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Use of cadaveric pieces and synthetic models in the anatomy teaching in undergraduate nursing courses

Uso de peças cadavéricas e modelos sintéticos no ensino da anatomia nos cursos de enfermagem

Uso de piezas cadavéricas y modelos sintéticos en la enseñanza de la anatomía en los cursos de enfermería

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Abstract: Objective: to identify potentialities and difficulties of the use of cadaveric and synthetic pieces in the anatomy teaching in Nursing courses. **Method:** quantitative, cross-sectional and descriptive study. A questionnaire containing 23 questions was sent to the students of the Nursing course who finished the anatomy subject in 2015 and 2016. Data were analyzed with the help of statistical software denoted by absolute and relative frequencies. **Results:** the study included 132 students, 80.3% of them agreed that cadaveric pieces help the knowledge construction; 35.6% do not have difficulties in relating synthetic parts with cadaveric ones; 38.6% disagree that the use of cadaveric pieces alone is enough for learning; and 55.3% consider that the concomitant use of pieces helps the understanding. **Conclusion:** the use of cadavers in the anatomy teaching shows more potentialities when compared to the use of synthetic pieces. The associated use of these resources facilitates the teaching-learning process.
Descriptors: Anatomy; Nursing; Cadaver; Higher education; Nursing education

Resumo: Objetivo: identificar potencialidades e dificuldades do uso de peças cadavéricas e sintéticas no ensino de anatomia nos cursos de Enfermagem. **Método:** estudo quantitativo, transversal e descritivo. Um questionário contendo 23 perguntas foi enviado aos estudantes do curso de Enfermagem que finalizaram a disciplina de anatomia nos anos de 2015 e 2016. Os dados foram analisados com auxílio de *software* estatístico denotados por frequência absoluta e relativa. **Resultados:** participaram do estudo 132 estudantes, destes 80,3% concordaram que as peças cadavéricas ajudam na construção do conhecimento; 35,6% não apresentam dificuldades em relacionar peças sintéticas com as cadavéricas; 38,6% discordam que o uso somente de peças cadavéricas é suficiente para a

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aprendizagem; e 55,3% consideram que a utilização concomitante das peças auxilia o entendimento. **Conclusão:** o uso de cadáveres no ensino da Anatomia apresenta mais potencialidades quando comparado ao uso de peças sintéticas. A utilização associada desses recursos facilita o processo de ensino-aprendizagem.
Descritores: Anatomia; Enfermagem; Cadáver; Educação superior; Educação em enfermagem

Resumen: Objetivo: identificar las potencialidades y dificultades del uso de piezas cadavéricas y sintéticas en la enseñanza de la anatomía en los cursos de enfermería. **Método:** estudio cuantitativo, transversal y descriptivo. Se envió un cuestionario con 23 preguntas a los estudiantes del curso de Enfermería que terminaron la asignatura de anatomía en 2015 y 2016. Los datos se analizaron con la ayuda de un programa estadístico denotados por frecuencias absolutas y relativas. **Resultados:** el estudio abarcó 132 estudiantes, el 80,3% de ellos acordaron que las piezas cadavéricas ayudan a la construcción del conocimiento; el 35,6% no presentaron dificultades para relacionar las partes sintéticas con las cadavéricas; el 38,6% discreparon con el uso solamente de las piezas cadavéricas es suficiente para el aprendizaje; y el 55,3% consideran que el uso concomitante de las piezas ayuda a la comprensión. **Conclusión:** el uso de cadáveres en la enseñanza de la Anatomía presenta mayores potencialidades en comparación con el uso de piezas sintéticas. El uso asociado de estos recursos facilita el proceso de enseñanza-aprendizaje.
Descriptores: Anatomía; Enfermería; Cadáver; Educación superior; Educación en enfermería

Introduction

Anatomy is the science that studies the structure of the human body. The expression anatomy derives from the Greek word *Anatome*, which means "to cut into pieces" (*ana* = to cut; *tome* = into pieces). The first records on the dissection of human cadavers are from the XIX century B.C. in ancient Egypt.[1]

