

Dissection as a modulator of emotional attitudes and reactions of future health professionals

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CONTEXT There is ongoing discussion within the medical education community about dissection as an educational strategy and as a professional training tool in technical and emotional skills training.

OBJECTIVES This study aimed to discover the emotional reactions, attitudes and beliefs of new students faced with human cadaver dissection; to evaluate the changes produced in these variables by the exhibition and practice of dissection; to analyse the level of anxiety students feel when faced with death, and to elucidate the possible relationships between these items.

METHODS The study used a sample of 425 students who were first-time enrollees in a human anatomy course. Three new instruments were designed, with items covering emotional reactions (cognitive, physiological and motor reactions), beliefs and attitudes related to what the student expects to experience or has experienced in dissection. Death anxiety was measured using the Death Anxiety Inventory.

RESULTS As students gained more experience of dissection, their emotional reactions were reduced and their attitudes and beliefs changed. Statistically significant differences in the level of death anxiety emerged, depending on the perceptions students had of their degree of preparation for dissection, and

emotional control and deeper thoughts about life and death during dissection.

DISCUSSION The practice of anatomy allows the student to learn how to face up to and adapt his or her emotional reactions and attitudes; this gives human cadaver dissection great importance as an educational strategy and as a professional training tool in technical and emotional skills training.

KEYWORDS humans; male; female; adolescent; students, medical/*psychology; *attitude of health personnel; dissection/*psychology; *cadaver; *emotions; anxiety; *education, medical, undergraduate; anatomy/*education.

Medical Education 2008; **42**: 563–571

doi:10.1111/j.1365-2923.2008.03079.x

INTRODUCTION

Huge cultural changes have taken place in medical science from the 16th century to the present day. As a result, dissection no longer represents the great source of medical investigation it did in the 16–18th centuries, or the training tool or even the mere initiation ritual it did in the 19th and first half of the 20th centuries. In the late 20th century, dissection was even excluded from some teaching plans in the belief that new technologies could replace it, thus avoiding the emotional distress caused by, for example, the very real contact with death dissection affords. It is this distress, however, which may give dissection its formative role in the development of professional competence.¹

American sociologists were the first to theorise about the role of dissection in medical training. Initially, they observed that medical students felt reactions of suppression and repression when faced with dissection, but that this did not cause major educational problems.² In the 1970s, commentators pointed out that overcoming the emotions generated within a

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Overview

What is already known on this subject

Students confronted with anatomical dissection experience a range of different emotional reactions.

What this study adds

This paper analyses students' emotional reactions, attitudes and beliefs about the experience of dissection and levels of death anxiety, and elucidates the relationships among them.

Suggestions for further research

Continued investigation into the implications of both general and death-related anxiety in anatomy students for their performance would be valuable, given that a considerable proportion of student attention during practical dissection sessions is concentrated on controlling emotions and not on the task of dissection itself.

profession which works with death is one of the greatest difficulties of Year 1 medical students,³ who feel distressed, but repress their emotions and create mechanisms to develop a 'scientific attitude' of silence towards the emotional element.

In the 1980s some anatomists^{4,5} began to take an interest in the subject, but, at the beginning of the 1990s, the role of dissection was still rarely discussed and was perceived as being of little scientific interest.⁶ However, subsequent years saw an increase in interview-based^{4,7-9} and questionnaire-based¹⁰⁻¹³ research into the descriptive aspects of the physiological responses of students to dissection. In the current decade, investigations are focused on the emotional aspects. As a result of all of this, it has become clear that students require some preliminary emotional preparation¹⁴⁻¹⁷ and that humanistic values should be integrated into the anatomy curriculum,^{16,18,19} particularly in view of the fact that the student-cadaver relationship precedes and forms a model for the future doctor-patient relationship.^{7,10,11,20} However, very few studies have focused on the search for factors that determine these reactions, such as death anxiety.

