



EDUCATION

Anatomical prosection practices in the Occupational Therapy degree. Student anxiety levels and academic effectiveness^{☆,☆☆}



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ABSTRACT

Context: The practice of anatomical dissection and/or prosection on human cadavers is an essential component of human anatomy training programmes. However, this activity can be stressful for inexperienced students when exposed to cadavers for the first time, and it may generate high anxiety levels. The aims of this study are threefold: 1) to analyse the thoughts and feelings of first-year students of the Occupational Therapy degree about prosection practices; 2) to examine their anxiety levels in relation to these practices; and 3) to evaluate how useful and effective they are as an educational tool for anatomy training. **Methods:** This is a before-and-after cross-sectional study of first-year students of the Occupational Therapy degree at the Universidad de Castilla-La Mancha, Spain. These students had not previously participated in prosection practices. An anonymous questionnaire was distributed among the students before and after the practice, in order to examine their feelings and perceptions during the practice. To examine their anxiety levels, we used a State-Trait Anxiety Inventory (STAI) questionnaire. To assess their learning outcomes the students had to complete two practical tests of recognition of anatomical structures, one before attending the practice and one immediately afterwards.

Results: Basal anxiety levels, measured as trait anxiety (TA), remained stable and did not show significant differences during the practice ($p > 0.05$). Their emotional anxiety, measured as state anxiety (SA), dropped from 14.7 to 10 points ($p < 0.05$) after the practice. Before the start of the practice 11 students (19%) showed signs of anxiety, and these remained so at the end of the practical session ($p > 0.05$).

As for their academic performance, we observed that the number of students able to pass the test after attending the prosection practice increased notably (by more than 60%). Additionally, 100% of the students recommended that the practice be retained for future courses, giving it an approval rate of 9.1 out of 10.

Conclusion: Although anatomy is usually an attractive subject for Occupational Therapy students and they value prosection practices positively, they remain a potentially complex and stressful experience. Some students find that their experiences in the dissecting room can upset their emotional balance, however, the implementation of coping mechanisms could be a very effective strategy to reduce their anxiety and also to improve their learning outcomes, helping to strengthen their practical knowledge of anatomy as

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we have observed in this study. The students not only value positively these practices, they also believe that they are an extremely useful tool for both teaching and learning anatomy, and they recommend their routine use as part of the training process.

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1. Introduction

A good knowledge of anatomy is a fundamental component in all Health Sciences disciplines. Therefore, human anatomy is a scientific subject that sits at the core of all Health Sciences educational programmes, in most cases as a compulsory subject taught during the students' first academic year at university. The current European higher education framework, created as a consequence of the Bologna Process, establishes that in order to gain the skills necessary for the development of their future professional practice students must combine the theoretical aspects of their education (the acquisition of knowledge) with an active participation in the learning process (through the acquisition of practical skills). Therefore, together with the different educational activities intended to foster the achievement of the necessary learning outcomes, it is also crucial to develop training strategies directed at the acquisition of practical skills from the very beginning of the students' university training.

The practice of anatomical dissection on human cadavers has a long tradition in medical school programmes (Ghosh, 2015), but it is not such a frequent part of the training in other Health Sciences disciplines (i.e., Nursing, Physiotherapy, Speech and Language Therapy, or Occupational Therapy). In these cases, access to practices might be limited by technical questions or by lack of materials and human resources (Vidal et al., 2016; González-López and Cuerda-Galindo, 2012). This has been the case with Occupational Therapy, where the recent introduction of prosection has proven very popular with students, who consider that it gives them a better understanding of the human body (Horne et al., 1990; Miguel-Pérez et al., 2007; Bati et al., 2013; Lempp, 2005; Sandor et al., 2015; Arráez-Aybar et al., 2004, 2008). However, and despite their perceived usefulness, dissection and prosection practices can also be stressful for students, in that they imply seeing, touching and general sensorial awareness of a human cadaver, as well as, bringing up religious, moral and philosophical issues (Tschernig and Pabst, 2001; Leboulanger, 2011; Bob et al., 2015; Arráez-Aybar et al., 2007). Up to 16% of medical students claimed to have thoughts about diseases and death when faced with a cadaver (Mompeó-Corredera, 2014; Lempp, 2005; Boeckers et al., 2010).