The anatomy teaching takes place from the direct observation of pieces and sections of anatomical structures with the objective of relating them to their functions and to the modulations of structure in response to temporal, genetic and environmental factors.[2] Anatomy is a basic subject for all students admitted to the health area. Above all, in nursing undergraduate courses, it is the basis for the understanding of other essential subjects such as physiology, pathology and others associated with the care of the human being.[3,4] In addition, the anatomy teaching can contribute to the formation of the ethical behavior of nursing professionals.[5]

In order to consolidate the knowledge of anatomy, several teaching methods are applied. The most traditional method in the health area is structured in two different moments:

the first, in the classroom, where concepts and definitions of the different systems and organs of the human body are introduced, their interrelationship characteristics; in the second moment, practical classes are conducted in laboratories, using natural (cadaveric) and/or synthetic anatomical pieces that are able to help in the teaching-learning process.[6]

Besides the use of cadaveric pieces, the use of artificial anatomic models is a common practice in undergraduate health courses.[6] These innovative and alternative resources are intended to overcome the disadvantages that arise with the use of cadavers, such as, for example, insufficient quantity, difficulty in obtaining them, high cost for their maintenance, difficulties in proper storage, degradation caused by constant handling and the use of chemical and toxic products for their preservation.[7] Additionally, other tools such as e-learning, audios, videos, games and three-dimensional reality have been employed to complement the Anatomy teaching.[6-9]

Although the use of cadavers is recognized as necessary for the anatomy teaching, [6-9] the use of synthetic pieces and other technologies can contribute to the learning process. In addition, many students show concern at the moment prior to the procedure of seeing the cadaver for the first time, and may experience discomfort, weakness and nausea when contacting with it.[10] Studies have proven that it is relevant to consider the preferences of students, [6] the facilities of each educational resource and the contributions of the use of cadavers and technologies in the anatomy teaching.[9] Nevertheless, this evidence is mostly derived from research with medical students[6, 8-9]; and, in relation to nursing, there is a shortage of studies addressing these characteristics.[3,5]

For nursing, the anatomy teaching comprises the “basic axis” for the understanding of anatomical structures (shape and location), which allows the comparison with the structures of the living individual; promotes better understanding of the physiopathology, as well as clinical assessment, and the accomplishment of nursing procedures. Thus, in order to access the aspects

that can contribute to a better application of new resources in teaching, aiming not only the most effective teaching-learning, but also the training of a qualified professional, this study asked: what are the potentialities and difficulties in the use of cadaveric and synthetic pieces in the anatomy teaching in undergraduate nursing courses? The objective was to identify the potentialities and difficulties in the use of cadaveric and synthetic pieces in the anatomy teaching in undergraduate nursing courses.

Method

This is a quantitative, cross-sectional and descriptive study. The population was composed of undergraduate students of the Nursing courses: Bachelor Degree (80 students/year) and Bachelor Degree and Licentiate (50 students/year) from a higher education institution located in the countryside of the State of São Paulo, who finished the Anatomy subject in the years 2015 and 2016, regardless of having been approved or not. In this regard, 260 invitations were sent.

In the aforementioned institution, anatomy is a subject that makes up the program of the first year of the courses. The anatomy teaching is characterized by the method of teaching anatomy in systems, which are introduced to students in theoretical and practical classes. In this educational model, the first practical class of each system is conducted with synthetic pieces. In a dynamic way, students are prepared to identify and know the body topography interrelated with physiological functions. In turn, the second practical class is conducted with cadaveric pieces preserved through the process of formalization.

Firstly, students were invited via e-mail. In the invitation, there were explanations about the purpose of the study and the questioning about what would be the best date and time to apply the questionnaire.

In order to collect data, we prepared a structured questionnaire (Survey type) composed of previously established closed questions, capable of identifying the evaluation of these

students regarding the potentialities and difficulties of using cadaveric pieces and synthetic models for the anatomy teaching in the nursing area. This questionnaire was designed based on scientific literature,[11,12] structured in three parts, containing 23 questions and responses by means of a Likert scale of five alternatives. The first part of the questionnaire evaluated the use of cadaveric pieces; the second part evaluated the use of synthetic pieces; and the third part evaluated the concomitant use of these pieces in the anatomy teaching. The questions addressed the easiness in handling and the reliable representation of structures, thereby facilitating the achievement of learning objectives.

