second most prevalent learning style. Subjects with this style adapt and integrate their observations into complex and logical theories. They analyse and summarise information and, when they act, they prioritise logic and rationality.

The students adopting the visual and kinaesthetic learning styles of the NLP model tended to have the best grades⁽⁴⁾. Most students in the sample adopted the visual style.

Students adopting the visual style tend to give importance to aesthetics and images. They speak quickly and the images in their head move at high speed.⁽¹²⁾ They learn by observing demonstrations and procedures. During reading processes, they prefer descriptions and they carefully imagine scenarios in an intense and detailed manner.

In the kinaesthetic style, students learning by doing, by involving themselves directly. They move when they read, they are better at remembering what they have done and they do not give importance to images.

These styles are relatively stable, but can be modified in different learning environments. This can be achieved when teachers help students identify their own learning style and adapt to their educational experiences. Thus, in certain teaching experiences involving the use of new instruments for fundus examination, students learned how to use them and to perform diagnosis in only eight weeks.⁽¹⁵⁾

The implementation of educational prototypes or specific teaching strategies⁽¹⁶⁾ based on recognising learning styles can help future doctors perform a precise and timely diagnosis of eye conditions in general practice. This will help improve the population's visual health.⁽¹⁷⁾

CONCLUSIONS

The learning styles of 5th year medical students in the field of ophthalmology do not affect their academic performance, i.e., both variables act independently of each other.

Although the correlation between variables does not reach the significance level of 0.05, the best academic performance tended to be achieved by students adopting the visual (NLP model) and reflexive (Kolb model) styles.

Also, a higher prevalence of the visual style (of the NLP model) was observed among students.

The QHAEA questionnaire results showed that the most prevalent style of the Kolb model was the reflexive style, followed by the theoretical style.

Professional training in the fields of medicine and ophthalmology could be improved if teaching staff knew the cognitive processes involved in their students' learning and used teaching techniques that would lead to improved academic performance.

Limitations

Among the limitations of this study, it should be mentioned that we did not know the students' learning styles as they began studying medicine and whether this style changed over the first 4 years. Similarly, students were not followed-up over time in a way that allowed us to detect possible effects to their performance resulting from their awareness of their learning styles.

Another limitation was that no previous studies had been conducted on this group of students allowing us to compare the possible effects of other teaching/learning methods used in their education.

REFERÊNCIAS

1. Biggs J. Calidad del aprendizaje universitario. 2a ed. Madrid: Narcea; 2006
2. Kolb DA. Experimental learning: experience as the source of learning and development. New Jersey: Prentice-Hall; 1984.
3. Bandler R, Grinder J. Reframing: neuro-linguistic programming and the transformation of meaning. Moab, UT: Real People Press; 1982.
4. Canalejas Pérez MC, Martínez Martín ML, Pineda Ginés MC, Vera Cortés ML, Soto González M, Martín Marino AM, et al. Estilos de aprendizaje en los estudiantes de enfermería. Educ Méd. 2005;8(2):33-40.
5. Romo Aliste ME, López Real D, López Bravo I. ¿Eres visual, auditivo o kinestésico? Estilos de aprendizaje desde el modelo de la Programación Neurolingüística (PNL). Rev Iberoam Educ. 2005;38(2):1-9.
6. Borracci RA, Guthman G, Rubio M, Arribalzaga EB. Estilos de aprendizaje en estudiantes universitarios y médicos residentes. Educ Med. 2008;11(4):229-38.
7. Diaz-Veliz G, Mora S, Lafuente-Sánchez JV, Gargiulo PA, Bianchi R, Terán C, et al. Estilos de aprendizaje de estudiantes de medicina en universidades latinoamericanas y españolas: relación con los contextos geográficos y curriculares. Educ Med. 2009;12(3):183-94.
8. Mc Coll P. Estilos de aprendizaje en los estudiantes de primer año de carreras de la Universidad de Valparaíso. Rev Educ Cienc Salud. 2009;6(1):34-41.
9. Bitran C M, Zúñiga P D, Lafuente G M, Viviani G P, Mena C B. Tipos psicológicos y estilos de aprendizaje de los estudiantes que ingresan a Medicina en la Pontificia Universidad Católica de Chile. Rev Méd Chile. 2003;131(9):1067-78.
10. Fortoul TI, Varela Ruiz M, Ávila Costa MR, López Martínez S, Nieto DM. Factores que influyen en los estilos de aprendizaje en el estudiante de medicina. Rev Educ Sup. 2006;35(2):55-62.
11. Napoli J, Formosa MI, Urssi L. Evaluación comparativa de los estilos de aprendizaje en estudiantes de pregrado de Patología, médicos residentes y profesionales de la Carrera docente. Rev Assoc Med Arg. 2010;123(4):18-22.
12. Gómez L. Manual de estilos de aprendizaje. México DF: Secretaría de Educación Pública; 2004.
13. Carvalho JA. Oftalmología e realidade virtual. Rev Bras Oftalmol. 2012;71(1):40-7.
14. Grossman P, Wilson S, Shulman L. Profesores de sustancia: El conocimiento de la materia para la enseñanza. Profesorado (Revista de Currículum y Formación del Profesorado). 2005;9(2):1-24.
15. Damasceno EF, Damasceno NA, Costa Filho AA. Ensino de oftalmología na graduação médica: Estudo comparativo de aprendizaje na oftalmoscopia direta com oftalmoscópio convencional e de campo amplo (Panoptic). Rev Bras Oftalmol. 2009;68(4):231-6.
16. OCDE. Banco Mundial. La educación superior en Chile: Revisión de políticas nacionales de educación. Santiago de Chile: MINEDUC; 2009.
17. Lopes Filho JB, Leite RA, Leite DA, Castro AR, Andrade LS. Avaliação dos conhecimentos oftalmológicos básicos em estudantes de Medicina da Universidade Federal do Piauí. Rev Bras Oftalmol. 2011;70(1):27-31.

Corresponding author:

Associate Professor Dr. Mario Pellón, MSc, Ophthalmologist
 Facultad de Medicina Universidad de la Frontera
 Casilla 54-D, Temuco, Chile -
 Tel: +56 45 325 570 Fax: +56 45 325 600
 E-Mail: mpellon@ufro.cl