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Self-directed learning and learning styles in resident physicians.

Aprendizaje autodirigido y estilos de aprendizaje en médicos residentes.

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Summary.

Introduction: Self-directed learning has become an essential skill for physicians in a context characterized by high workloads and access to vast amounts of information. Identifying learning styles can facilitate the use of strategies that promote autonomous learning. Objective: To determine if there is a relationship between self-directed learning and learning styles in resident physicians. **Method:** Observational and descriptive study; resident physicians assigned to the General Hospital of Family Medicine Subzone No. 8 were included. Data collected included age, sex, marital status, whether they had children, and place of origin. To assess self-directed learning, the Self-Directed Learning Readiness Scale was used, and the Honey-Alonso test was used to identify learning styles. Descriptive analysis and the Kruskal-Wallis test were used, considering a p-value less than 0.05 to be significant. **Results:** Thirty-two physicians were included, 68.8% of whom were women; 22 were family medicine residents and 10 were epidemiologists. Reflective learning predominated at 31%. No statistically significant difference was observed between self-directed learning and learning styles in learning planning ($p = 0.824$), self-confidence ($p = 0.708$), self-management ($p = 0.103$), self-evaluation ($p = 0.141$), and desire to learn ($p = 0.349$). **Discussion:** Although it might be expected that resident physicians would have a high level of self-directed learning, less than 20% possess good skills in this area, which is unrelated to learning style. It has been suggested that there is a difference in learning style between men and women, with a predominance of theoretical and pragmatic styles, respectively. In the present study, the predominant learning style was reflective, with no differences between sexes, courses, or specialties. **Conclusions:** Specialty does not influence the preference for a learning style. The relationship between self-directed learning and learning styles is not statistically significant.

Keywords: Learning, physicians, teaching, medical specialization, medicine, self-learning

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1. Introduction

In medical education, where knowledge is constantly evolving, self-directed learning is an indispensable skill. Although almost all adults actively participate in their learning, few do so within a formal setting (1). The training of medical professionals in residency programs (2) combines two essential roles: healthcare worker and postgraduate student. This context demands the development of competencies that enable the continuous acquisition of knowledge, skills, and attitudes, with self-directed learning being one of the most relevant (3). During their residency, residents must complete an academic program accredited by a university, in addition to engaging in ongoing professional development, with the autonomous acquisition of new knowledge being fundamental.

Self-directed learning, as described by Knowles (4), refers to the process by which the individual takes the initiative to identify their learning needs, formulate objectives, identify resources, select strategies, and evaluate results. The teacher's role is that of a learning facilitator and procedural guide. Self-directed learning encompasses dimensions such as learning planning, the desire to learn, self-confidence, self-management, and self-evaluation. These dimensions allow us to understand not only the student's disposition but also their actual capacity to regulate their own learning process (5). The student learns autonomously, starting from their learning needs and prior experiences, using their own resources, and evaluating the outcome. This involves significant cognitive activity combined with motivation and self-identity, making it not a technique but a process (1). Several authors suggest that, although many students and resident physicians exhibit moderate to high levels of self-directed learning, there are significant differences in their mastery of its components (6).

Among university students, particularly in health sciences and distance learning programs, self-directed learning is positively related to academic performance. Those with a greater capacity to plan, execute, and reflect on their learning tend to achieve better results, especially when they have clarity about their strengths and weaknesses. However, some populations have identified overall levels of self-direction below expectations, suggesting the need to strengthen educational models focused on autonomy, responsibility, and academic freedom (3, 7-9). Specifically among medical students and undergraduate interns, self-directed learning has been documented to be moderate to high and is associated with better levels of knowledge and higher grade point averages (10, 11). Nursing students have been reported to have low levels of readiness for self-directed learning, with a positive association for the perceptual learning style and a negative association for the analytical style (12). Furthermore, learning styles, which explain individual preferences in how

information is perceived and processed, have also been linked to academic performance. The Honey-Alonso model classifies learning styles as active, reflective, theoretical, and pragmatic (13). Learning styles are unique to each individual, thus providing a personalized way of learning.

Regarding learning styles, most studies agree that there is no single pattern, but rather combinations that vary according to the academic context and level of training. In health sciences students, the reflective style frequently predominates, followed by the theoretical style, although visual, auditory, and kinesthetic profiles are also identified, depending on the instrument used. In resident physicians, a tendency toward reflective-theoretical styles has been reported in clinical specialties, and pragmatic styles in surgical areas, possibly influenced by the nature of the training activities and the degree of professional maturity (6, 10, 11, 14, 15).