Anxiety, fear and sadness are the most common emotional reactions to death,^{21,22} which, in our

society, is experienced as something strange and unforeseen, which interferes with our lives and which, most of the time, is far from our thoughts. This social rejection is transferred into the medical environment, where individual attitudes towards death may condition the ways in which professionals deal with death and the treatment they give to terminally ill patients. Higher levels of death anxiety in oncologists have been correlated with lower levels of efficiency in terms of attention to patients.²³

However, 21st-century health professionals should be capable of confronting death, just as they confront illness.²⁴ A first step in the preparation of health professionals will require them to learn about their own attitudes towards and emotional responses to death.

One variable which may have an important influence on death anxiety is the form in which it is perceived and faced.²⁵ Undoubtedly, one of the first situations in which a future health professional is confronted with death is in the dissection room (DR), where the experience may be made into much more than a tool for technical learning.²⁶⁻²⁸ In this paper we set ourselves the following aims:

- 1 to discover the emotional reactions, attitudes and beliefs of new students faced with human cadaver dissection;
- 2 to evaluate the changes produced in these variables by the exhibition and practice of dissection;
- 3 to analyse the level of anxiety students feel when faced with death, and
- 4 to establish the possible relationships between these factors.

METHODS

Subjects

Participants were 425 students from three university courses: medicine ($n = 195$), occupational therapy ($n = 141$) and odontology ($n = 89$). All students were enrolled for the first time in a human anatomy course. A total of 79.6% were women and 20.4% men. Their average age was 18 years ($SD = 2.13$). Participation in the study was voluntary and anonymity was guaranteed. Participants cannot be identified from the material presented and no plausible harm to participating individuals can arise from the study.

Instruments

Three new instruments were designed (Table 1):

- a check-list of sensations, including sensations or reactions that the student expected to experience or did experience in dissection;
- a pre-session questionnaire, consisting of four sections covering attitudes and beliefs related to experiences prior to carrying out the first dissection, and
- a post-session questionnaire, consisting of eight sections covering beliefs and attitudes related to dissection, after having experienced it.

Death anxiety was measured using the Death Anxiety Inventory (DAI),²⁹ which gives an overall score and covers five areas: externally generated death anxiety; meaning and acceptance of death; thoughts about death; life after death, and the brevity of life. The DAI has been proven to show good reliability, with indices of internal consistency > 0.90, and correlations of 0.76–0.79 with other scales measuring attitudes towards death.

Procedure

All students carried out practical dissections on human cadavers. The DR had 18 work tables and each practical session was supervised by 2 teachers. The DAI was administered in the first weeks of the course, before the beginning of practical dissection sessions. The 3 new instruments described above were used in the first and last compulsory practical dissection sessions of the course. In both sessions, 2 points of measurement were established, immediately before (Pre) and immediately after (Post) the dissection session.

The 3 new instruments were completed by the students just before going into the DR (Pre-session) and immediately after leaving it (Post-session), and were administered in the first (Pre-1, Post-1) and last (Pre-2, Post-2) dissection sessions, with at least 6 months between the two. Thus the check-list of sensations was administered at the 4 time-points described (Pre-1, Post-1, Pre-2, Post-2), the Pre instrument at the 2 time-points immediately before the student entered the DR (Pre-1, Pre-2) and the Post instrument at the 2 time-points when the dissection practice ended (Post-1, Post-2).

Data were analysed using SPSS Version 14.0 (SPSS, Inc., Chicago, IL, USA).

RESULTS

Emotional reactions to the experience of dissection

The idea of 'performing a dissection' generates different types of emotional responses, which we have subdivided into cognitive, physiological and motor emotional reactions. Table 2 presents the percentages and frequencies shown by the students at the 4 time-points of measurement.

For cognitive emotional reactions, the results show that, prior to the first experience, dissection principally aroused reactions of curiosity (88.5%) and interest (74.1%). The sensation of uncertainty (68.8%) before the first session, declining sharply once students had finished their first dissection. Other sensations before the first experience of dissection were experienced by < 20% of students.

