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ORIGINAL ARTICLE

Methodology for the development of research skills in students of the Health Rehabilitation degree program

Metodología para el desarrollo de habilidades investigativas en estudiantes de la carrera Rehabilitación en Salud

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ABSTRACT

Background: the profound transformation of university education must respond to new social and technological demands, especially in such sensitive sectors as health.

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Objective: to design a methodology for the development of research skills through the teaching-learning process of the main integrating discipline Rehabilitation, in the Health Rehabilitation degree program.
Methods: an experimental study was conducted in third-year students, between January 2023 and December 2024. Theoretical methods were applied: analysis-synthesis, induction-deduction, historical-logical and modeling; empirical methods: pretest and posttest. The designed methodology was evaluated by groups of experts using the Delphi technique in order to adjust it and derive recommendations for its application.
Results: a methodology for the development of research skills in students of the Health Rehabilitation degree program was designed and validated. After its application, significant development was observed, especially in the skills of knowing the research skill: using ICT, working in a multidisciplinary team for decision-making in therapeutic and rehabilitative treatments, and applying scientific evidence in the clinical practice of rehabilitation.
Conclusions: the methodology not only favored the acquisition of theoretical knowledge but also enhanced the practical application of research skills in real care and rehabilitation contexts. It was satisfactorily evaluated by the experts.
MeSH: qualitative research; research support as topic; education, professional; strategies; capacitation; learning; education, medical

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RESUMEN

Fundamento: la transformación profunda de la educación universitaria debe responder a las nuevas demandas sociales y tecnológicas, especialmente en sectores tan sensibles como la salud.
Objetivo: diseñar una metodología para el desarrollo de habilidades investigativas desde el proceso enseñanza aprendizaje de la disciplina principal integradora Rehabilitación, en la carrera Licenciatura en Rehabilitación en Salud.
Métodos: se realizó un estudio experimental en estudiantes de tercer año, entre enero 2023-diciembre 2024. Se aplicaron métodos teóricos: análisis-síntesis, inducción-deducción, histórico-lógico y modelación; empíricos: el pretest y postest. La metodología diseñada fue valorada por grupos de expertos mediante la técnica Delphy con el objetivo de ajustarlo y derivar recomendaciones para su aplicación.

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Resultados: se diseñó y validó una metodología para el desarrollo de habilidades investigativas en estudiantes de la carrera Licenciatura en Rehabilitación en Salud. Tras su aplicación, se constató un desarrollo significativo, destacan especialmente en las habilidades conocimiento de la habilidad investigativa: emplear las TIC, trabajar en equipo multidisciplinario para la toma de decisiones en los tratamientos terapéuticos y rehabilitadores, y aplicar evidencias científicas en la práctica clínica de la rehabilitación.
Conclusiones: la metodología no solo favoreció la adquisición de conocimientos teóricos, sino potenció la aplicación práctica de habilidades investigativas en contextos reales de atención y rehabilitación. Fue valorada satisfactoriamente por los expertos.
DeCS: investigación cualitativa; apoyo a la investigación como asunto; educación profesional; estrategias; capacitación; aprendizaje; educación médica

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INTRODUCTION

Currently, globalization and rapid technological evolution require professionals to be constantly updated and to adopt a critical and creative vision to solve social challenges. It is not enough to apply technical knowledge; it is essential to understand the social context in order to design sustainable and equitable solutions.[1]

Ruiz-Arnaud *et al*.,[2] point out that Cuban higher education is undergoing curricular transformation processes that reflect the constant and accelerated scientific, technological, social and cultural changes. This process is evidenced in the transition from curriculum D to E, based on the formation of a generalizing mode of action; and it refers to concrete ways to materialize the relationship between education and society, with a professional approach aimed at developing in the graduate a comprehensive personal information system. This

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system not only implies the acquisition of knowledge, but also a deep emotional commitment and a solid professional identity.