The instrument was evaluated by a committee consisted of three specialists with experience in nursing education, who evaluated the contents of the instrument, observing to what extent the matter of interest was contemplated by the items, analyzing if these were adequate to the universe of content that defined the variables of interest of this study. The questionnaires, together with the Free and Informed Consent Term (FICF) were delivered to those interested in taking part in the survey on the scheduled days and times.

The responses were double-typed in Microsoft Office Excel® 2010 and exported to the Statistical Package for the Social Sciences (SPSS) software, and the absolute and relative frequencies of the variables investigated in the study were calculated. The results were displayed in tables. This study was prepared in accordance with the guidelines contained in Resolution CNS 466/2012 for the development of research with human beings and authorized by the Ethics Committee on Research with Human Beings, and then approved according to CAAE number: 52683215.7.0000.5393, on March 7th, 2016.

Results

This study involved 132 undergraduate students in Nursing. Of these, 57 (43.2%) were undergraduate students of the Bachelor degree and 75 (56.8%) were undergraduate students of

the Bachelor degree and Licentiate in Nursing. Among the undergraduates, 115 (87.1%) were women and 17 (12.9%) were men.

Table 1 displays the responses concerning the characteristics of the first part of the questionnaire that evaluated the potentialities and difficulties of the use of cadaveric pieces in the anatomy teaching in the undergraduate course in Nursing.

Table 1 – Evaluation of nursing students regarding the use of cadaveric pieces in the Anatomy teaching, Ribeirão Preto/SP, Brazil, 2016-2017.

Variables	Fully agree N (%)	Agree N (%)	Neutral N (%)	Disagree N (%)	Fully disagree N (%)
1.1. The contact with the cadaveric pieces met my expectations.	52 (39.4)	62 (47.0)	13 (9.8)	5 (3.8)	-
1.2. The use of cadaveric pieces has contributed to the construction of my knowledge.	106 (80.3)	26 (19.7)	-	-	-
1.3. The cadaveric pieces make it easier to visualize the anatomical structures.	73 (55.3)	34 (25.8)	13 (9.8)	10 (7.6)	2 (1.5)
1.4. The anatomical structures in the cadaveric pieces are very similar to the structures of the human body.	49 (37.1)	56 (42.4)	22 (16.7)	4 (3.0)	1 (0.8)
1.5. I did not have difficulty in identifying the anatomical structures in the cadaveric pieces. *	8 (6.0)	22 (16.7)	34 (25.8)	53 (40.2)	12 (9.0)
1.6. The structures of the cadaveric pieces correspond to the images displayed in the books and anatomy atlases.	11 (8.3)	45 (34.1)	38 (28.8)	31 (23.5)	7 (5.3)
1.7. The contact with the cadaveric pieces aroused feelings of anguish and discomfort in my person.	2 (1.5)	4 (3.1)	6 (4.5)	43 (32.6)	77 (58.3)
1.8. I was able to handle the body pieces without feeling disgust.	77 (58.3)	35 (26.5)	12 (9.1)	5 (3.8)	3 (2.3)
1.9. During the classes, I did not see the corpses as dead people, but just as technical pieces.	37 (28.0)	37 (28.0)	30 (22.7)	18 (13.6)	10 (7.7)

* Non-respondents in item 1.5: n (%) = 3 (2.3).

Table 2 displays the responses of students regarding the potentialities and difficulties of the use of synthetic pieces in the anatomy teaching in undergraduate nursing courses.

Table 2 – Evaluation of nursing students regarding the use of synthetic pieces in the Anatomy teaching, Ribeirão Preto/SP, Brazil, 2016-2017.

