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Research Article

Learning Styles on Third Year Pediatric Medical Residents

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Abstract

Medical residents needs to acquire knowledge to solve problems. Learning style is the way in which pupil learn and put the knowledge in him/her. Pediatrics Residents have two learning styles (reflective and theoric) most of the other two (pragmatic and active). Many papers show that characteristic for health science, while humanities show different way for learn. We studied 30 pediatric residents from 3rd year (last-one). They answer CHAEA scale, which is a questionnaire about learning styles. Project was review by Ethics Research Committee. All subjects read and sign Informed consent. We discuss these findings.

Introduction

In order to study a medical residence it is needed to acquire particular knowledge and skills guided to solve problems that attain the entire society, residents have to reach a totally satisfactory quality level, including a great quantity aspects and terms, in between one of these multiple items, the one that appertain this paper is the learning style each medical resident has.

Learning is not a passive and receptive process, not even a mere copy from reality, it is better understood as a complex task that provides answers; an interactive and dynamic process whereby external data is interpreted and re-interpreted by the subject's mind, which progressively builds explicative models each time more complex [1] and finally culminating in behavioral changes, relatively permanent.

In relation to each person learning style, educational psychologists have a consensus, pointing that everyone develops his very own, those are, in substance, the main responsible of how a particular student behave when confronting the learning process.

Firstly we will define style. In pedagogic matter it is referred as a set of various behaviors reunited under a single label. According to Guild and Garger [2] (1998) "the term style was first used by 20th century investigators, particularly by those who were working on distinguish differences among subjects in areas like psychology and education". A concept of the word style, focused on pedagogic terms, was the one expressed by Alonso [3] (1994), assuring that styles are "conclusions arose from the way people behave, resulting on concepts useful to analyze and classify behaviors".

According to Alonso and Gallego [3, 4] there are three basic psychological elements forming the concept of style: an affective component represented by emotional intelligence; a cognitive component understood as cognitive intelligence and a behavioral component, the social intelligence. Those elements are structured according to each subject style and show the way they build their own learning process".

Lozano [5] (2000), after analyzing several theories and integrate multiple concepts, defined style as "a set of preferences, tendencies and dispositions a person has in order to do something, manifesting it through a conduct pattern and the strength that make him distinguish from others". Gutierrez Tapias and cols. [6, 7] (2006) adds to the previous definition "in the way the person acts, wears, talks, thinks, thoughts, learn, teach and solve".

For Hilgard [8] (1979) learning is a process whereby an activity originates or is changed through the reaction of a given situation. Bordenave [9] (1987), defines learning as a relatively permanent modification on men capacity or disposition, occurred as result of their activity and that cannot be attributed to growth, development or causes like illnesses or genetic mutations. Cotton [10] (1989) gives a definition for learning as a process of acquisition of knowledge, new abilities and dispositions, relatively durable, conceived to change perception or behavior as a result of experience.

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Gregorc [11] (1979) states that learning styles consist in distinctive behaviors which can be used as an indicator of how a person learns and adapts to his environment. For Riding [12] (1999) cognitive learning style reflects an essential facet of person, having a physic basis, controlling how an individual responds to different occurrences and ideas he experience [4].

Learning styles are cognitive, affective and physiological characteristics which can be used as indicators, relatively durable, of how teachers perceive, interact and respond to their learning environments.