Practices on human cadavers are one of the students' first professional contacts with death, and therefore they can generate stress and anxiety responses (Miguel-Pérez et al., 2007; González-López and Cuerda-Galindo, 2012; Leboulanger, 2011; Bob et al., 2015; Bati et al., 2013; Arráez-Aybar et al., 2004). However, the experience is perceived as very useful for their training since the cadaver represents an "almost perfect model" (Vidal et al., 2016), better than any alternative material according to 76% of the students (Mompeó-Corredera, 2014; Sandor et al., 2015; Qamar and Osama, 2014). Anxiety is an emotional adaptive response to uncertain or alarming situations, and it forces us to act and to find an appropriate response to deal with them. Reactions, feelings and anxiety levels in the dissecting room have been examined in different countries in the context of Medicine (Horne et al., 1990; Arráez-Aybar et al., 2004; Leboulanger, 2011; Bob et al., 2015; Boeckers et al., 2010; Getachew, 2014), Odontology, Speech and Language Therapy and Pharmacy students (Bati et al., 2013; Redwood and

Townsend, 2011; Criado et al., 2017). Some of these studies also include brief references to Occupational Therapy (Arráez-Aybar et al., 2007, 2008).

The aim of this study is to examine the thoughts, perceptions and anxiety levels of the students in relation to the prosection practices with human cadavers, as well as, to explore the effectiveness of the use of prosection as an educational strategy within the Occupational Therapy degree course.

2. Materials and methods

This is a descriptive epidemiologic cross-sectional before-and-after study of first-year students of the Occupational Therapy degree, who enrolled in the "Human Anatomy and Physiology" course (n = 58 students) at the Occupational Therapy, Speech and Language Therapy and Nursing Faculty at the "Universidad de Castilla-La Mancha" (UCLM) in Talavera de la Reina (Toledo, Spain).

The Human Anatomy and Physiology course with 12 ECTS/120 h, 4 ECTS/40 h of which are practical. These practices are carried out in laboratories where anatomical models, bones and atlases of human reconstructions by dissection plans and microscopes are used.

These students had never previously participated in prosection. The study explores a practical session that took place during the academic year 2016/2017 in the dissecting room of the Faculty of Medicine at Ciudad Real (UCLM), with the participation of lecturers from the Medical Sciences departments of both faculties. Participation in the study was voluntary. Each student was equipped with a personal protection kit (lab coat, mask and gloves). Half an hour before the start of the practice the students received an anonymous questionnaire designed ad hoc for this study, collecting variables regarding their thoughts, emotions and perceptions (Criado et al., 2017). This questionnaire was number-coded by the students themselves, so that it could be paired with a second questionnaire to be completed immediately after the practice (although to avoid possible bias the students were not informed at the time that there would be a second questionnaire).

To evaluate their anxiety levels, we used a State-Trait Anxiety Inventory (STAI) questionnaire. The STAI, which has been validated for use in Spanish, is a self-administered test that was developed as a research instrument to assess levels of anxiety in otherwise healthy adults. It consists of 40 questions that measure two different, but interrelated, types of anxiety: state anxiety (SA) and trait anxiety (TA). Trait anxiety (TA) is a relatively stable emotional state that indicates a personal disposition to perceive everyday activities as threatening. It is an individual characteristic that reflects feelings that are usual and basal. State anxiety (SA), on the other hand, reflects subjective and fleeting feelings of tension, apprehension and fear that can change or fluctuate in intensity with time. It can increase as a response to different kinds of tension, and likewise it can be reduced with the use of relaxation techniques. Therefore, it is a valid indicator of an individual's response to specific situations of stress. In both cases the questionnaire records the intensity with which certain feelings and sensations of anxiety appear in a given moment, with scaling responses that range between 'nothing', 'a bit', 'quite a lot', and 'a lot' (0, 1, 2 and 3 points, respectively). As each one consisted of 20 questions, the scores obtained range between 0 and

Table 1
Student's thoughts before the practical session.