For physiological and motor emotional reactions, the principal reactions reported by students before performing dissection for the first time were nervous excitement (45.4%) and queasiness (31.3%). In both cases the percentage of students reporting the sensation decreased immediately after finishing the first dissection. This decrease was progressive until the last session of the dissection practice programme. Other reactions were initially reported by < 10% of students (palpitations, trembling, breathing difficulties and dryness of the mouth). Feelings of dizziness and nausea were demonstrated by smaller numbers of students.

McNemar's chi-square test was used to analyse statistically significant variations in the frequencies observed (Table 2).

First, we analysed the variations in the observed intra-session frequencies (Pre-1–Post-1 and Pre-2–Post-2). In the first session, statistically significant changes took place in the majority of emotional reactions shown by students. However, in the last session we found fewer statistically significant variations, especially in physiological reactions. These decreases were maintained.

In order to study the effect of the experience (inter-session), variations between the Pre-1–Pre-2 points were analysed. We found statistically significant drops in the cognitive reactions of curiosity, uncertainty, anxiety, worry and fear. Variations were observed in

Table 1 List of items covered in the questionnaire used in the present study

1AB Mark the sensation(s) you feel at the idea of dissection:

Anxiety	Disturbed breathing	Calmness	Curiosity
Disgust	Distaste	Dizziness	Dry mouth
Fear	Happiness	Horror	Interest
Nausea	Nerves	Palpitations	Pleasure
Queasiness	Revulsion	Satisfaction	Trembling
Uncertainty	Upset	Worry	Other:

2AB Do you/did you feel emotionally prepared to goin to the dissecting room?
 YES..... NO.....

3AB In the dissecting room, what do you think is most unpleasant?

No problem	The smell
Fear of an infection	Seeing the cadaver's face
Touching certain parts of the cadaver	Touching the cadaver in general.....
Which?	

4A Have you ever seen a dead body?
 NO Yes, a stranger Yes, a family member or friend.....

5AB For you, what is the cadaver? Mark only one option:
 An inanimate object..... A being who used to be alive.....

6B In the dissecting room, did you have any strong thoughts about life or death?
 YES..... NO.....

7B In the dissecting room, were you afraid of losing control? (crying, running away, leaving the room, shouting, etc)
 YES..... NO.....

8B Did you have to control your feelings in order to concentrate on your work?
 YES..... NO.....

9B During the dissection, did you give the cadaver a name?
 YES..... NO.....
 If so, what was it?

10B Did you see any jokes, or humorous or funny situations during the dissection or contact with the cadaver?

No, I did not seeany	I took part
I was against it	I felt bad when others did it
I did not mind other people doing it	Other:

A: asked in pre session B: asked in post session

the majority of physiological and motor emotional reactions.

It therefore appears that the responses most closely related to the emotional reaction which may be aroused by the anticipation of a new and unknown situation, such as physiological and motor responses, tend to become less apparent as a result of exposure, right from the first session (Pre-1–Post-1). This finding is confirmed by the

stability of the frequencies observed when comparing results (Pre-2 and Post-2) for the last session.

Similarly, we should point out that the responses which tended to remain stable over time, or even increased during the session, were those most closely related to cognitive reactions associated with the specific presence of the stimulus: nausea, revulsion and upset.

Table 2 Students whom marked each emotional reaction to the experience of dissection (expressed in percentages) and variation's analysis between the four points of measurement