A recent analysis of higher education in Cuba underlines that curricular transformation: "... is oriented towards an integrative model that combines the cognitive and socio-affective dimensions, strengthens the study-work link and balances national leadership with contextualized and flexible university management".[3] This process of updating study plans seeks to respond agilely to the demands of social and scientific-technical development, training professionals with the necessary competencies to contribute effectively to the Cuban social project.

It is argued that in contemporary professional training: "... the research dimension is a fundamental pillar, since it develops in the student the capacities for critical thinking, analysis and creativity essential for solving complex problems; (...) this specialization process must be anchored in higher education institutions, which are uniquely equipped to offer deep, rigorous and evidence-based training in a specific area of knowledge".[4]

The transformation in university education is essential for it to respond to new social and technological demands, especially in such sensitive sectors as health. In Cuba, this implies a joint effort to update professional training, and integrate advanced biomedical technologies in order to prepare the specialists necessary to continue improving the quality of life of its population.

For García-Hevia *et al.*,[5] formative research focuses on learning and developing research skills from early stages of higher education, while scientific research in the strict sense corresponds to the generation of new knowledge and the advanced research function of the university at postgraduate levels. This differentiation is key to designing educational policies and curricula that adequately integrate research at all educational levels and strengthen the university research mission.

The review of previous works by authors mentioned by Morales-González *et al.*,[6] express the importance of developing these competencies in higher education, their capacity to form

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autonomous, critical individuals capable of contributing to scientific and social development. However, the lack of robust theoretical modeling on these competencies in higher education evidences the need to deepen research that addresses their development in an integral and contextualized way, beyond specific professional training.

The University of Medical Sciences of Sancti Spíritus shows a favorable environment for the development of research, supported by the curricular mastery of students and where scientific activities are involved, which strengthens educational quality and contribution to scientific advancement in the health area. The objective of this work is to design a methodology for the development of research skills through the teaching-learning process of the main integrating discipline Rehabilitation in students of the Health Rehabilitation degree program.

METHODS

An experimental study was conducted at the Dr. Faustino Pérez Hernández Faculty, in the period January 2023-December 2024. The population consisted of the 80 enrolled students and the sample included the 45 third-year students (56.25 % of the total number in the degree program).

An intentional non-probabilistic sampling technique was used, taking into account that the third year is the key year for results when system analysis is applied to the curricular design of the academic program. From this year onwards, students consolidate theoretical, procedural and attitudinal content in a context of pre-professional practice.

Theoretical methods were used:

- Analysis-synthesis and induction-deduction: used to obtain, process and analyze the information of the variables used, the interpretation of the results obtained, writing the report and conclusions of the study; in all cases moving from the abstract to the concrete.

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- Historical-logical: used to understand the bibliographic background, its comparison with the reviewed articles, and in writing the logical foundations of the theoretical framework.
- Modeling: used in the conception and design of the applied methodology.

Empirical methods:

- Student questionnaire: before applying the methodology and after its completion, (pretest and posttest); its purpose was to obtain empirical data on the student's knowledge of research skills.

The cognitive dimension was considered with its respective indicators measured on a four-category ordinal scale: Very adequate, Quite adequate, Adequate and Inadequate (MA, BA, A and I)

Cognitive dimension: expresses the mastery the student has over the knowledge of research skills in the teaching-learning process of the main integrating discipline Rehabilitation for professional practice (knowing):

- Indicator 1. Argue the process related to the evaluation of health technologies and quality of services in the rehabilitation area
- Indicator 2. Identify problematic situations in the rehabilitation care area
- Indicator 3. Select and apply scientific methods and techniques for data collection and analysis associated with the rehabilitation care area
- Indicator 4. Apply scientific evidence in the clinical practice of rehabilitation
- Indicator 5. Use multidisciplinary teamwork for decision-making in therapeutic and rehabilitative treatments
- Indicator 6. Use ICT
- Indicator 7: Communicate results

The structure of the methodology described by De Armas-Ramírez *et al*.[7] is assumed for the design and structure of the proposal in stages that contemplate actions aimed at developing

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research skills from the teaching-learning process of the discipline during activities in education at work.