		Yes		No	
		n	%	n	%
Thinking about dissection evokes...	Anxiety	6	10.3	52	89.7
	Displeasure	2	3.4	56	96.6
	Curiosity	51	87.9	7	12.1
	Uncertainty	26	44.8	32	55.2
	Fear	3	5.2	55	94.8
Which is the most unpleasant experience in the dissecting room?	Seeing the cadaver's face	25	43.1	33	56.9
	The smell of the dissecting room	36	62.1	22	37.9
	Touching the cadaver	12	20.7	46	79.3

In none of these cases are there statistically significant gender differences regarding their thoughts ($p > 0.05$).

60 points per questionnaire, with higher scores being correlated with higher levels of anxiety. The STAI test provides a score for SA and another for TA. The absolute value of the difference between the SA and TA scores indicates whether an event creates anxiety. Dissection is considered to create anxiety for those individuals whose score is higher than 10 points (STAI-Total > 10). The sum of the SA and TA scores yields the total STAI-Sum (Spielberger et al., 2002; Arráez-Aybar et al., 2004; Casado et al., 2012). The STAI has been validated for use with a Spanish population and has a Cronbach's α of 0.93 for TA and 0.92 for SA (Fonseca-Pedrero et al., 2012).

A month before the start of the prosection practice, once the students had finished the theoretical and practical section of the module "Locomotor system and Neuroanatomy", the students underwent a practical test of their recognition of ten anatomical structures (Test 1) using illustrations that had to be labelled. The only practical material accessed by the students thus far in this course had been anatomical models.

The prosection practice lasted four hours, divided into two two-hour sessions (Session 1: "Locomotor system and Neuroanatomy"; Session 2: "Splanchnology"). After finishing this practice, and without prior notice, the students had to undergo a practical test to ascertain their Knowledge of the anatomical structures that had been examined during Session 1 of the practice (Test 2), but this time the test was carried out using a human cadaver.

Afterwards the students were given an anonymous questionnaire designed ad hoc to obtain feedback on how useful, effective and satisfactory they perceived this experience to be, and what their thoughts were on the quality of the practice. Again, the questionnaires were number-coded by the students themselves, correlating it to the previous questionnaire, so that they could be paired.

The students were informed about the general aims of this study, which was also approved by the Ethics Committee in Scien-

tific Research from Talavera de la Reina (Toledo, Spain) (File CEIC 23/2017).

The descriptive and inferential statistics analysis used variable-scale parameters. We established a confidence interval of 5%. SPSS (*Statistical Package for the Social Sciences*) 15.0 for Windows was used in data analysis.

3. Results

A total of 63 students enrolled in the first-year Occupational Therapy degree course "Human Anatomy and Physiology". Of these, 58 students volunteered to participate in this study (81%). Their mean age was 20 ± 2.01 years (mean: 20 years; range: 18–28), and 93.1% were female ($N = 54$).

The most common thought among the students before the practice was "Curiosity" (87.9%, $N = 51$), while the most unpleasant sensation while in the dissecting room was the "Smell of the room" (62.1%, $N = 36$). In these responses there were no statistically significant differences in terms of gender ($p > 0.05$) (Table 1).

Generally, the students reported feeling "Calm" and "Confident" before the start of the practice (67.2% and 79.3% respectively) (Table 2). After the practice these percentages rose to 89.6% and 87.5%, respectively, with 85.4% of the students feeling "Comfortable" – as opposed to 86.2% previously ($p < 0.05$). There were no statistically significant gender differences in relation to their different feelings, neither for the whole of the student group nor for those who suffered anxiety ($p > 0.05$) (Table 2).

Basal anxiety levels, measured as TA, were stable and did not show differences after the practice ($p < 0.05$), only dropping from 17.3 to 15.3 points (Table 3). Their levels of state (or emotional) anxiety did show a marked decrease, dropping from 14.3 to 10.0 points ($p < 0.05$) (Table 3). Before the start of the prosection practice 11 students (19%) had shown symptoms of anxiety (STAI-Total > 10), and this number remained stable once the practice was over ($p > 0.05$).

