



Methodological approaches used in the teaching-learning process of Human Anatomy in the last 50 years and applications to undergraduate students in Physiotherapy

Abordagens metodológicas utilizadas no processo de ensino-aprendizagem de Anatomia Humana nos últimos 50 anos e aplicações aos graduandos em Fisioterapia

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Abstract

The content of Human Anatomy (HA) is considered one of the pillars of the curricular matrix that make up the basic cycle of undergraduate courses in the health area, serving as a subsidy for other curricular components, exactly as it happens in the undergraduate course in Physiotherapy. However, the literature points out difficulties during the course of the discipline, as it is an extensive and complex content. In this sense, this study aims to identify which methodological approaches are used in the teaching-learning process of the HA discipline and its applications for undergraduate students in Physiotherapy. For this purpose, an integrative literature review was carried out, using electronic databases - Google Scholar, SciELO and Capes Periodicals - applying the following keywords: "Teaching of Human Anatomy", "Human Anatomy and Education", and "Human Anatomy". A total of 1764 articles were found, of which, after evaluating the title and abstract, 179 were selected. Then we proceeded to read and collect information that pointed out a diversity of educational technologies and active methodologies aimed at teaching Human Anatomy. Mainly, in the last 20 years, realizing the importance of constant innovations in the teaching-learning process. However, a small portion of studies was directed to the Physiotherapy course. In addition, most studies have investigated proposals for educational technologies and methodologies, new and or adapted, to courses in the health field.

Keywords: Physiotherapy. Teaching. Didactic-Pedagogical Methods. Human Anatomy.



Resumo

O conteúdo de Anatomia Humana (AH) é considerada um dos pilares da matriz curricular que compõem o ciclo básico das graduações na área da saúde, servindo de subsídio para outros componentes curriculares, exatamente como acontece na graduação em Fisioterapia. Entretanto, a literatura aponta dificuldades durante a trajetória da disciplina, pois trata-se de um conteúdo extenso e complexo. Neste sentido, este estudo visa identificar quais as abordagens metodológicas utilizadas no processo de ensino-aprendizagem em AH e suas aplicações para graduandos em Fisioterapia. Para tanto foi realizado uma revisão integrativa da literatura, utilizando bases de dados eletrônicas – *Google Acadêmico*, *SciELO* e *Periódicos Capes* – aplicando as seguintes palavras-chave: “Ensino de Anatomia Humana”, “Anatomia Humana e Educação” e “Anatomia Humana”. Foram encontrados 1764 artigos dos quais após avaliação, leitura do título e do resumo, 179 foram selecionados. Em seguida procedemos a leitura e coleta de informações que apontaram uma diversidade de tecnologias educacionais e metodologias ativas voltadas ao ensino de Anatomia Humana. Principalmente, nos últimos 20 anos, constatando a importância de inovações constantes no processo de ensino-aprendizagem. No entanto, em sua maioria, os estudos investigaram propostas de tecnologias e metodologias educacionais, novas e/ou adaptadas, aos cursos da área da saúde e, uma pequena parcela de estudos direcionada a Fisioterapia.

Palavras-chave: Fisioterapia. Ensino. Métodos Didático-Pedagógicos. Anatomia Humana.

Introduction

Human Anatomy (HA) is considered one of the pillars of the curriculum in health graduation courses (VERRI *et al.*, 2011), composing the basic cycle of subjects that subsidizes the building of other course-specific curricular components (ARRUDA; SOUSA, 2014), exactly as it happens with the undergraduate course in Physiotherapy.

However, the complexity and extension of the contents approached in this curricular component may cause complications in the learning process and the course of the graduation. Among the adversities reported in the literature, the exotic and unusual nomenclatures, besides the difficulty in correlating theoretical content and clinical practice, promote other conflicts that transport to demotivation feeling in the student environment and consequently, the absence or loss of interest (CROCHEMORE; MARQUES, 2017; SILVA *et al.*, 2018).

In the face of the difficulties and the constant advance of technology, new approaches rise determined to make possible the learning process, the restructuring and edification of teaching, by exploring Educational Technologies, Active Methodologies, Educational Products and Information and Communication Technologies (ICT) (OLIVEIRA; WOLKERS, 2020) to enhance and improve the learning process.