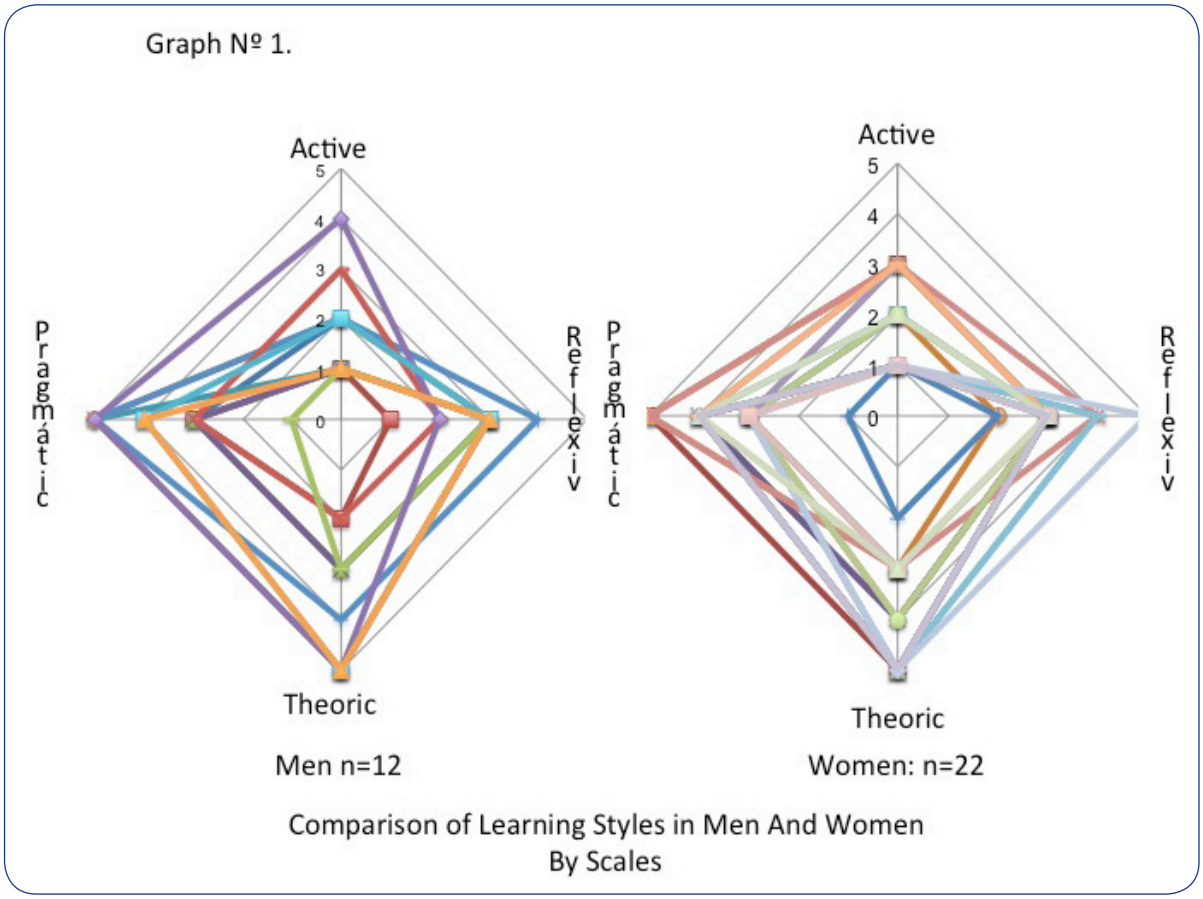
Various models and measurement systems of learning styles have been described on literature, among them, Kolb's theory, cited by Lozano, described in 1984, assumes that in order to learn something, the subject has to process information acquired from the milieu, starting from a direct and concrete experience or from an abstract experience, which then, is transformed into knowledge when we process it in a reflexive way or by experiencing the information in an active way.

According to Kolb's theoretical model, an optimum learning is the result of processing information in four phases:

P. Honey and A. Mumford (1986), cited by Alonso [4], start from an academic reflection and analysis from Kolb's theory and instruments, insisting on the circular process of learning into its four stages, and on the importance of learning by the experience. On what they differ from Kolb, is on learning style's inventory, trying to enhance the effectiveness of learning and trying to find a better and completer tool to ease the orientation for the improvement of learning. The main differences can be pointed on three fundamental aspects: a) Descriptions of learning styles are more detailed and based on subject's actions. B) Answers for questionnaires are the starting point, not the end point, it is all about to ease and provide a practical guide to help and orient individuals to enhance. C) They describe a questionnaire which includes eighty items to analyze learning styles with a greater number of elements (CHAEA) 3.

For Mumford [3], the scheme of learning process by experience is divided as follows:

(activepediatric medical resident)TO ACT	TO REFLECT (reflective pediatricmedical resident)
(theoretical pediatric medical resident) TO THEORIZE	TO EXPERIMENT (pragmatic pediatric medical resident)3



For Kolb, There are Four Learning Styles

Learning styles developed by Kolb	
Assimilator (abstract-reflective):	**Divergent (concrete-reflective):**
Assimilates great quantities of information. Tends to learn by systematizing and unifying data into patterns and theories, without particular interest on the practical application of knowledge. Reflects before acting. Prefers theorical classes to practical activities.	Learns easily from experience after analyze it from multiple perspectives. He cares about concrete details. Shows no interest on theoretical aspects.Values relationships and prefers to work on teams.
Acomodador (concrete-active):	**Convergent (abstract-active):**
Has preference and easiness to learn with experimentation or practice Does not show interest theoretical aspects. Explores opportunities and takes risks. Prefers practical activities to theoretical classes.	Learns by solving problems. Applies the knowledge on practice, parting from the generation of hypothetical models. Prefers practical activities to theoretical classes.