Table 2
Students' feelings during the prosection practice.

	Before						After						Statistical significance
	Yes		Indifferent		No		Yes		Indifferent		No		
	n	%	n	%	n	%	n	%	n	%	n	%	
I feel calm	39	67.2	18	31.0	1	1.7	43	89.6	3	6.3	2	4.2	$p < 0.05$
I feel confident	46	79.3	11	19.0	1	1.7	42	87.5	3	6.3	3	6.3	$p < 0.05$
I feel nervous	7	12.1	27	46.6	24	41.4	3	6.3	9	18.8	36	75.0	$p < 0.05$
I feel scared	3	6.3	6	8.3	49	85.4	3	6.3	4	8.3	41	85.4	$p < 0.05$
I feel happy	25	53.2	0	0	22	46.8	43	89.6	5	10.4	0	0	$p < 0.05$
I feel comfortable	50	86.2	8	13.8	0	0	41	85.4	2	4.2	5	10.4	$p < 0.05$
I feel relaxed	28	48.3	26	44.8	4	6.9	40	83.3	6	12.5	2	4.2	$p < 0.05$
I feel worried	4	6.9	17	29.3	37	63.8	4	8.3	8	16.7	36	75.0	$p < 0.05$
Do you feel emotionally prepared for entering the dissecting room?	34	58.6	20	34.5	4	6.9	38	79.2	5	10.4	5	10.4	$p < 0.05$

In none of these cases are there statistically significant gender differences regarding their feelings ($p > 0.05$).

Table 3
Anxiety levels among the students during the prosection practice.

	Before Mean \pm standard deviation	After Mean \pm standard deviation	Statistical significance
Trait anxiety (TA)	17.3 \pm 7.28 (median: 17.5)	15.3 \pm 7.47 (median: 15.5)	$p > 0.05$
State anxiety (SA)	14.6 \pm 6.56 (median: 13)	10.0 \pm 6.71 (median: 9.5)	$p < 0.05$
STAI-Sum (TA+SA)	32.0 \pm 11.79 (median: 29.5)	25.3 \pm 12.33 (median: 24)	$p < 0.05$

In none of these cases are there statistically significant gender differences regarding their anxiety levels ($p > 0.05$).

Table 4
Results of the anatomical structure recognition tests.

Number of correct answers	Test type			
	Test 1 (before)		Test 2 (after)	
	n	%	n	%
9–10	1	1.8	0	0
7–8	4	7.0	22	48.9
5–6	6	10.5	14	31.1
3–4	18	31.6	0	0
0–2	28	49.1	9	20
	57	100	45	100

This means that those students who experienced anxiety before the practice remained anxious, whereas the levels of state anxiety of the group as a whole decreased.

The results of the assessments indicate an increase in the number of students who passed Test 2 (80%, $N = 36$), as opposed to 19.3% ($N = 11$) that passed Test 1, prior to attending the prosection (Table 4).

Finally, 100% of the students recommended that the prosection practice be maintained for future courses, expressing being “Satisfied” or “Very satisfied” with it (19.1%, $N = 11$ and 78.7%, $N = 45$, respectively). The average rating of the experience was 9.1 ± 1.15 points out of 10 (mean: 9; range: 4–10). Also, 100% of the students considered that the prosection was very useful for their human anatomy training.

4. Discussion

Anatomy is a fundamental subject present in all the academic programmes of the different Health Sciences disciplines, and it is particularly popular with first-year medical students. However, as many studies have previously pointed out, dissection and prosection practices can also be upsetting and stressful for inexperienced students (Horne et al., 1990; Miguel-Pérez et al., 2007; Bati et al., 2013; Sandor et al., 2015; Arráez-Aybar et al., 2004, 2008). There is currently some degree of controversy among anatomists regarding what the best methods are for the teaching–learning process in this discipline, and in particular, about whether human cadavers should remain the main focus of human anatomy training (Patel et al., 2015; Mompeó-Corredera, 2014; Biassutto et al., 2006; Sandor et al., 2015; Redwood and Townsend, 2011). This has led to a search for alternative educational strategies, although the central role of human dissection practices in medical training has remained unchanged (González-López and Cuerda Galindo, 2012; Lempp, 2005; Qamar and Osama, 2014; Dissabandara et al., 2015; Ghosh, 2015).