Despite the exponential growth of new didactic resources, the teaching of HA is still narrowly inherent to the human corpse, this being the most used resource during classes (OLIVEIRA; WOLKERS, 2020). Although studies point out certain difficulties in the use and maintenance of cadaverous pieces such as, for example, donation difficulties, for their renewal. Their high financial cost, deterioration from constant use – sometimes even derailing the study, in addition to being obstacle for some students that show visual, tactile and olfactory repulse (COSTA; COSTA; LINS, 2012).

Nevertheless, in the perspective of fostering learning autonomy and to bring the students closer to the process of teaching-learning, is that the adoption of active methodologies and new teaching technologies is gaining space, transcending the



passivity of knowledge development, carrying the integration and familiarization of what is made available and so, making possible that their voice is active during all formation process (STRINI; STRINI; BERNARDINO JÚNIOR, 2020).

In this sense, the teaching of Anatomy has suffered reformulations on its praxis, aiming at improving and promoting its understanding, as well as its conceptual applications. Because of this panorama, and guiding the development of this research, we evaluated the approaches utilized in the teaching-learning process of Human Anatomy in the last 50 years and their applications for undergraduate students in Physiotherapy.

Methodology

The present work is an integrative review of literature, which was made through bibliographical research of electronic databases Scientific Electronic Library Online (SciELO), CAPES periodicals, and Google Scholar from January to March 2021. Next, from April to October 2021, the selection, evaluative reading, and data collection were carried out. The time space used for the research of articles was the period between 1920 and 2020. For this Search, the Keywords used were “Teaching Human Anatomy”, “Human Anatomy and Education” and “Human Anatomy”.

For the selection and evaluation of the studies, we established inclusion criteria (studies that approached the insertion of methodological alternatives in the teaching-learning process of Human Anatomy) and exclusion criteria (studies that did not approach such insertion). However, some studies such as, for example, literature review and opinion studies relevant to the theme, were used in the theoretical foundation and discussion. To include such studies on the data collection we used two criteria: 1) studies that discussed human anatomy teaching and; 2) studies that discussed or evaluated methodologies for the teaching of human anatomy. As exclusion criteria we used: 1) anatomy-specific studies that did not apply to the teaching process; 2) studies published on annals of scientific events, masters' dissertations, doctoral theses, and duplicated articles.

After the selection and reading of the articles, we proceeded to information analysis and data collect from each selected work. This way, the studies were grouped in three categories: 1) studies that applied already existent methodologies for human anatomy teaching, 2) studies that proposed new methodologies for human anatomy teaching, and 3) studies that developed and applied new technologies for human anatomy teaching. For all the selected articles, information was gathered in a Microsoft Excel spreadsheet for the quantification of the following data: Author, Year, Title, Objective, Methodology, Scenery, Result, Application, and Evaluation. Besides, hoping to comprehend and evaluate the Human Anatomy teaching trajectory from 1970 to 2020, the publications were grouped by decade.