The designed methodology was evaluated by groups of experts using the Delphi technique in order to adjust it and derive recommendations for its application and the projection of new research.

The ethical aspects of the study were analyzed and approved by the Ethics Committee and the Scientific Council of the aforementioned faculty. Informed consent was obtained in writing from each of the students. The objectives of the study were explained and the voluntary nature of participating or withdrawing at any time was established. The data obtained were used only for research purposes, without disclosing personal data of the participants.

RESULTS AND DISCUSSION

As the main result of this research, a methodology for the development of research skills in students of the Health Rehabilitation degree program was designed and validated; structured in a theoretical-cognitive apparatus and a methodological-instrumental one, represented in Figure 1. It contains educational actions for the developm of research skills.

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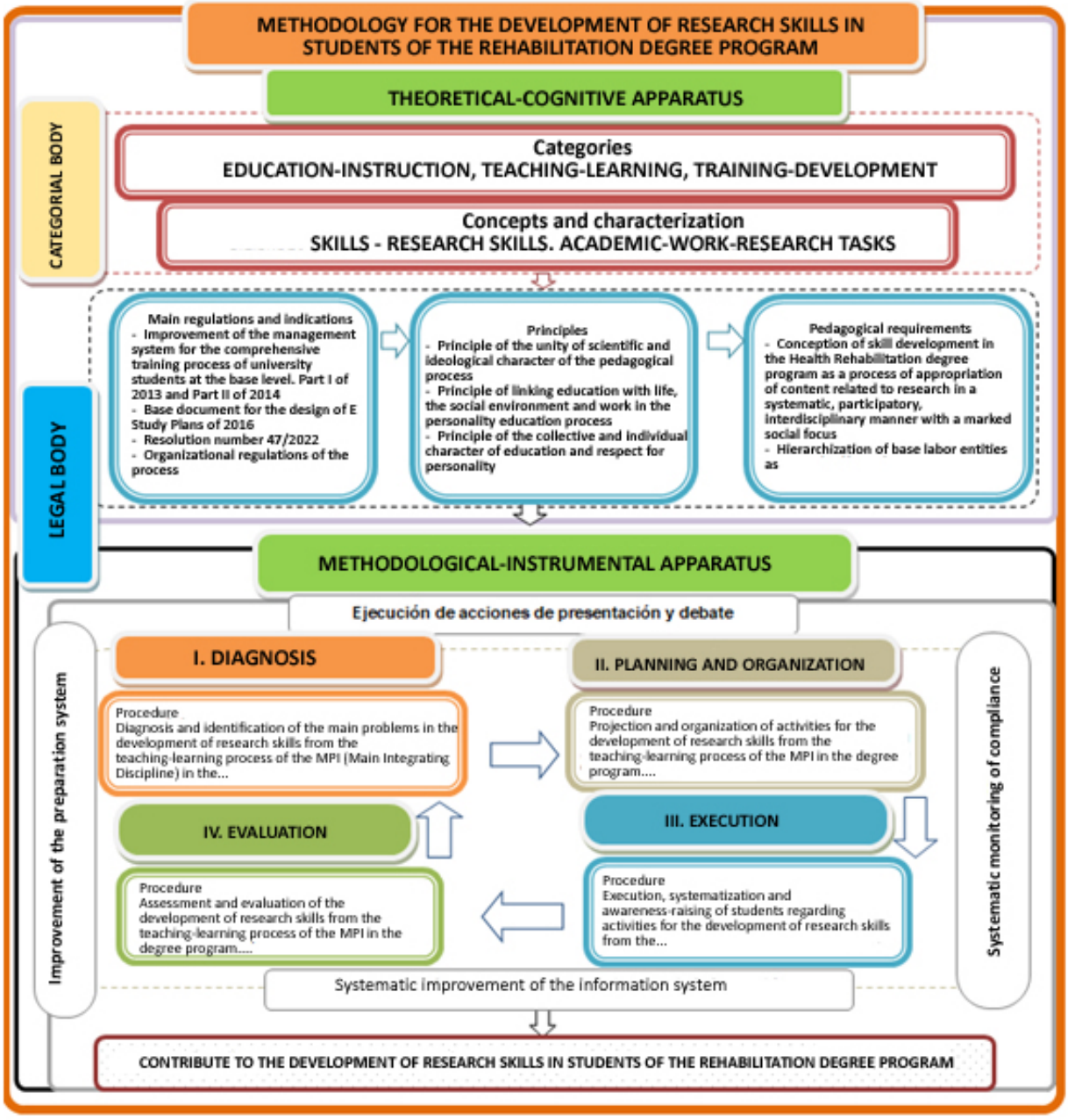