Alonso y Gallego,[3, 4], Gutierrez[6], Kolb[32]

- Have an experience.
- Review the experience.
- Make conclusions based on that experience.
- Plan the next steps.

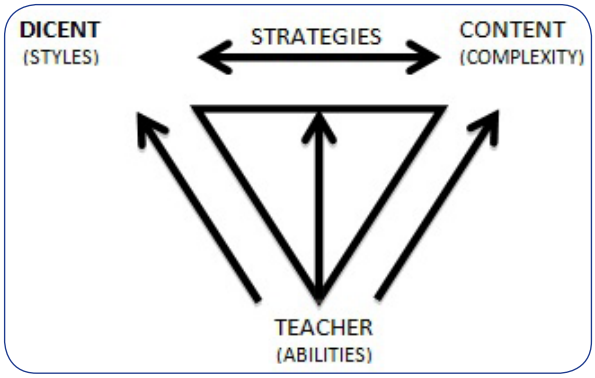
Alonso, Gallego and Honey (2005) establish four learning styles, described as follows14. (figure 2)

Fig. 2. Alonso, Gallego and Honey´s learning styles.

Active: Cheerful, improvisator, discoverer, risky, spontaneous, creative, novel, adventurer, inventive, idea generator leader, fun, participative, competitive, trouble shooter. Other characteristics are priggish, inconstant, and protagonist.	Reflective:Measured,conscientious,receptive, analytical, exhaustive, watchful, patient, careful, detailist, arguments maker, alternative farsighted, investigative, assimilator, prudent. Other characteristic are distant and slow.
Theoretical: Methodical, logical, objective, critical, structured, disciplined, planner, systematic, orderly, reasoner, hypothesis, questions and concepts finder, explorative and perfectionist.	Pragmatic: Realist, practical, direct, effective, experimenter, fast, decided, positive, concrete, objective, clear, organizer, actual, solves problems, applies what he learned.

Alonso, Gallego y Honey, cited in LagoBaldomero and cols. [13]

For them, the first five characteristics mentioned at each learning style are the main ones, those who give each style a determined profile.



The didactic triangle including these concepts can be conceived as follows:

This explains by itself that the scholastic, with his abilities, interacts with the dicent, contents and strategies, meanwhile the dicent, with his particular style, interacts with contents through the strategies the scholastic suggests and the contents have their own complexity.

Several studies have been made with the main objective of identify each subject's predominant learning style; in a study ran in Canada, it was reported that the main learning style on medical students was divergent (concrete-reflective), in accordance with Kolb's theory; for surgery residents and general surgeon practitioners, the predominant learning styles were acomodador (concrete-active) and convergent (abstract-active) 15.

In a study made in Buenos Aires, Argentina, the predominant learning style on second grade medical students and seniors of medical school, were, for information acquisition, the theoretical, and for information use, the reflective one. On cardiology residents, the same results were obtained. As a general rule, the predominant learning style on women was divergent (concrete-reflexive) with a clear preference on studying a clinical medical residence, meanwhile, on men, predominated the assimilator learning style (abstract-reflective), with preference on studying a surgical medical residence [16].

In Madrid, Spain, in a study made in nursing students, reflective and theoretical learning styles were the predominant on that population.

Another study ran in Mexico City, it was found that on medical emergencies residents the main learning style was theoretical, followed by pragmatic; for internal medicine the same result was obtained; on the other hand, on pediatric medical residents three

predominant learning styles were identified: reflective, theoretical and pragmatic; as a general rule, those styles combined each other at almost 33%, the most frequent combination was theoretical-pragmatic, followed by theoretical-reflective [1].

The aim of this study was to identify which learning style predominated on pediatric medical residents, in order to get to know completely each medical resident, their weaknesses and their virtues in terms of their learning style, giving the docent the chance to determine how to proceed and amplify continuously the limits of his development area, particularly on the formation stage.