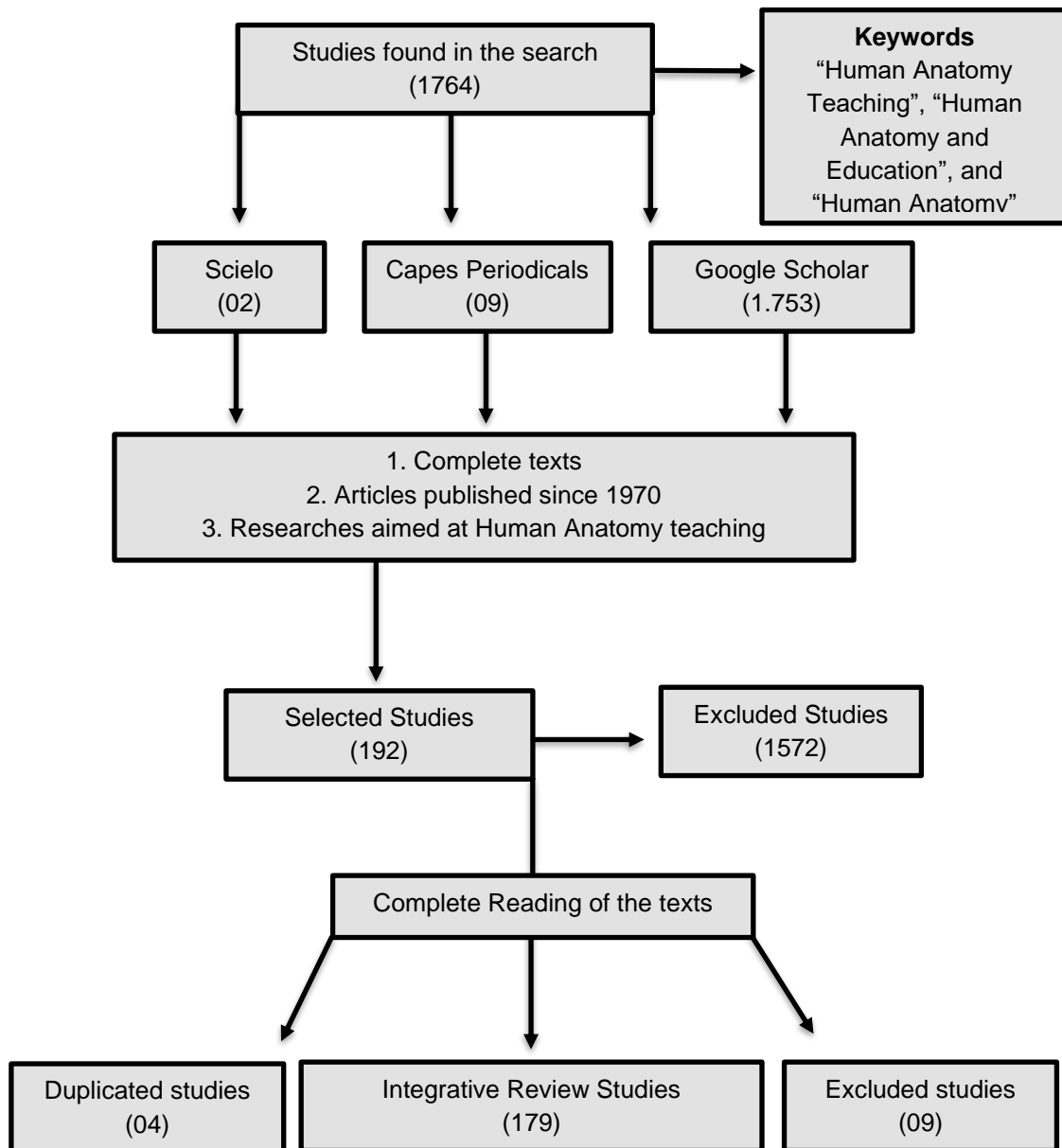
Results

With the application of the adopted strategy for data collection, 1764 articles were found, distributed in the following manner: (02) two in SciELO, (09) nine in CAPES periodicals and 1753 in Google Scholar. Then, the articles were evaluated by reading



the titles, and abstracts which fit in the study’s theme, which resulted on the selection of 192 publications, with 1572 being excluded. By the end of this process, we still excluded (04) four more publications for being duplicated and (09) nine for not fitting in the inclusion criteria, resulting in a total of 179 articles, which were read in full by the authors (Image 1).

Image 1 – Flowchart referent to the steps of the data search process for the evaluation of publications related to Human Anatomy teaching.

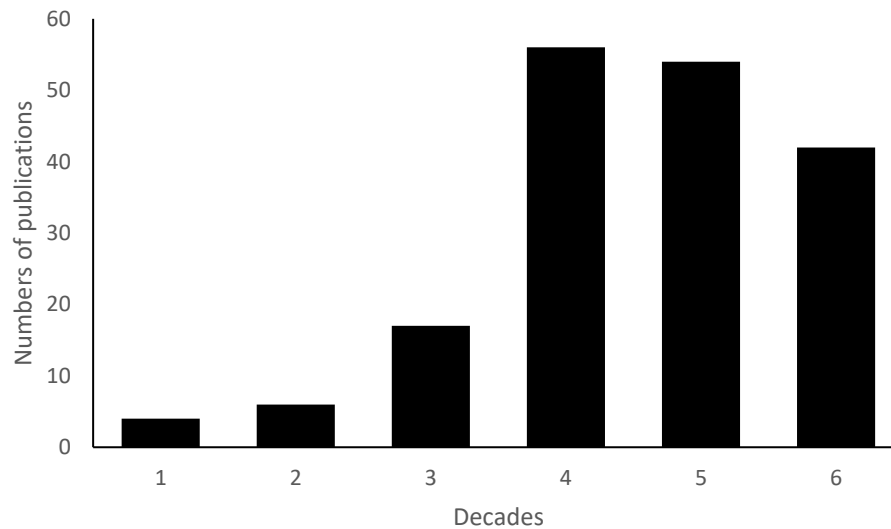


Source: Elaborated by the authors (2021)

The distribution of the publications pointed out an increase in researches and methodological propositions with new educational tools applied to Human Anatomy teaching. A substantial increase in the last 20 years (Image 2). Throughout the analyzed period, from 1970 to 2020, the decades of 2000/2009 and 2010/2019

concentrate a bigger number of publications, while the decade of 1970/1979 showed smaller production.