It is unclear whether a specific learning style favors the development of self-directed learning in physicians, or whether self-directed learning modifies the preference for certain styles. In medical students, when comparing learning styles from the beginning of their studies to postgraduate studies, a theoretical (77%) and reflective (86%) style was identified at the beginning (assimilative), which decreased during their studies with an increase in the active style at the postgraduate level (16). A relationship between self-directed learning and the reflective learning style has been proposed, based on the idea that those with a reflective style tend to work autonomously and think carefully about the subject matter; this is essential in the health field, which requires continuous professional development. However, some authors point out that self-directed adults are more likely to have an active learning style, being more motivated and more sociable, unlike reflective learners who tend to be more isolated (1,3). On the other hand, Richard Riding points out that, more than the learning style itself, it is the cognitive style (Holistic-Analytical or Verbalizing-Visualizing) that is related to learning performance (17). Self-directed learning and learning styles are variables that impact academic performance and medical training; however, evidence regarding their relationship in resident physicians is limited. Therefore, the present study aimed to identify whether a relationship exists between self-directed learning and learning styles in resident physicians at the General Subzone Hospital with Family Medicine No. 8 in Tlaxcala, Mexico.

2. Methods

This study is a quantitative, observational, cross-sectional, prospective, single-center study. All first- to third-year resident physicians specializing in Family Medicine and Epidemiology at the General Subzone Hospital with Family Medicine No. 8 in Tlaxcala, Mexico (n=32), of the Mexican Social Security Institute, participated; no physicians were excluded. Following approval from the ethics and health research committee (registration R-2024-2902-042) and authorization from the administrative staff, researchers visited the unit's classroom to invite the resident physicians to participate. After explaining the objectives, the risk-benefit ratio of their participation, and addressing their questions, those who agreed to participate were asked to sign the informed consent form.

2.1 Instruments.

To assess learning style, the previously validated Self-Directed Learning Readiness Scale (5) was used. This scale consists of 38 items distributed across 5 domains (learning planning, desire to learn, self-confidence, self-management, self-evaluation), scored on a Likert scale (1: strongly disagree; 2: disagree; 3: neither agree nor disagree; 4: agree; 5: strongly agree). The instrument's Cronbach's alpha coefficient is 0.89. It does not have a cutoff point; evaluation is based on the total score and scores for each subdimension.

Learning style was assessed using the Honey-Alonso test (10), employed by various authors to identify the different learning styles (active, reflective, theoretical, and pragmatic) exhibited by students in various health sciences programs, including medicine. The test consists of 80 statements to which the subject responds with agreement or disagreement. The items are grouped into four sets of 20 items each, and the sum of these scores indicates the degree to which the participant exhibits one of the four learning styles.

In addition, questions were asked about age, sex, marital status, place of origin, whether they had children, time elapsed (in years) from graduation from their undergraduate degree to the start of their specialization, their specialization, and their level of study.

2.2 Data analysis.

A database was generated for the corresponding analysis. Univariate descriptive statistics were used, including frequencies, percentages, and measures of central tendency and dispersion. For inferential analysis, Pearson's chi-square, Mann-Whitney U, and Kruskal-Wallis tests were used, considering a p-value less than 0.05 as statistically significant. IBM SPSS Statistics 27 software was used for the statistical analyses.