	Pre1 (n = 425)	Post1 (n = 425)	Pre2 (n = 425)	Post2 (n = 425)	McNemar's χ^2 tests (P-value) df = 1			
					Pre1–post1	Pre2–post2	Pre1–pre2	Pre1–post2
Cognitive emotional reactions								
Curiosity	88.5	64.6	72.2	57.7	22.67*** (0.000)	92.22*** (0.000)	9.28*** (0.000)	10.06*** (0.000)
Interest	74.1	71.7	75.4	68.8	39.39 (0.247)	101.44** (0.001)	13.55 (0.918)	9.45* (0.010)
Uncertainty	47.5	15.8	14.8	12.9	30.29*** (0.000)	54.92 (0.416)	8.38*** (0.000)	2.87*** (0.000)
Revulsion	17.4	15.8	11.7	17.7	77.30 (0.640)	142.01*** (0.000)	45.71 (0.079)	40.17 (0.358)
Anxiety	14.4	5.4	2.5	1.9	31.13*** (0.000)	13.17 (0.754)	2.82*** (0.000)	0.95*** (0.000)
Worry	13.4	5.7	2.5	2.2	14.95*** (0.000)	68.43 (1.00)	0.33*** (0.000)	0.22*** (0.000)
Calmness	16.7	33.6	30.6	32.9	22.77*** (0.000)	95.11 (0.620)	3.00*** (0.000)	1.23*** (0.000)
Distaste	9.6	15.1	11.4	17.4	53.47*** (0.004)	94.92** (0.002)	40.88 (0.065)	20.27*** (0.000)
Pleasure	9.6	16.5	11.7	10.7	85.79*** (0.000)	118.91 (0.690)	16.55 (0.888)	14.68 (1.00)
Fear	8.2	1.2	0.6	n.a.	37.56*** (0.000)	n.a.	0.87*** (0.000)	n.a.
Satisfaction	9.2	25.5	9.8	14.5	42.86*** (0.000)	80.21** (0.008)	42.97 (0.871)	21.03 (0.058)
Happiness	5.6	9.0	4.1	7.6	41.77* (0.026)	61.92* (0.041)	23.55 (0.108)	10.15 (1.00)
Loathing	3.8	5.9	5.4	6.9	46.13 (0.087)	107.12 (0.302)	18.80 (0.167)	38.72 (0.012)
Upset	1.6	2.6	2.8	4.1	68.23 (0.344)	51.87 (0.388)	3.76* (0.039)	2.36** (0.003)
Horror	1.4	1.2	n.a.	n.a.	2.39 (0.754)	n.a.	n.a.	n.a.
Physiological and motor emotional reactions								
Nervous excitement	45.4	12.3	7.9	5.0	20.69*** (0.000)	80.93 (0.064)	0.40*** (0.000)	0.06*** (0.000)
Queasiness	31.3	12.5	6.6	3.5	48.87*** (0.000)	47.68* (0.012)	15.41*** (0.000)	0.53*** (0.000)
Palpitations	8.9	3.1	1.3	1.3	13.93*** (0.000)	4.31 (1.00)	0.16*** (0.000)	0.16*** (0.000)
Trembling	5.4	0.2	n.a.	0.3	0.38*** (0.000)	n.a.	n.a.	0.00*** (0.000)
Disturbed breathing	5.2	2.1	1.3	0.3	75.38*** (0.000)	19.94 (0.250)	0.04* (0.019)	0.00*** (0.000)
Dry mouth	4.2	4.5	1.3	1.3	26.66 (0.851)	27.61 (1.00)	0.59 (0.118)	0.59 (0.118)
Dizziness	3.5	3.1	1.3	1.9	0.000 (1.00)	2.59 (0.727)	1.74 (0.344)	0.90 (0.774)
Nausea	3.3	6.1	3.2	5.0	51.64* (0.019)	56.22 (0.180)	3.80 (0.815)	6.90 (0.523)

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

n.a., not observed in someone of measurement's points

Attitudes, beliefs and reactions to the DR, the overall experience of dissection and the cadaver

Aspects related to the DR

Table 3 shows the aspects which students found most unpleasant about the DR. In first place came the smell, the percentage response to which increased over the sessions. In second place, seeing the face of the cadaver, followed by touching the cadaver were perceived as most unpleasant, although in both cases the highest percentages were obtained immediately before performing the first dissection and decreased progressively as it finished. Thus it would appear that seeing and touching the cadaver were anticipated problems, as students had not yet

entered the DR for the first time. The aspect which seems to have caused the least concern was fear of infection.