Variables	Fully agree N (%)	Agree N (%)	Neutral N (%)	Disagree N (%)	Fully disagree N (%)
2.1. The contact with the synthetic pieces met my expectations. *	35 (26.5)	43 (32.6)	30 (22.7)	16 (12.1)	7 (5.3)
2.2. The use of synthetic pieces has contributed to the construction of my knowledge. *	50 (37.9)	54 (40.9)	21 (15.9)	4 (3.0)	1 (0.8)
2.3. The synthetic pieces make it easier to visualize the anatomical structures.	46 (34.8)	55 (41.7)	19 (14.4)	11 (8.3)	1 (0.8)
2.4. The anatomical structures in the synthetic pieces are very similar to the structures of the human body. *	11 (8.3)	30 (22.7)	44 (33.3)	36 (27.3)	10 (7.6)
2.5. I did not have difficulty in identifying the anatomical structures in the synthetic pieces.	35 (26.5)	52 (39.4)	19 (14.4)	19 (14.4)	7 (5.3)
2.6. The structures of the synthetic pieces correspond to the images displayed in the books and anatomy atlases.	29 (22.0)	59 (44.7)	28 (21.2)	12 (9.1)	4 (3.0)
2.7. The contact with the synthetic pieces aroused feelings of anguish and discomfort in my person.	1 (0.8)	1 (0.8)	0 (0.0)	20 (15.2)	110 (83.2)
2.8. I was able to handle the synthetic pieces without feeling disgust.	92 (69.7)	21 (15.9)	2 (1.5)	3 (2.3)	14 (10.6)

* Non-respondents in items 2.1, 2.2 and 2.4, respectively n (%): 1 (0.8); 2 (1.5); 1 (0.8).

Table 3 displays the responses of students regarding the potentialities and difficulties of the concomitant use of cadaveric and synthetic pieces in the anatomy teaching in undergraduate nursing courses.

Table 3 – Evaluation of nursing students regarding the concomitant use of cadaveric and synthetic pieces in the Anatomy teaching, Ribeirão Preto/SP, Brazil, 2016-2017.

Variables	Fully agree N (%)	Agree N (%)	Neutral N (%)	Disagree N (%)	Fully disagree N (%)
3.1. I was able to relate, without difficulties, the structures in the synthetic pieces to those of the cadaveric pieces.	21 (15.9)	47 (35.6)	23 (17.4)	34 (25.8)	7 (5.3)
3.2. I believe that the use of both types of pieces has made it easier to understand the content.	73 (55.3)	42 (31.8)	9 (6.8)	6 (4.5)	2 (1.6)
3.3. I believe the use of synthetic pieces alone is enough for my learning.	1 (0.8)	2 (1.5)	1 (0.8)	34 (25.7)	94 (71.2)
3.4. The synthetic pieces are the best resource for the learning of anatomy.	0 (0.0)	5 (3.8)	21 (15.9)	52 (39.4)	54 (40.9)
3.5. The cadaveric pieces are the best resource for the learning of anatomy.	50 (37.9)	51 (38.6)	16 (12.1)	11 (8.3)	4 (3.1)
3.6. I believe that the use of cadaveric pieces alone is enough for my learning.	9 (6.8)	19 (14.4)	32 (24.3)	51 (38.6)	21 (15.9)

Discussion

The responses of the surveyed students show that the use of cadaveric pieces for the anatomy teaching is capable of meeting learning expectations and helping in the construction of knowledge, besides being considered as a good resource for teaching. Anatomy is a propaedeutic subject that contributes to the development of skills of nursing students for health care, since it allows the construction of knowledge about the shape and location of the structures of the human body, correlating them with their functions[13]; and it also cooperates with the development of skills for nursing interventions. In addition, when it comes to the use of the cadaver, the student and the teacher can develop principles such as humanization and ethics.[14]

As the biological and anatomical sciences have gone through a great phase of evolution, many clinical and surgical procedures and treatments have followed this path, which makes nursing care increasingly complex. In order to make the nursing professional able to play its role, it is necessary to understand the anatomy, which will give this professional subsidies to operate the mechanisms that guide this practice, such as, for example, a thorough evaluation of the physical and clinical conditions of the patient and of the results of the applied treatments.[15]

The articulation of theory with practice in the anatomy teaching can collaborate to enhance the construction of knowledge by the student. The adoption of teaching strategies such as the use of cadavers, synthetic models, e-learning, videos and three-dimensional reality can foster the learning process, since it mobilizes various skills in the student.[6] For the teacher, the appropriation of the combination of practical and theoretical knowledge and the union of several teaching methods can contribute to the achievement of more dynamic and attractive classes.[16] In this context, we believe that the link between these factors and the integration between teacher and student provides the basis for the professional future, making them more capable when dealing with the body systems and, mainly, its complexities.