3. Results

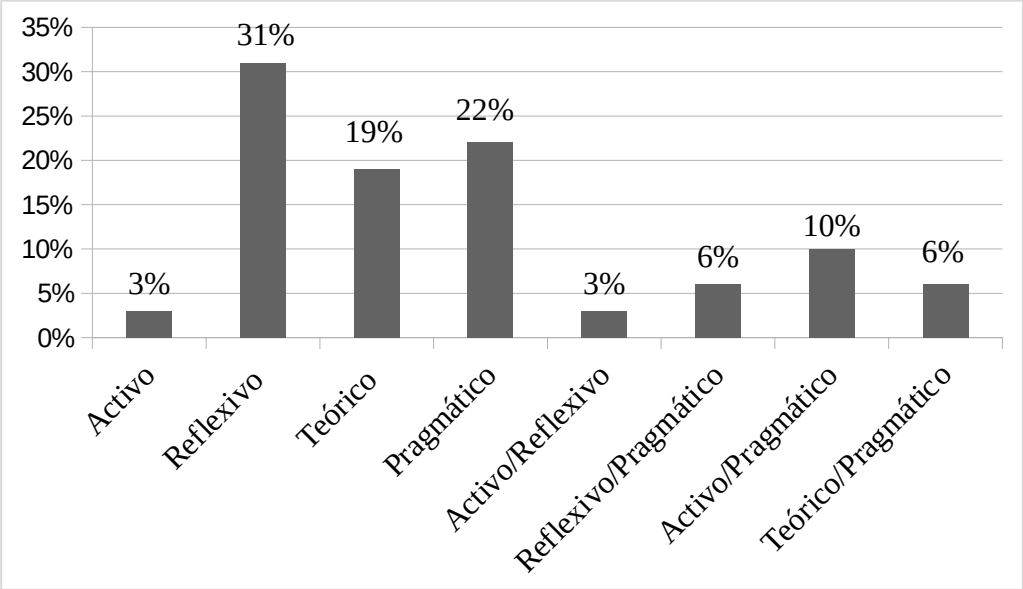
Thirty-two resident physicians participated, aged between 26 and 43 years (median age 30, interquartile range 4, 95% CI 29.21–32.25 years). 68.8% (22) were women; 71.9% (23) were single, 18.8% (6) were married, 6.3% (2) were in a consensual union, and 3.1% (1) was divorced/separated. 25% (8) had children, and 75% (24) did not. 78.1% (25) resided in the state of Tlaxcala, Mexico, before beginning their medical residency, and the remainder resided in Mexico City, Puebla, and the State of Mexico. 25% (8) had at least one child. 68.8% (22) were specializing in family medicine, and 31.2% (10) in epidemiology. 21.9% (7) were first-year students, 37.5% (12) were second-year students, and 40.6% (13) were third-year students. The time elapsed from graduation from the undergraduate program to the start of the specialization ranged from 1 year to 11 years, with a median of 3 years, an interquartile range of 3 years, and a 95% confidence interval of 2.8–4.9 years.

According to the learning styles model of Honey and Alonso (1994), 31% have a reflective learning style, while 25% have a mixed style (Figure 1).

Regarding self-directed learning, in their learning planning, most resident physicians prioritize their work and are responsible, but few set strict study schedules. In the dimension of desire to learn, 81.3% enjoy studying and learning new information, 78.1% enjoy a challenge, while only 21% of resident physicians report a need to learn. In the dimension of self-confidence, most can find information on their own and are confident in their abilities, and few prefer to plan their own learning. Regarding self-management of learning style, 87.5% are able to focus on a problem and like to make decisions for themselves, and only 17% perceive themselves as having good management skills. In the dimension of self-evaluation, most resident physicians are aware of their

own limitations and like to evaluate their work; however, self-evaluation is the dimension that scored lowest (Table 1).

Figura 1.



Distribución de estilos de aprendizaje.

Table 1. Relationship between self-directed learning and learning styles.

	Minimum	Maximum	Median	Interquartile range	95% CI
Overall score	104	108	142	12	138-146
Learning planning	25	39	33	3	31.73 - 33.77
Desire to learn	16	30	24	1	23.64 - 25.36
Self-confidence	21	45	34	3	33.03 -35.97
Self-management	28	45	36	4	34.53 – 36.72
Self-assessment	10	20	15	2	14.28 - 15.6

When evaluating the relationship between the score obtained in self-directed learning and learning styles, no statistical difference was observed (Kruskal-Wallis test 0.185, figure 2).

No statistically significant difference was observed between learning styles and specialty (Pearson's chi-square test of 0.676), nor between the overall self-directed learning score or any dimension (Mann-Whitney U test > 0.05). No statistically significant difference was found when relating the self-directed learning score to the level of medical specialty.

4. Discussion

During medical residency, it is necessary that learning be acquired autonomously, because at this stage medical practice has a great time demand. In the present study, the doctors who participated have not developed self-directed learning, making self-management an area of

opportunity. The vast majority have a reflective learning style, which is not related to self-directed learning.

It has been shown that in males the theoretical learning style predominates and in females the pragmatic style predominates (18), unlike the present research study, where residents regardless of sex have a reflective learning style.