An observational study was developed, longitudinal, comparative, approved by Ethics and Investigation Committees, with the main objective of determine the predominant learning style on third year (senior) pediatric medical residents. Secondary objectives were: describe the predominant learning style by sex, by age, determine the learning style associated with each medical specialty. Informed consent was obtained verbally from each participant.

Materials

All third year (senior) pediatric medical residents from a third level pediatric hospital in Mexico City, that qualified for all inclusive criteria were included, they also had to agreed participating and answer the whole (100%) applied evaluation.

Instruments

Honey-Alonso's learning style questionnaire (CHAEA, for its acronym in Spanish "Cuestionario Honey-Alonso de Estilos de Aprendizaje"). This questionnaire was made starting from the premise that needs, interests and motivations of each student are different, describing four learning styles (active, reflective, theoretical and pragmatic). This instrument consists of eighty questions which can be answered with a dichotomy, manifesting if he agrees or not with each item. Absolute score reached on a group of twenty items indicates the level obtained for each learning style previously described. This is how precise data are obtained to evaluate each student preferences for each learning style and finally obtain the predominant learning style on a particular subject.

The process of construction and validation of this inventory has been reported previously [18, 19, 20, 21, 22, 23].

CHAEA questionnaire was born from adaptation and translation of Peter Honey's LSQ (Learning Styles Questionnaire) to a spanish academic context. LSQ was conceived for enterprises professionals of the United Kingdom. CHAEA's translation was made by Catalina Alonso, applied in 25 faculties and colleges in Madrid, Spain, with a total of 1371 students evaluated [3].

Methods

Questionnaires were applied at three different moments. Residents who were not at the hospital at the time of application (professional social service) received the questionnaire via email, answered and replied by the same via.

At application time, all participants received information about the questionnaire, explaining them that it is designed to determine their preferred learning style and results could vary depending on how sincere questions were answered. Instructions were given to mark before each sentence in the blank space between parentheses with a (√) if he agreed with the sentence or with a (X) if he did not agreed.

For being an investigation project, informed consent was obtained, including the next phrase: "Information given on this questionnaire will be used exclusively for investigation matters. If you agree authorizing the aforementioned, please proceed answering the questionnaire; otherwise return it unsolved."

A space was added on top of questionnaires assigned for complete name, surname, age and sex of participant.

The questionnaire was applied on classrooms of the aforesaid hospital. Data were captured, then, results were analyzed.

Statistical Analysis

Once questionnaires were solved, it was proceeded to obtain the scores. Highest scores identify each subject's predominant learning style. In some cases, two or even more learning styles could have a tied score.

Percentage of the four learning styles was calculated for the whole population, getting by this method the predominant learning style for this population. This was done also to determine predominant learning style by sex.

Qualifications by los baremos belonging to CHAEA, were also obtained.

Results

Of a total of 38 third year (senior) pediatric medical resident, 34 were only included. Those who did not answer the questionnaire were excluded (4). 63% (n=) were female. Age fluctuated between 32 to 37 years old, with an average of 33.5± 1.2 years old.

On our population, before baremos, predominant style was reflective 60% (75% of them were females). Pragmatic style had only a 3%, which, all of them, were males. None of all residents had a predominant active learning style. 24% of the totals were a combination of the four different styles (chart number 1), most frequent combination was reflective-theoretical with 4, followed by theoretical-pragmatic combination, with 3, and meanwhile reflective-pragmatic combination got 2.

Of a total of 34 pediatric medical residents who answered the questionnaire, 74% (n=25) are, nowadays, doing a pediatric subspecialty, and, as can be seen on chart number 3, reflective learning style predominates on them.

Table Nº 1. Learning Styles in 3rd Year Pediatric Residents

n (%)	Active	Reflexive	Theoric	Pragmatic	Mixture	Total
Male	0	5 (45)	2 (18)	1 (9)	3 (27)	11
Female	0	15 (65)	3 (13)	0	5 (22)	23
Total	0	20 (59)	5 (15)	1 (3)	8 (24)	34

Table Nº 2. Learning Styles by Speciality and Subspeciality area

	Speciality	Subspeciality	
Learning Style	Pediatrícs n (%)	Medical n (%)	Surgical n (%)
Active	0	0	0
Reflexive	20 (59)	10 (56)	2 (29)
Theoric	5 (15)	2 (11)	1 (14)
Pragmatic	1 (3)	0	1 (14)
Reflexive-Theoric	4 (12)	4 (22)	1 (14)
Teoric-Pragmatic	3 (9)	1 (6)	2 (29)
Reflexive-Pragmatic	1 (3)	1 (6)	0
Total	34	18 (72)	7 (28)