Image 2 – Number of publications related to Human Anatomy teaching distributed from 1970 to 2020.



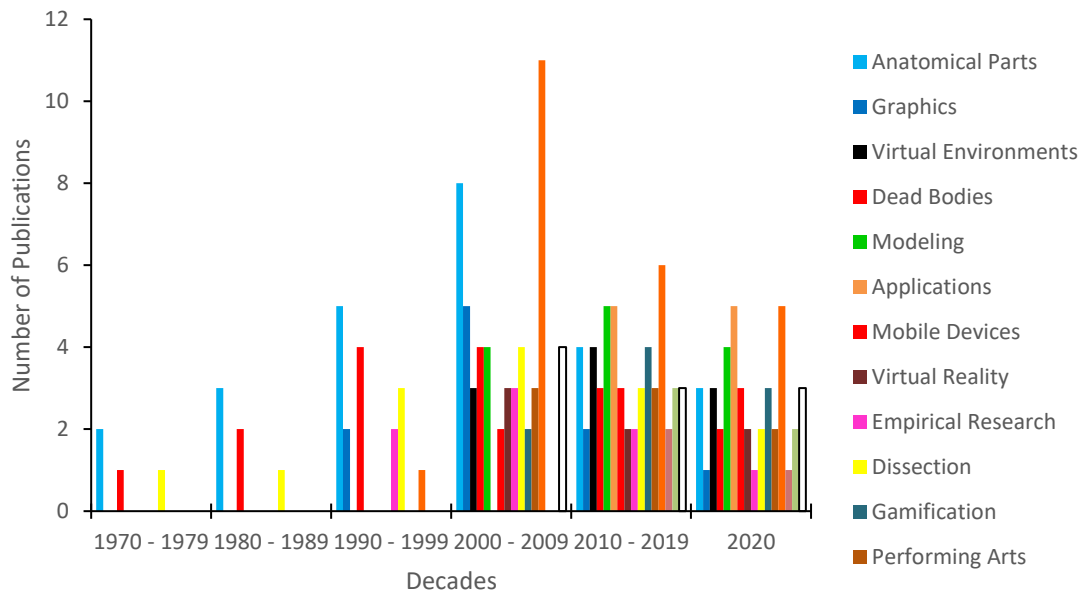
Source: Elaborated by the authors (2021)

When evaluating the distribution and the objectives of the researches, we could observe the constant increase in publications with a proposal of new teaching methods and tools for anatomy altogether. There was constant growth in publications from 2000 onwards. Such researches with a bigger focus on validation on teaching methods and techniques, generating possibilities for experimentation and evaluation of vases in distinct sceneries. (Image 3)

The sceneries, apart from one or another focusing on basic and elementary education, gave priority to technical and university education. More specifically, we could see that with the advance of digital technologies, the utilization of images was the research object in a bigger number of publications (Image 3). Nevertheless, we could also observe the addition of other methodological tools that intensified in the last 10 years, such as, virtual environments, molding, applications (including *software*), mobile devices, virtual reality, gamification, conceptual maps and active methodologies (several).

In addition, we could notice the presence of the utilization of traditional anatomical pieces, drawings, dissection and corpses, which are constant through time, showing a simple reduction for the use of corpses in the last years.