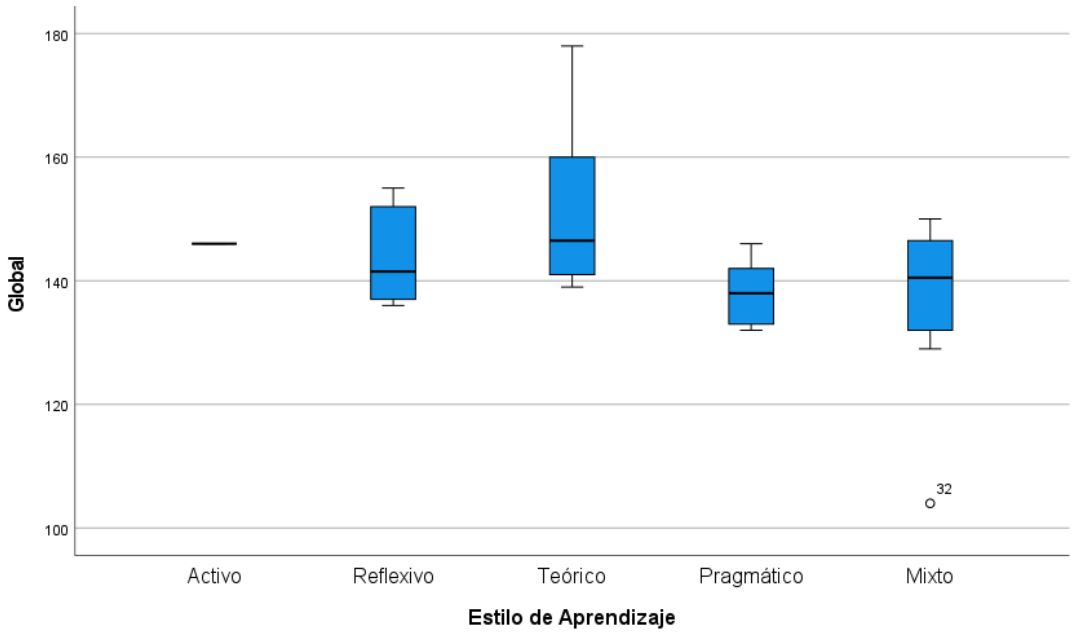


Figura 2. Relación entre aprendizaje autodirigido y estilos de aprendizaje.

In 2022, a study of medical students (9) found that higher levels of study were associated with a higher level of self-directed learning. However, this study found no statistically significant difference between self-directed learning and the level of medical specialty. This difference could be explained by the type of population and the sample size. Furthermore, it was shown that active learning styles are characteristic of medical and nursing students (19). However, in this study, reflective learning predominated regardless of the medical residency, age, or sex of the students. This could be explained by the fact that there is no single pattern in learning styles for each individual, as they depend on different personal and professional characteristics, as well as the level of maturity, age, and professional experience.

In the present study, the reflective learning style was present in one-third of the population, which coincides, although to a lesser extent, with the findings published by Juárez, M. (20), who also observed a predominance of the reflective style in 52 (86.5%) residents of the Pediatric Hospital in Mexico. The predominance of reflective learning was independent of the specialty, unlike what was reported by Loria et al., (15) at the La Raza National Medical Center, who indicated that the specialty influences the preference for learning style; in surgical specialties, the pragmatic style predominates, while in clinical specialties, the theoretical-reflective style predominates. However, others comment on the opposite, stating that it is the learning style that influences the choice of specialty (16).

It is unclear whether a specific learning style favors the development of self-directed learning in physicians, or whether AD modifies the preference for certain styles. When comparing medical students from the beginning of their studies to postgraduate studies, a theoretical (77%) and reflective (86%) style was identified at the beginning of their studies (assimilator), decreasing over

the course of their studies with an increase in the use of an active style at the postgraduate level (16).

In a study conducted on self-directed learning among family medicine residents in 2025 (17), the majority of residents demonstrated a high to medium-high level of self-directed learning, with self-control predominating over self-management and the desire to learn (21). However, in this study, only 17% perceived themselves as having good management skills, indicating that there is still much to be done to achieve self-directed learning among resident physicians. This is likely because the study included residents of all levels, considering that self-directed learning is a process that stems from learning needs and prior experiences, rather than a technique (1), and because the group was heterogeneous, particularly in terms of work experience prior to residency.