Perception of preparedness, emotional control and related thoughts during the dissection

In pre-questionnaires, the majority of students (88%) believed they were emotionally prepared to go into the DR for the first time. This high percentage increased further, reaching 97.2% by the final practical session. In post-questionnaires, administered after the practical sessions, the percentage of students who said they felt themselves to be emotionally prepared rose from 91.5% to 95.9% between the first and final sessions.

Table 3 Unpleasant aspects of the dissection room in percentages (multiple-reply option)

	Pre1 (n = 425)	Post1 (n = 425)	Pre2 (n = 425)	Post2 (n = 425)
Smell	72.5	72.0	82.3	80.5
Fear of infection	4.2	2.6	2.7	2.7
Seeing the face of the cadaver	55.9	27.5	27.7	24.5
Touching the cadaver	17.4	9.7	2.3	2.7
Touching certain parts of the cadaver	0.0	3.9	3.6	2.7

As for emotional control, after their first experience of dissection, 20.6% of students stated that they had needed to control their feelings in order to concentrate on their work. The percentage of students who said they were afraid of losing emotional control fell from 10.9% after the first experience to 3.5% at the end of the course. Similarly, 20.4% of the students declared that they had had more intense ideas or thoughts about life and death during the first dissection. These values fell to 15.6% after the last practical.

Responses related to the cadaver

Half the students had never seen a cadaver before, and so this experience represented their first contact with a dead human being. The majority of them (85.8%) regarded the cadaver as a person who had been alive; this view was held by only 68.9% by the end of the practical sessions as students shifted towards thinking of the cadaver as an inanimate object. A total of 33.1% said they had witnessed jokes or humorous behaviour during the first session; this figure dropped to 22.7% for the final session. A small percentage of students (4.5%) said they had given the cadaver a name in the first practical.

Death anxiety

Table 4 shows the means and standard deviations obtained by students on the DAI scale and its five factors.

In order to analyse the impact that death anxiety levels may have on an activity such as dissection of a human body in terms of achieving the professional task implied by dissection for an anatomy student, six two-way ANOVAs were conducted, with student perceptions of preparedness, emotional control and related thoughts during the dissection as independent variables and the different scales of the DAI, respectively, as dependent variables (Table S1).

The results show that there are statistically significant differences with respect to levels of death anxiety, depending on the perceptions students have of their degree of preparation, emotional control and their more profound thoughts about life and death during the dissection. Those students who, before their first experience, said they felt ready to perform the dissection presented considerably lower levels of death anxiety than students who said they were not ready. Similarly, students who, after the dissection, said they had been prepared, presented lower levels of death anxiety than those who said they had not been prepared.

Similarly, students who, referring to their first experience of dissection, said they had been afraid of losing control and that they had had to control their feelings to concentrate on the dissection, or those who had experienced more profound ideas or thoughts about life or death during the dissection, showed significantly higher levels of death anxiety than students who did not report such behaviour.

Finally, those students who, before their first dissection, stated that they considered the cadaver to represent a once-living being presented greater levels of death anxiety than students who considered it to be an inanimate object.

DISCUSSION

The reactions of our students coincide with those shown by other authors,^{4,6,10–12} although we found some differences in incidences of reactions such as feelings of anxiety, horror and interest, and in the incidence of jokes or humorous behaviour. Although 75% of students evaluated by Penney⁴ claimed to feel anxiety and 11% horror before seeing the cadaver, only 14.4% of our students reported anxiety and 1.4% horror. These data make more sense when we consider Penney's⁴ finding that 32.0% of his sample showed interest before seeing the cadaver, compared with 74.1% of ours. We also found differences with

Table 4 Descriptive statistics obtained by the students on the DAI scale and its five factors