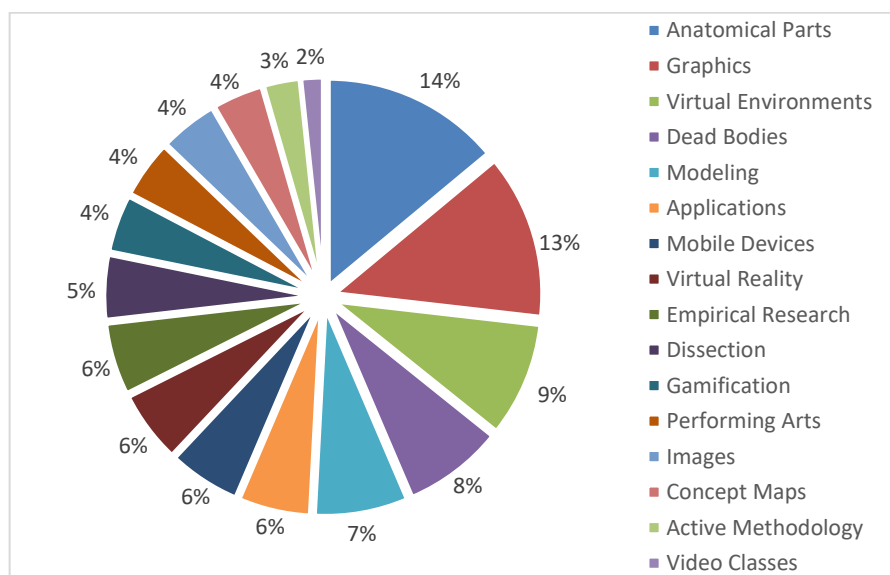
Image 3 – Number of publications and methodological tools related to Human Anatomy teaching distributed in the period from 1970 to 2020.



Source: Elaborated by the authors (2021).

In these publications, the utilization of anatomical pieces and the Virtual Learning Environments (VLE) were the most evaluated and used as teaching tools, making a total of 14% and 13% of the evaluated publications, respectively. In contrast, virtual reality and video classes were the least evaluated and used as teaching tools (3% and 2%, respectively) (Image 4).

Image 4 – Percentage of occurrence of methodological tools utilized by the 179 publications from 1970 to 2020 related to Human Anatomy teaching evaluated.



Source: Elaborated by the authors (2021).

Discussion

Human Anatomy teaching aims at comprehending the structures that make the human body. Over Years its teaching has been guided by theoretical presentations that has little interact with the students, resulting in monotony and lack of interest. Allied to expository classes are the practical demonstrations that make the classic duo in the teaching-learning process in several undergraduate courses. However, in other spheres, such as basic and elementary education, the outlook is different. This way, it is up to the teacher to create a more attractive class, putting more dynamism into the activities. In this sense, we could observe with the results of this research significant advance in the creating of methodological proposals that make the teaching praxis and the teaching-learning process easier. It is notorious the creation and amplification of methodological proposals for the teaching allied to the advance of technology, which undoubtedly contributed to leveraging the progress of the teaching-learning process (COLARES *et al.*, 2019; BOFF *et al.*, 2020). In the last years, it could be observed the dissemination and utilization of active methodologies in teaching in all levels of education (KFOURI *et al.* 2019). This diversification in teaching methodologies is related to the technological advance currently experienced.

The importance of utilizing teaching methods for the learning of Human Anatomy in courses of the health field, especially in an undergraduate course in physiotherapy was evident in all articles evaluated. Among the types of approaches carried out, we can highlight the use of cadaveric pieces, that even not being the study object of some researches, has an almost unanimous use as an teaching method, mostly used during classes. In all the decades here analyzed, the use of anatomical pieces, corpses e dissection are methodologies that cannot be missed in this discipline. According to Costa, Costa and Lins (2012) 88,9% of the students “consider their use indispensable in anatomy classes”, despite other works of literature pointing them as a hindrance for some students, on a smaller scale.

About the possibilities of teaching with human corpse, dissection is highlighted, because according to Pereira *et al.* (2014), gives the students the possibility of correlating the structures with “diverse pathologies, clinical and surgical procedures”, due to the realism, strengthens the clinical practice in accordance to the theoretical contribution. Furthermore, image techniques and a clinical problems resolution can enhance the process (COLLIPAL, 2011).

However, the adversities of this methodology are also depicted. Among them we can mention the use of formalin (PEREIRA *et al.*, 2013), emotional maturity of the undergraduate students (COSTA; COSTA; LINS, 2012), scarcity and good conditioning (ARRUDA; SOUSA, 2014), besides high financial cost ad difficulty to renew corpses and pieces (PEREIRA *et al.*, 2014). And as much as the traditional teaching approach in Human Anatomy has an extensive explanation in literature, new methods emerge as a complementary tool to learning, without the purpose of usurping the importance of using the human body. These innovations present themselves through alternatives with low cost-effective, easy access, portability, realistic images, evaluation tools e favoring the comprehension of the object study. Studies show that the use of multiple teaching methods improves the understanding capacity of the students (FORNAZIERO & GIL, 2003; JOHNSON *et al.*, 2012), since they arouse abilities and curiosity.