The relationship between the subscales of self-directed learning and learning styles and strategies in medical students, as proposed in previous studies (3), was not found in this study. This could be due to the type and size of the study population, coinciding with the findings of Borracci et al. (16), where the majority have a reflective learning style, suggesting a possible interdependence between learning style and self-directed learning. Qualitative intervention studies should be considered to support or facilitate the self-reflective process necessary in the health field.

Ignacia Styl et al. analyzed 16 articles published since 2010 on the effectiveness of pedagogical interventions in the teaching of semiology at the undergraduate level, noting that active techniques showed positive trends compared to traditional methods. The combination of problem-based learning with lectures was associated with higher performance (21). These findings emphasize the need to analyze what is necessary to promote self-directed learning.

Among the limitations encountered was the low availability of resident physicians to respond to the survey, citing a lack of time and requiring persistence to complete it. This may indicate a lack of interest, reluctance, or procrastination, which could introduce information bias. Another limitation hindering the generalizability of the results is the small sample size. The medical unit studied, being a sub-zone hospital, has a limited range of specialties (only Family Medicine and a newly established Epidemiology residency program). Therefore, the total number of resident physicians at the time of the study was 23 in Family Medicine and 12 in Epidemiology. Consequently, the study's estimates are less precise and lack the statistical power to detect small or moderate effects. Furthermore, there is a risk of selection bias and a lack of representativeness compared to other residency programs or resident populations. Therefore, the findings should be interpreted with caution and are not directly applicable to the general population. Furthermore, there is no specific scale to evaluate self-directed learning in resident physicians; therefore, it has been assessed using qualitative methods (self-reports) or generic scales, despite being a strategic process (3).

5. Conclusions

- No statistically significant difference was found between self-directed learning and learning styles. The predominant learning style was reflective; medical specialty and academic degree did not influence learning style preference.
- It is necessary to develop pedagogical strategies that promote self-management and self-evaluation to improve self-directed learning. Likewise, it is essential to implement strategies that strengthen autonomy, self-regulation, and critical reflection in residency programs.

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Author Contributions: SSBF: Data Curation, Formal Analysis, Research, Methodology, Project Management, Resources, Original Draft Writing, Visualization. MLLV: Conceptualization, Data Curation, Formal Analysis, Methodology, Project Management, Software, Original Draft Writing, Visualization. PSF: Conceptualization, Methodology, Project Management, Supervision, Validation, Visualization. DIDB: Research, Data Curation, Visualization. Please indicate the contributions of each author listed by their initials.