The evolution and the adoption of contemporary teaching methods and strategies in health education have enabled innovative and creative resources, such as computerized educational technologies, to be used in nursing courses. These technologies encompass interactive videos, computer simulations, interactive computer programs, text-books, atlases, images, synthetic anatomical models and organic pieces of non-human animals[6,8-9,17] capable of contributing to the teaching-learning process, making it easier for the student to properly perform his/her functions.

Regarding the feelings of the students associated with the handling of pieces in practical activities, the results highlighted that most students did not feel anguish, discomfort or repulsion (58.3%) when coming into contact with cadaveric pieces, which can be considered the first approach of the student with the cadaver.[18] Therefore, it is important to be attentive to the link between the technical aspects and the ethical-humanistic aspects, so that students develop skills for the daily actions of their professions without forgetting the humanization.[14]

Anatomy underpins nursing practices such as anamnesis, physical examination and bed bathing, identification of a musculature for vaccine application,[18] development of professional responsibilities and ethical and social commitment, although the latter are still processes under construction in the teaching-learning universe.[15]

As for the use of synthetic pieces, we noted that these elements did not arouse feelings of anguish and discomfort in the students, where this evidence was considered a potentiality. Nevertheless, for most students, the use of synthetic pieces alone is not enough for the teaching-learning of the human anatomy.

It is evident that, in the handling of synthetic structures, the feeling aroused in students may be of something unreal, artificial, false and/or unaltered,[14] incapable of generating any feelings of disgust or discomfort, unlike the feelings aroused by cadaveric pieces, through which students may show feelings of anxiety, expressions of disgust and fear or even repulsion. [10,12]

When the questionnaire asked if the students did not see the corpses as dead people, but as technical pieces, we noted a greater variety of responses, where 28% of the participants fully agreed, 28% agreed and 22.7% remained neutral in their responses, thereby denoting the importance of the teacher in reinforcing the attitudinal learning during the teaching of anatomy.

In this respect, we recommend to be cautious in such a way as to enable students to avoid the development of an excessively biological and technical view of cadaveric pieces, with fragmentation of the human body, which could provoke a depersonalization of the individual (not alive),[14] thereby excluding the integrity and humanization that these bodies bring with them. In practice, this biological and technical view undermines nursing care, because the professional ends up looking more at the disease, the pathology itself, than at the socioemotional side of the patient.[19,20]

In this context, the teacher, when planning teaching activities, should consider the articulation among cognitive, procedural and attitudinal learning processes, since it is pertinent not to fragment the structure of knowledge, which, in practice, is never learned and perceived in a separate way.[21]

As described above, the learning of attitudes should be part of the educational actions of the teacher, since the teaching of principles or ethical ideas helps people to make a judgment about the behaviors and their meaning.[21] Moreover, when learning attitudes, it is up to the teacher, from the beginning of the course, to reinforce to the new student that the learning will be constructed to achieve the objective of training, i.e., the care of the patient/human being, which is not only an organ or a pathology. Accordingly, the communication of health professionals with the most severe patients generates a type of care focused on the technique and on the controls of a physiological nature, where these workers are unable to deal with feelings of pain and death in their professional life, due to the absence of an integral and humanized vision of the patient/family during their training. [19-20]

Currently, the colleges have focused on a new aspect that seeks innovative teaching strategies, aiming at inserting the student in an ethical, critical, reflexive and transformative educational practice, thereby overcoming the limits of purely technical training, in order to effectively achieve the formation of the human being as a historical being, inscribed in the dialectics of action-reflection-action, proposing to the student the ability to develop an integral and humanized vision in human care.[21]

When the students were asked if the contact with the cadaveric pieces met their expectations, 39.4% fully agreed and 47% agreed; regarding the synthetic pieces, 26.5% and 32.6% fully agreed and agreed, respectively.