But, to use an approach different from the conventional, it is necessary to extract a diagnosis of all the teaching-learning process, that runs across the difficulties faced by the students, to the way the content is explored by the teacher. And although the research made by Cardinot *et al.* (2014) states that for the undergraduate students of physiotherapy, the study of Human Anatomy is fundamental to achieve professional excellence, corroborating the data obtained by Martineli *et al.*, (2019) and Arruda e Sousa (2014), sometimes they show demotivation and can't see clinical applicability to what was learned.

Even with its importance being recognized by the students, it is noticeable a lack of interest related to the discipline, which may be linked to the number of work and content approached in a short amount of time, points that express the learning vulnerability, causing the adoption of mechanical knowledge (ARRUDA; SOUSA, 2014). These authors still highlight that the difficulties shown by students related to Human Anatomy are due to the memorizing content of the discipline, the lack or inexistence of clinical correlation, the lack of clinical application, and lack of finality with the teacher's methodology (ARRUDA; SOUSA, 2014).

Among the contributions brought by the students, adoption of other approaches that aim at the learning correlated to the clinical practice and the non-memorizing of the structures, besides the adoption of more practical classes, for example, Palpatory Anatomy (ARRUDA; SOUSA, 2014), is a significant indicative of what can be explored through the discipline course.

Another methodology found in the literature was the utilization of diagnostic imaging tests, once they show importance to the clinical diagnosis, besides subsidizing its treatment and consequently, a positive prognosis. Among the images studied, emphasis is given to radiography, computed tomography, and magnetic resonance (SILVA; ALMEIDA, 2019). However, to describe the results shown, it is necessary knowledge in Human Anatomy, but due to the time dedicated to imageology, comprehension is vulnerable. Starting from superficial knowledge, showing a lack of deepening the practice, and inconsistent knowledge then (FEITOZA *et al.*, 2019).

The use of Concept Maps (CM) was one of the active methodologies approached by Brito *et al.* (2017) and SILVA *et al.* (2018), and in these researches, students initially had difficulties Building the CMs, with this building being described as complex. However, despite the initial obstacles, this tool was described by the teachers as facilitator of a meaningful learning, also exposing possible gaps in the acquired knowledge.

Generally speaking, the studies that make up the sample here evaluated, show a diversity of educational technologies and active methodologies oriented to teaching Human Anatomy and its growth in parallel with the technological advances. However, a small portion of them is directly oriented to the undergraduate course in Physiotherapy. Most of the studies show an approach and investigation regarding undergraduate courses in the health field. It is also noticeable that the utilization of methodologies such as images, applications, and molding appeared in the last 20 years, and tend to grow due to the crescent utilization of technologies.



Final Considerations

The articles that make up the sample of the present research show a diversity of educational technologies and active methodologies oriented to the teaching of Human Anatomy. However, a small portion of these studies was directed to the undergraduate course in Physiotherapy. Still, the majority of the studies investigated technology proposals and educational methodologies, new or adapted, to the undergraduate courses in the health area, especially in the last 20 years, verifying the importance of constant innovation in the teaching-learning process.

Furthermore, they reveal the lack of studies that focus the teaching methodology for Human Anatomy in an undergraduate course of physiotherapy, focusing on the inherent specialties to the academic education of this professional. Such as factor corroborates with the lack of diversity in methods and techniques that have scientific verification and with application/replication inside the academic space.

However, the researches state in consensus the importance of theoretical teaching with practical applicability, stimulating clinical thinking, and bringing academic space and professional reality closer.

On the other hand, the approaches shown in this sample are diverse among themselves, containing educational technologies and the use of the human body itself. Nevertheless, despite the use of anatomic cadaveric pieces and dissection is frequently pointed out as the most common methodologies in health area undergraduate courses, low-cost and innovative proposals have gained notoriety, mainly for the conjuncture of making the student autonomous of their knowledge by actively ascending a solid building.

Generally speaking, we can conclude that the teaching of Human Anatomy has been a constant target of investigation and experimentation of new teaching technologies, following the advances of science, including digital technologies, especially in the last 20 years. And the addition of experiences during the teaching-learning process, with the increase of distinct methodological tools, have contributed to avoiding evasion, lack of stimulation an interest in the contents.

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