Table 5. Learning Styles Scales

	Active	Reflexive	Theoric	Pragmatic
Very Low	15 (39.5)	1 (2.6)	0	2 (5.3)
Low	10 (26.3)	4 (10.5)	3 (7.9)	0
Medium	8 (21.1)	24 (63.2)	12 (31.6)	14 (36.8)
High	1 (2.6)	4 (10.5)	5 (13.2)	11 (28.9)
Very High	0	1 (2.6)	14 (36.8)	7 (18.4)
Total	34	34	34	34

Table 6. Comparison of mean and standard deviation of Scales of Learning Styles in pediatric residents.

	Active	Reflexiv	Theoric	Pragmatic
	Media±St. D.	Media±St. D.	Media±St. D.	Media±St. D.
Men	1.75±0.87	2.75±0.64	3.75±0.99	3.67±0.91
Women	1.91±0.86	3.14±0.63	3.95±0.99	3.59±0.91
Todos	1.85±0.89	3.00±0.69	3.88±1.06	3.62±1.01

St. D..= Estándar Desviación

Table Nº 3. Learning Styles in Pediatrics subspecialities

	Active	Reflexive	Theoric	Pragmatic	Teo-Prag	Ref-Teo	Ref-Prag
Hematology 0.12		3					
Neurology 0.12		2	1				
Neonatology 0.8		1			1		
Neumology 0.16		1	1		1	1	
Infectología 0.08		1				1	
Cardiology		1					1
Oncology 0.04			1				
Inmunology		1					
Emergency		1					
Gastroenterology		1					
Down Syndrome		1					
Inmuno-Alergic		1	1				
Surgery		1			1		

TableNo.4. Comparison of Learning Styles in Pre and Postgraduate Medical Students

	n (%)	Active	Reflexive	Theoric	Pragmatic
Medical Pregrade	200	30(15)	70(35)	67(33)	33(16)
Medical Posgrade	200	15(7)	85(42)	71(35)	29(14)
	400	45(11)	155(39)	137(34)	62(15)

Borraci y cols. [19]

Table 7. Comparison of Learning Styles Health Areas and No Health Areas

	%	Active	Reflexive	Theoric	Pragmatic
Health Areas	100	12	34	35	19
No Health Áreas	100	24	28	26	22

Juarez[18], Canalejas[20],Camarero [21], Bousbia [22],Loria [23], Padierna [24], Engels[25], Gupinar [26], Hendry [27].

Discussion

Unlike what has been reported in other studies, where theoretical learning style was the predominant one, in our study we found the reflective learning style to be the most common [1,5,8,9]. Nevertheless, when considering the baremos, theoretical learning style surpasses, by far, reflective learning style. Those results seemed logical to be found, as in pediatric medical specialty several qualities need to be attained on their students, which, many of those, are part of reflective learning style definition, in example: being measured, receptive, exhaustive, observant, patient, careful, detailist and prudent; and from theoretical learning style: methodic, logical, objective, critical, structured, disciplined, planned, systematic, ordered, reasoner, seeker of new hypothesis, questions or concepts.

The pediatrician, either on the emergency department or in the clinical room, must have several qualities and abilities in order to accomplish successfully his work, some of them are: meticulous observation of the patient, make the right decisions according to the most likely diagnosis, contrast as many differential diagnosis as possible, reevaluate continuously based on patient's response to applied management, obtain an exhaustive medical history from the patient's responsible adult; when giving a determined medication, consider children's weight and age. All of the aforementioned qualities and abilities are related with reflective and theoretical learning styles.

Of our awareness is that in all consulted references, an active learning style has never been reported previously for a clinical medical specialty, though, being found on residents of surgical medical specialties [1,5,8,9]. Among surgical residents, the qualities compatible with active learning style are being improvisator, discoverer, risky, creative, leader, problem solving, etc., all of these are indispensable qualities on surgical residents, who also must have extensive knowledge on human anatomy and it's normal and abnormal variants, as well on all diseases who may have a surgical diagnosis or treatment, considering, possible complications on every patient's management; at the operating room, the surgeon must be the leader of the team (anesthesiologist and nurses), for all the aforesaid reasons, they need to handle well stress and be able to make accurate decisions on a short period of time.