Fig.1. Design of the proposed methodology for the development of research skills

Source: own elaboration.

Out of a total of 37 possible experts, 24 achieved a Kc. between 0.8 and 1 (classified by the author as high); 8 obtained a Kc. between 0.7 and 0.75 (classified as medium); and only 5 of them obtained a Kc. between 0 and 0.6 (classified as low).

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The work with these experts consisted of two rounds in which they issued their critical judgments regarding the design of the methodology. In the first round, they expressed that its elaboration required improvement. Among the fundamental criticisms and questions, it was pointed out that the structure needed to be rectified due to the excessive number of stages without adequate explanation.

After these initial observations were corrected, the improved elements were presented to them, which showed a substantial change and a higher degree of maturity compared to the first round. The second round was then carried out and the 24 considered that all the proposed aspects were pertinent and of a high degree of relevance.

After implementing the methodology, the posttest was applied, obtaining the results presented in Table 1 and Figure 2.

Comparatively, in the pretest the Inadequate level predominated in all indicators; while in the posttest the figures increased to the Very adequate level, as observed below:

Pretest. Inadequate Level:

- Indicators 1 and 2: 82.22 %
- Indicator 3: 88.88 %
- Indicators 4 and 5: 84.44 %
- Indicator 6: 51.11 %
- Indicator 7: 86.66 %

Posttest. Very Adequate Level:

- Indicators 1, 2, and 3: 88.88 %
- Indicators 4 and 5: 93.33 %
- Indicator 6: 97.77 %
- Indicator 7: 86.66 %

After implementing the methodology, no student was placed in the Inadequate level, which justifies its application in the context for which it was designed.

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Table 1. Evaluation of indicators related to the development of research skills according to students. Health Rehabilitation Degree Program. January 2023-December 2024

Indicators	Very adequate		Quite adequate		Adequate		Inadequate	
	Pre test	Post test	Pre test	Post test	Pre test	Post test	Pre test	Post test
1	0	88.88	4.44	4.44	13.33	6.66	82.22	0
2	0	88.88	4.44	4.44	13.33	6.66	82.22	0
3	0	88.88	2.22	4.44	8.88	6.66	88.88	0
4	0	93.33	4.44	6.66	11.11	0	84.44	0
5	0	93.33	4.44	6.66	11.11	0	84.44	0
6	0	97.77	22.22	2.22	26.66	0	51.11	0
7	0	86.66	4.44	8.88	8.88	4.44	86.66	0

Source: pretest and posttest.