Both dissection and prosection practices allow students to explore the human body in a real context, enabling them to appreciate even slight individual anatomical variations. These practices also allow them to connect different anatomical structures on a spatial level, paying special attention to their position and relationships to adjacent structures. They also allow students to exercise self-reflection and to internalize the cognitive and emotional skills required for future clinical practice (Ahmed et al., 2010; Rizzolo and Stewart, 2006). However, the increased cost of the materials and the

resources required to prepare, manipulate and preserve cadavers has made it necessary for some Health Sciences disciplines (such as Nursing, Speech and Language Therapy, Occupational Therapy or Physiotherapy) to opt for less costly alternatives, such as the use of anatomical models or computer applications – despite the learning outcomes not being the same.

There have been a few studies that have assessed the impact of hands-on practices (dissections or prosections) on Health Sciences students; however, most have focused on medical students (Pabst, 1993; Pabst et al., 2001; Arráez-Aybar et al., 2007, 2008; Bati et al., 2013; Criado-Álvarez et al., 2017). It is therefore necessary to further examine their effect. It is necessary to carry out evaluations on this subject on both undergraduate and postgraduate students (Pabst, 2002), not only in the Medical degree but also to extend it to all health sciences degrees. This may help to optimize the investment in methodological resources required for human anatomy training in other disciplines. Our study, which has yielded results like those published for other disciplines (Bati et al., 2013; Arráez-Aybar et al., 2007, 2008; Criado-Álvarez et al., 2017), is focused on the impact of prosection practices on the Occupational Therapy students.

For most students prosection practices are their first experience with death and/or physical exposure to cadavers, and some students find them very stressful (Tschernig and Pabst, 2001; Miguel-Pérez et al., 2007; Leboulanger, 2011; Boeckers et al., 2010). However, and although it can upset them emotionally (Arráez-Aybar et al., 2004, 2007, 2008; Getachew, 2014), most students still consider the experience satisfactory or even very satisfactory, and, in fact, 100% of our students recommended that it be retained for future courses – although the rates published by other studies only reach 85.5% (Mompeó-Corredera, 2014). Our result could be attributed to our highly motivated lecturers, who are aware of the importance of these practices as an educational tool and have transmitted their enthusiasm to their students. This has a clear impact both in the positive perception of the practice, with students expressing their satisfaction and happiness with the experience (above 85% in both cases after finishing the session), as well as in terms of learning outcomes, with 80% of students scoring between 5–10 out of 10 after the practice (as opposed to only 19.3% that passed the previous test). It is noteworthy that although our students have been trained in a digital environment (which could make us expect them to be more comfortable and confident working with computer simulations and 3D anatomical models), they remain very satisfied with the practical experience and have no doubts recommending it – a fact observed by other researchers (Mompeó-Corredera, 2014; Leboulanger, 2011; Qamar and Osama, 2014). It is also important to note that the students' high degree of satisfaction with the practice matches their successful performance in Test 2, where the number of “passes” increased up to 80% (from 19.3% in Test 1). There is sufficient evidence that experiential learning is more effective and satisfactory for students, as it fosters learning from experience, action and interaction, involving their bodies, minds and emotions in the process (Ros and Verdick, 2003; Berkhout et al., 2017). Also, the practical effect of these methodologies has to be taken into account, as they allow the students to examine real anatomical structures,

which makes positioning them and connecting them with adjacent structures easier than using any atlas or anatomical model. As for those aspects of the practice on human cadavers that were perceived as negative, 62.1% of students remarked on “Smell” as an unpleasant factor, in line with the results published by similar studies (Bati et al., 2013; Cahill and Ettarh, 2009; Qamar and Osama, 2014; Dissabandara et al., 2015). This result, however, is still lower than those published elsewhere, which can reach up to 70–80% (Mompeó-Corredera, 2014; Miguel-Pérez et al., 2007; Leboulanger, 2011; Arráez-Aybar et al., 2008). As for “Seeing the cadaver’s face”, our study indicated that 43.1% of students found it unpleasant, like other studies (Miguel-Pérez et al., 2007; Leboulanger, 2011).