A study conducted in a teaching institution in the northeast of Brazil showed the perceptions of students regarding the teaching-learning process of the anatomy subject; it was found that, for 93.4% of the students, the use of synthetic mannequins was the main model adopted for the practical anatomy classes. The authors warn about the lack of corpses in the institutions and about the difficulties to acquire them, thereby emphasizing the importance of other methods that allow the students to have more affinity with anatomy and be more active in their learning.[22]

Students are expected to feel anxious and enthused for the first anatomy class or that may feel scared in front of the human cadaver. Similarly, they may not show any feeling because the fact of thinking that it will be just another subject contributing to their training as professionals, regardless of their expectations. Eager, enthusiastic, frightened or indifferent, they may show difficulties in learning human anatomy; however, a study showed that the motivation of students for learning can improve their academic performance.[23]

For some authors, the use of educational books, images and synthetic reproductions of the human body is seen as a fantastic means of study for students and health professionals, since it has facilitated the search for information and gives an idea of the anatomical structures,

thereby contributing to its visualization. [3,9,18,24] Complementarily, the anatomic computer programs also offers students three-dimensional images of the structures and are seen as an additional support for its identification. [9, 13, 24]

When asked if synthetic pieces are similar to the structures of the human body, 33.3% of the students remained neutral in their responses and 27.3% disagreed. It is worth highlighting that 44.7% of the participants believe that the synthetic pieces correspond to the images displayed in the anatomy books and atlases, possibly because this representation is more related to the educational issues of the subject and that make it easier to visualize and understand compared to the exact representation of the structures of the human body.

With regard to cadaveric pieces, 42.4% of the participants agreed that they are similar to the structures of the human body; 37.9% and 38.6% fully agreed and agreed, respectively, that cadaveric pieces are the best resource to learn anatomy. Nevertheless, in the present study, 40.2% of the participants reported having difficulties in identifying anatomical structures. This result suggests that, even being a human body, structures may suffer alterations due to the handling, the preservation and the degradation.[13]

Among the students, 55.3% and 31.8% of them fully agreed and agreed, respectively, that the use of the two types of pieces (synthetic and cadaveric) facilitated the understanding of the content; and 35.6% agreed that they could relate, without difficulties, the structures in the synthetic pieces to those of the cadaveric pieces. A survey that evaluated the perception of students about the anatomy teaching showed that they find it difficult to memorize the names of structures; however, the evidence reaffirms that the use of cadavers facilitates their learning,[18] which is a result similar to the findings of this study.

When asked if synthetic pieces are the best resource for learning, 40.9% and 39.4% fully disagreed and disagreed, respectively. When asked if the use of cadaveric pieces alone is enough for learning, 38.6% of the students disagreed. These results reaffirm that the new teaching resources

can be used concurrently with the cadaveric pieces, but not as a substitute for them, since they serve as a support and complement to the student in the teaching-learning process. [13-15, 24]

Conclusion

This study has shown that the use of cadavers in the anatomy teaching has more potentialities when compared to the use of synthetic pieces. Although cadavers may suffer alterations in their structures over time, due to the handling, the preservation or the degradation, nursing students have positively judged their use for knowledge construction. We have noted that the use of synthetic models is positive in the teaching-learning process, as long as it is associated to cadaveric pieces as a complement to the student.

The evidence of this study was limited to the sample size and the inclusion of students from a single educational institution. Nevertheless, we hope that it may contribute to the planning and inclusion of anatomy teaching strategies, specifically for undergraduate nursing courses, in such a way as to meet the expectations of the students by bringing them closer to the exercise of nursing. The potentialities and difficulties related to the use of cadaveric and synthetic pieces can be explored through other instruments that contain more objective questions, including other nursing education institutions from different regions of Brazil and covering technological resources, in order to improve teaching methods.

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