Another variable considered for the analysis was if the third year pediatric medical resident was going to study a pediatric subspecialty or not, if so, which of all pediatric subspecialties, thus, being found that for clinical subspecialties, reflective learning style was the predominant one, as expected; for surgical pediatric subspecialties predominated reflective and pragmatic learning styles, these results were not concordant on what has been said before, where the active style was the main on surgical residents. Finally, for those pediatric subspecialties which combine clinical and surgical skills, the predominant learning style was theoretical in combination with pragmatic and reflective. Those findings support the theory that learning styles are not static, but evolving continuously, based on the interest and field of study of each person.

In order to become a pediatric surgeon, first you have to be a pediatrician, developing a reflective learning style, as been seen on different studies; then when becoming a resident of a surgical pediatric subspecialty, the subject develops a different learning style, as mentioned before. On the other hand, Boracci (2008) and Engels (2010) found that surgical residents had a pure active learning style, but it is need to be considered that those surgical residents focused their skills only in an adult population, not having the need to develop a reflective or theoretical learning style like those who had to become pediatricians at first instance.

Juarez-Munoz et al. report in a study made in a Mexico City hospital, in a population including pediatric medical residents (without distinction if they were making a surgical or medical pediatric subspecialty), where the CHAEA questionnaire was applied, that in women of that population predominated the reflective learning style, meanwhile for male population the predominant one was the theoretical. For residents of a pediatric surgical subspecialty, the main learning styles were reflective and pragmatic; on the other hand, pediatric clinical subspecialties had residents with a predominant theoretical learning style. Not concordant on what we found on the present study, where reflective learning style was the predominant on both sexes, graphic number 1 shows the baremos by sex. Likewise, in our results, reflective learning style predominated on surgical subspecialty residents, followed by pragmatic and theoretical styles, whereas for medical subspecialty residents, the reflective learning style was the main, too.

In our study, active learning style appeared in none of our subjects, while in Juarez-Munoz et al. 24 study, one pediatric resident showed a predominant active learning style. On both studies, Juarez's and ours, CHAEA questionnaire was the instrument used to obtain subject's learning style. To begin our research, we look for different articles using the following key words: "learning styles", CHAEA", "learning, styles", "medicine", "pediatrics", "health"; on those revised files a statement is found, that in medicine the active learning style is not identified; this can be interpreted just like an interesting find or it can point that CHAEA questionnaire underestimates active learning style as a general rule. In order to figure out this entanglement, we searched articles whose objectives included finding the predominant learning style, using the same instrument (CHAEA questionnaire), on populations who did not include health care personnel. Camarero (2000) [25], made this quest on different areas, such as informatics, physics, mathematics,

attorneys and teachers. Concerning to Bousbia (2008) [25], he worked with computing science students. On Gutierrez Tapias [6] multinational project, he included magisterium students from Spain, Mexican agronomic engineering students and finally students of education career, formed in Venezuela 28. In all aforementioned studies who did not included health care related personnel, the active learning style was estimated on the same proportion as the other three learning styles. On graphic number 2, the comparison between our results and Gutierrez's can be appreciated, notice the scarce presence of active learning style on medical population when compared with teachers and engineers. Likewise, graphic number 3 shows a comparison between health care related students and students not related to health care, which clearly shows the less proportion of subjects with an active or pragmatic learning style on health care related students.

The proportion of learning styles on third year pediatric residents by baremos, allow us to identify the following, as the active learning style is quite low, the theoretical learning style is the predominant one, then, the pragmatic and reflective learning styles are present on lower proportions (graphic number 4).

The limiting of the present study was that only third year pediatric residents were included, excluding the previous year residents, another was the disproportion between gender, as females where twice as the male population.

Conclusions

The predominant learning style on third year pediatric medical residents of Instituto Nacional de Pediatria was theoretical, followed by reflective. Most of the population who answered our questionnaire were women, representing a 66% of our total population, these is why a bigger percentage of reflective and theoretical learning style were found on female population, when compared with men; meanwhile the pragmatic learning style was found as predominant only on male population.

It also can be concluded that active learning style is not found on health related sciences.

According to a predominant learning style associated with subject's age, no significant results were obtained, perhaps because the age gap in-between our studied population was not big enough to find a significant difference.

Educative investigation in Mexico will allow developing specific learning strategies according to each subject's learning style, which theoretically will result on an optimized learning and specifically in better health services.

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