In terms of the students’ anxiety levels, the observed drop in state anxiety could be attributed, as some researchers have suggested, to the use of coping mechanisms. We suggest that students, after going through the first session of the practice and during the ensuing break, were able to exchange insights, sensations and perceptions with their peers, with the resulting drop in their collective anxiety levels and fears of the unknown at the end of the practical session (Miguel-Pérez et al., 2007; Casado et al., 2012). This is a phenomenon that some researchers have called “socializing with death” (Lempp, 2005; Horne et al., 1990; Sandor et al., 2015). Other researchers have published similar data results for the STAI-Sum, with scores of 30.3 and 30.1 points ($p > 0.05$) before and after the first dissection practice, respectively (Leboulanger, 2011). Our study yielded scores of 32.0 and 25.3 points (Table 3), which is a statistically significant difference ($p < 0.05$), as has been noted elsewhere (Arráez-Aybar et al., 2004, 2007, 2008). However, the studies of Leboulanger (2011) and Bob et al. (2015) did not find a general drop in SA levels, which they attributed to the compulsory character of the practice (as opposed to ours, where attendance was voluntary).

Anxiety levels tend to drop as students attend more practices, with SA levels falling from 14.6 to 10.0 (Arráez-Aybar et al., 2004, 2008). Some researchers have advocated the use of audio-visual presentations or seminars prior to the practice as a precautionary measure or coping mechanism, believing that it could have a positive emotional influence in helping students cope with the stress caused by exposure to human cadavers (Tschernig and Pabst, 2001; Arráez-Aybar et al., 2004, 2008; Casado et al., 2012).

It might be that future studies offer different results, as this is the first time that this practice has been introduced to Occupational Therapy students, and their lack of experience also reduced the risk of them being biased (Bati et al., 2013; Arráez-Aybar et al., 2007). It would also be interesting to introduce coping strategies prior to practices with future groups, in order to evaluate their impact.

Practices on human cadavers are obviously nothing like dealing with a patient, but they are without doubt an unforgettable experience that will have a positive impact on students’ future professional practice as occupational therapists. The dissecting room fosters a positive learning environment for the students (Mc Garvey et al., 2001). The experiences gained therein are considered pivotal during anatomy training (Rizzolo and Stewart, 2006; Somanath et al., 2015).

Although there is a small percentage of students that are emotionally affected by their exposure to a human cadaver, most consider this kind of educational activity invaluable for their training, giving it a very high approval rate. Dissection and prosection practices improve students’ spatial reasoning skills and help them relate anatomical structures to their images as they are usually depicted, allowing for a better integration of cognitive and emotional skills – which can be appreciated in the results of their assessments.

5. Conclusions

The results presented in this study, together with the feedback expressed by the students themselves, are important factors that should be considered during the design of academic guidelines to improve the success of human anatomy courses – not just in terms of their learning outcomes, but also as a personal experience for the 7 students.

Accordingly, the study plan in Occupational Therapy regarding human anatomy and physiology should be revised and eventually modified.

The authors propose that from the four total practical credits ECTS of the subject, 1.5 ECTS (15 h) should correspond to prosection with cadavers. This should be a mandatory teaching part of human anatomy and physiology in the occupational therapy as a complement pre-existing teaching structures (2.5 ECTS/25 h). This involves changes and modifications in competences, objectives, practical contents and evaluation criteria of human anatomy and physiology, which must be approved by the relevant faculty and university committees and also by the Spanish Agency of Evaluation of Quality and Accreditation.

On the other hand, based on the studies by Pabst (1993, 2002) and Pabst et al. (2001) it is necessary that the anatomy teachers in the health sciences grades use evaluations (at the undergraduate level and also the postgraduate phase). This is necessary to evaluate the effectiveness of the used technologies, teaching hours of anatomy necessary for the curriculum in the health sciences degrees and emotional evaluations before the dissections or prosections to improve teaching.

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