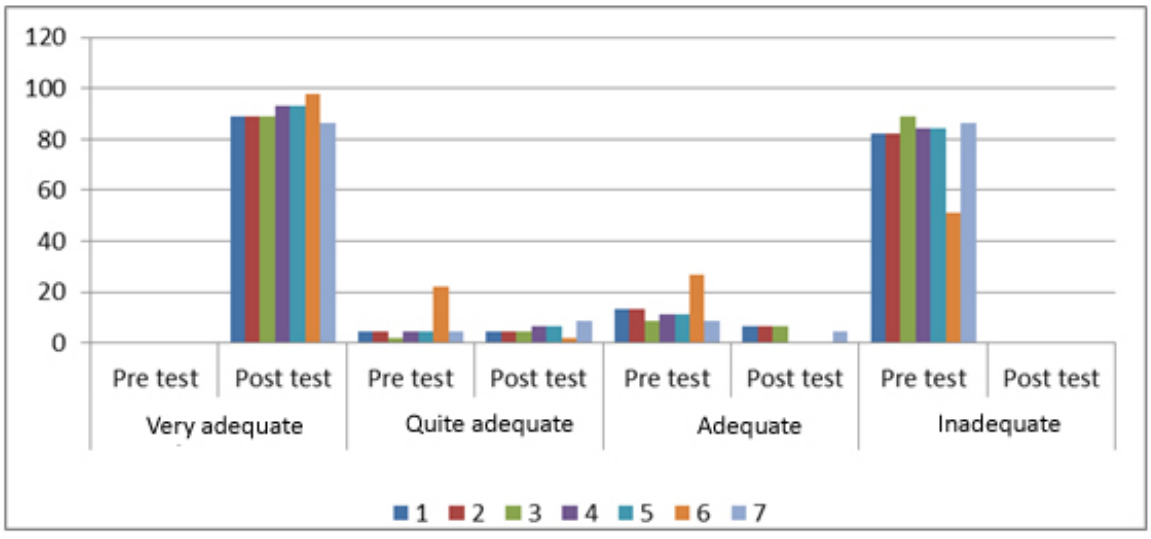

Fig. 2. Evaluation of indicators related to the development of research skills according to students. Health Rehabilitation Degree Program. January 2023-December 2024

Source: pre test and post test.

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Research skills, according to Chávez-Ayala *et al*.,[8] are essential in academic activity; their absence anticipates poor performance and very low-quality academic-scientific production. These allow university students to apply the scientific method to identify problems, acquire and clarify knowledge, and formulate well-founded conclusions, which is essential for comprehensive and balanced training.

The study observed a predominance of the female sex among participants, as well as a greater number of students in their third year of the degree program.

Regarding knowledge related to research skills, it was evident that in the pretest, their levels were not adequately aligned with the research demands necessary for solid training in research. However, in the posttest, significant development of these skills was observed in the students.

The students achieved the Very adequate level in the skills: using ICT (97.77 %), using multidisciplinary teamwork for decision-making in therapeutic and rehabilitative treatments (93.33 %) and with the same percentage, applying scientific evidence in the clinical practice of rehabilitation. These results demonstrate the positive and effective contribution of the implemented methodology, showing that a well-designed educational intervention can significantly enhance research skills in university students. This not only improves their academic performance but also strengthens their ability to face scientific and professional challenges autonomously and critically.

Indeed, there is little specific research on the measurement of research skills in students of the Health Rehabilitation degree program. However, studies have been conducted that address their development and evaluation in related careers, although with different approaches and methods than the present study.

For example, Hernández *et al.,*[9] in their quasi-experimental study at a Mexican university showed that a workshop where problem-based learning was applied significantly improved skills for formulating research questions and designing methodologies in health sciences

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students, measured using validated rubrics. The results showed that 85 % of the students in the experimental group achieved a competent or higher level, compared to 45 % in the control group, evidencing the impact of active methodologies.

Valverde-Ayte[10] evaluated the level of attitude towards research in 72 Medical Technology interns specialized in Physical Therapy and Rehabilitation in Metropolitan Lima. In this study, the female sex predominated, with 51 participants (70.83 % of the total). The participation of interns from public and private universities was almost equitable, which brought diversity to the analysis.

The authors consider that these results reflect the need to strengthen educational and motivational strategies to improve research attitude in students of this specialty, as a key component for the development of research competencies and active participation in scientific and academic processes.

Barbachán-Ruales *et al.*,[1] focused on determining basic research skills, considered the starting point and fundamental support for the development of more complex competencies in research, in 30 university students in the technological area. The results showed that the majority (56.7 %) were in a neutral position, that is, they neither disagreed nor agreed regarding their mastery or development of these basic skills. On the other hand, 23.3 % stated they disagreed with possessing these skills; while only 13.3 % agreed and 6.7 % totally agreed regarding their mastery of them.