	<i>N</i>	Minimum observed	Maximum observed	Mean	Standard deviations
DAI	425	25.00	87.00	54.0541	11.91021
Factor 1: External generators of death anxiety	425	5.00	24.00	13.1153	4.27348
Factor 2: Meaning and acceptance of death	425	5.00	25.00	12.8188	3.96418
Factor 3: Thoughts about death	425	4.00	20.00	11.5341	3.31298
Factor 4: Life after death	425	3.00	15.00	9.7294	3.33431
Factor 5: Brevity of life	425	3.00	15.00	6.8565	2.28729

this author in student use of some coping mechanisms, such as the presence of jokes or humorous behaviour during practical classes, which was reported by 33.1% of our students, compared with 6.0% of Penney's.⁴ Dissections of the face, genitals and hands are the tasks that aroused the strongest feelings, as indicated above.¹²

As the students gained more experience of dissection, their reactions diminished. Generally, they no longer showed physiological and motor emotional reactions (i.e. reactions regulated by the autonomic nervous system, as well as the cognitive emotional reactions most closely related to these responses [anxiety, worry, fear]). This result supports the findings of previous investigations which show that the state of anxiety presented by students faced with a cadaver tends to diminish as students acquire experience.^{13,16,17}

Similarly, the attitudes and beliefs shown by students before dissection changed as the students gained more experience. Thus, among other manifestations, there was a drop in the number of students who stated that they had to make an effort to control their feelings and emotions so that they did not interfere with the task of dissection. Practice gives students control over their emotions and increases their concentration on the task, helping them to face up to the dissection.

A high percentage of our medicine, occupational therapy and dentistry students presented moderate to high levels of death anxiety; these results are consistent with findings in other research.^{21,22} Students with significantly higher levels of death anxiety tended to be those who reported not being prepared (either before or after) to carry out the dissection, those who were afraid of losing control, those who needed to control their feelings to concentrate on

the task, and all those who experienced profound thoughts about life or death during the dissection. In other words, subjects who had no prior contact with death show more fear of what is unfamiliar.²¹ Exposure to death may help students to be able to confront it,³⁰ as it is the situation itself which is new for the students, and their reactions to death change through the sessions as they learn to adapt to the situation.

Present-day trends in practical human dissection may allow the student to learn how to face up to and adapt his or her emotional attitudes and reactions, a learning outcome which is compatible with traditional concepts of professionalism in anatomy training. In this way, dissection not only offers the future professional the opportunity to learn about the anatomy of the human body and to receive a technical training, but its emotional aspects will help the student develop the ability to confront death and the dying of a patient.

CONCLUSIONS

The act of cutting open a human body, even under the auspices of a scientific imperative, is far outside any other experience; this may make the process of dissection a formative factor in medical professional character development and a catalyst for the development of attitudes towards illness and death. Historically, this experience has been directed towards facilitating the development of medical professionalism as it applies within the doctor–patient relationship.¹

Based on results such as those shown here, we can state that the practice of dissection allows the student to learn how to face up to and adapt his or her emotional attitudes and reactions; this gives

human cadaver dissection great importance as an educational strategy and as a professional training tool in both technical and emotional skills training.

The observation that the practice of dissection of human cadavers may play a decisive role in developing attitudes that apply to the doctor–patient relationship significantly reactivates the role of dissection in undergraduate studies, where the teaching of professional anatomy should be combined with teaching of reflexive anatomy. These conclusions contribute to current debate about the virtues of teaching anatomy on cadavers versus computers,²⁷ or the use of anatomical dissection as a teaching method.²⁸

Contributors: all authors contributed to the conception and design of this study and the acquisition, analysis or interpretation of data. All authors participated in the writing of this paper and reviewed the final manuscript.

Acknowledgements: the authors wish to thank all the students who gave up their time to participate in the study.

Funding: the study was supported by a grant from the Complutense University PR1/06-14506-B.

Conflicts of interest: none.

Ethical approval: not required.

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SUPPLEMENTARY MATERIAL

The following supplementary material is available for this article:

Table S1. Six one-way ANOVAS, using Death Anxiety Inventory (DAI) outcomes (total scale and factors) as dependent variables and student beliefs about and attitudes and responses towards to the dissecting room (experience of dissection and cadaver) as independent variables. Means and standard deviations are given for each DAI item.

Received 28 June 2007; editorial comments to authors 11 September 2007; accepted for publication 26 October 2007