6. References.

1. Jennings SF. Personal development plans and self-directed learning for healthcare professionals: are they evidence based? *Postgrad Med J.* **2007,** 83, 982, 518-24. https://doi.org/10.1136/pgmj.2006.053066.
2. Procedure for the planning, programming, operation and evaluation of the educational process of residents in the course of specialization training at the *Mexican Social Security Institute* 2510-003-019 7. *IMSS.* **2021.** https://www.imss.gob.mx/sites/all/statics/pdf/procedimientos/2510-003-019.pdf
3. Márquez C, Fasce E, Pérez C, et al. Self-directed learning and its relationship with learning styles and strategies in medical students. *Rev méd Chile*. **2014,** 142, 11, 1422. http://dx.doi.org/10.4067/S0034-98872014001100009.
4. Knowles M. Self-directed learning: A guide for students and teachers. Chicago, IL: *Follett Publishing Company,* **1975.**
5. Fasce E, Pérez C, Ortiz L, et al. Factorial structure and reliability of the Fisher, King & Tague self-directed learning scale in Chilean medical students. *Rev Med Chil*. **2011,** 139, 11. http://dx.doi.org/10.4067/S0034-98872011001100006.
6. Pinzón R, Gonzalez E, Celi K, et al. Learning Styles in Medical Students. *Ciencia Latina Multidisciplinary Scientific Journal.* **2024,** 8, 2. https://doi.org/10.37811/cl_rcm.v8i2.10832.
7. Hernández N. Self-directed learning in collaborative work processes in higher education. *Educar.* **2022,** 58, 2. https://doi.org/10.5565/rev/educar.1525.
8. Soria M, López Pingarron L, Guerra M, et al. Evaluation of self-directed learning in medical students. Correlation with academic results. *Rev educ invest. innov.* **2024,** 82. https://doi.org/10.26754/ojs_reiit/eiit.202418854.
9. García Franco C, Márquez Celedonio F, Gutiérrez Aguilar P, et al. Association of sociodemographic and academic factors with self-directed learning in medical students. *Inv Ed Med.* **2022,** 1, 42, 55. https://doi.org/10.22201/fm.20075057e.2022.42.21413.
10. Méndez J. Level of knowledge, self-directed learning and learning styles in undergraduate medical interns. Undergraduate thesis, *National Autonomous University of Mexico.* **2021.** https://search.ebscohost.com/login.aspx?direct=true&db=edsbas&AN=edsbas.99508181&lang=es&site=eds-live
11. Tirado Silva A, Trujillo Neciosup ME. Learning styles and academic performance of medical interns at the Trujillo Regional Teaching Hospital, Peru. *Revista Médica Vallejiana.* **2020,** 9, 1, 24. https://revistas.ucv.edu.pe/index.php/revistamedicavallejiana/article/view/77.
12. Ballad CA, Labrague LJ, Cayaban AR, et al. Self-directed learning readiness and learning styles among Omani nursing students: Implications for online learning during the COVID-19 pandemic. *Nursing forum.* **2022,** 57, 1, 94. https://doi.org/10.1111/nuf.12664.
13. López Muñoz J, Meza Zamora EC, Saavedra Vélez CH, et al. Learning styles in health sciences students and the Intercultural University of the Veracruzana University. *Ciencia Latina Multidisciplinary Scientific Journal.* **2021,** 5, 4, 4798. https://doi.org/10.37811/cl_rcm.v5i4.660.
14. Vásquez Villanueva CA, Briceño Ledesma NS, Garamendi Revatta S, et al. Learning styles, according to the models of Kolb, Felder and Silverman: advantages and disadvantages. Journal *of Research in Educational Sciences.* **2022,** 4, 1, 21. https://educas.com.pe/index.php/paidagogo/article/view/99

15. Loría-Castellanos J, Rodríguez E, García M, et al. Learning styles of resident physicians at a teaching hospital in Cuba. *Higher Medical Education.* **2007,** 21, 3, 150. https://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0864-21412007000300001.
16. Borracci RA, Guthman G, Rubio M, et al. Learning styles in university students and resident physicians. *Medical Education.* **2008,** 11, 4, 229. https://scielo.isciii.es/pdf/edu/v11n4/original3.pdf.
17. Riding R, Cheema I. Cognitive styles: an overview and integration. *Educational Psychology.* **1991,** 11, 3–4, 193. https://doi.org/10.1080/0144341910110301.
18. Morales-Cadena GM, Lagunes-Costales, V. Learning styles in resident physicians of clinical and surgical specialties. *An Orl Mex.* **2023,** 68, 1, 16. https://doi.org/10.24245/aorl.v68i1.7843.
19. Baez-Lobato VJ, Xaxalpa-Salinas A, Becerril-Ramos NA, et al. Learning styles and emotional intelligence in family medicine residents. *Innovation and Technological Development Digital Journal.* **2024,** 16, 1, 375. https://iydt.wordpress.com/wp-content/uploads/2024/02/1_54_estilos-de-aprendizaje-e-inteligencia-emocional-en-residentes-de-medicina-familiar.pdf
20. Juárez-Muñoz IE, Gómez-Negrete A, Varela-Ruiz M, et al. Learning styles in resident physicians and their professors in a pediatric hospital. *Medical Journal of the Mexican Social Security Institute.* **2013,** 51, 6, 614. https://www.redalyc.org/pdf/4577/457745492004.pdf
21. Méndez Sandoval NR, López Ramirez LA, Estrada Andrade ME, et al. Self-directed learning in family medicine residents: research training and acceptance rates in scientific publications. *Archives in Family Medicine.* **2025,** 27, 3, 105. https://doi.org/10.62514/amf.v27i3.150.

22. Styl Antinao I, Saavedra Abarzúa V, Retamal Rodríguez J, et al. Effectiveness of Pedagogical Strategies in Teaching Medical Semiology for the Development of Clinical Skills: A Systematic Review. Rev Esp Edu Med 2026, 7. https://revistas.um.es/edumed/article/view/712321



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