In the authors' opinion, these data reflect a general perception of uncertainty or insufficiency in the development of basic research skills among students of that technology faculty. Since these skills constitute the basis for learning and advanced research practice, it is essential to implement pedagogical strategies from the initial stages of university education.

Valenzuela-Santoyo *et al.*,[11] described the level of mastery of research skills and research competencies in 40 postgraduate education students, divided into two groups according to the type of institution funding: public (n=20) and private (n=20). In the group of students enrolled in a doctoral program at a public institution, the results highlighted that the skill

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"evaluating" was the most developed, with a mean of 4.00 and a standard deviation of 0.60, indicating a high and consistent level in this competency; while "synthesizing" was the least developed, with a mean of 2.25 and a standard deviation of 1.21, which expresses low mastery and greater variability among students.

Oseda-Gago *et al.,*[12] at the National University of Cañete, analyzed the relationship between digital competencies and research skills in 155 students. The results showed that 65.07 % had a good level of digital competencies, while 63.01 % achieved a good level of research skills. Furthermore, a direct, strong and highly significant relationship was found between both variables, with a correlation coefficient of 0.896 and a p-value of 0.000, indicating that the greater the mastery of digital competencies, the greater the development of research skills.

The authors of this study confirm that this relationship suggests that adequate handling of digital tools facilitates the research process, from searching and evaluating information to preparing projects and theses, especially in virtual teaching contexts such as those imposed by the COVID-19 pandemic. Therefore, strengthening digital competencies in students is key to enhancing their research skills and their autonomy in learning.

The study by Marmol-Castillo *et al*.,[13] evaluated 96 students in the second semester of the Business Administration degree program at the Salesian Polytechnic University, along with five teachers of the Research Methodology subject. The objective was to obtain an in-depth view of the current state of research skills training and professional competencies, also considering an approach aligned with neuroeducation. It investigated whether the contents of the subject effectively contributed to the development of research skills. The results reflected an unpromising perception by students regarding the usefulness and correlation of the knowledge acquired in this subject with other subjects in the curriculum. In detail, only 12.5 % indicated they totally agreed and 19% agreed that what was learned in Research Methodology was significant for other learning. On the other hand, 26 % were neutral (neither agreed nor disagreed), while 19 % disagreed, and 23.5 % totally disagreed. Overall, this means that barely 31.5 % considered that the subject contributes significantly to their comprehensive training, while a large 68.5 % perceived it as not very significant.

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Gómez *et al*.,[14] at a Colombian university identified through focus groups that the factors that most influence the development of research competence are close and continuous tutoring, and the integration of real projects in disciplinary subjects. It was concluded that the development of research skills is not spontaneous, but requires intentional educational interventions, with a strong component of teacher guidance and practical contextualization.

Betancourt Bethencourt *et al.,*[15] at the Tula Aguilera Teaching Polyclinic in the municipality of Camagüey, Cuba, involved 50 fifth-year medical students studying the Public Health subject. During the interviews, various deficiencies related to their research skills were identified, among which stand out: they do not differentiate between the practical problem and the scientific problem, they are unaware that the research problem depends on a thorough review of existing bibliographic references, in the construction of the protocol they do not value social aspects in their correct dimension, they do not have sufficient ability to gather information from interviews, surveys, observations, and they lack skills in writing and referencing. The authors of this study emphasize that medical students should receive early and systematic training in research methodology, statistics, and research ethics from the beginning of their academic training.

Scientific contribution

The scientific novelty of the study lies in the practical integration of the designed methodology in rehabilitation services, from the dynamics of the teaching-learning process of the main integrating discipline of the Health Rehabilitation degree program, which enhances the development of research skills applied to the clinical reality required by the professional mode of action.

CONCLUSIONS

A methodology was designed which, once implemented, showed that it not only favored the acquisition of theoretical knowledge, but also enhanced the practical application of research skills in real care and rehabilitation contexts. This contributes to training more competent,

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critical professionals capable of contributing to the continuous improvement of rehabilitation processes and patient well-being.

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Declaration of interests

The authors declare no conflict of interest.

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