Anxiety and Dissection of the Human Cadaver: An Unsolvable Relationship?

LUIS-ALFONSO ARRÁEZ-AYBAR,* M. ISABEL CASADO-MORALES, AND GLORIA CASTAÑO-COLLADO

Anxiety is an emotional reaction frequently shown by students when a human cadaver is being dissected. Nonetheless, few studies analyze the nature of the anxiety response in this situation and the ones that do exist are mainly limited to English-speaking countries. Our research has three aims: to study the characteristic anxiety reaction to dissection practices, to determine the weight exerted by internal and environmental variables on this anxiety reaction, and to design practices aimed at reducing the state of anxiety experienced by pupils in their human anatomy practices. The studies were carried out in the dissection room of the Department of Human Anatomy and Embryology II at the Faculty of Medicine of the Complutense University, Madrid, during the 3 academic years 2000–2003. The anxiety response to the first dissection of a human cadaver is mainly determined by a situation considered to be threatening, with novelty as its main characteristic. The students' anxiety response is first determined by the situation itself and reactions depend on individual differences. Repeated or gradual exposure (detailed verbal information on the situation, visits to dissecting rooms when no cadaver is present, videos showing pictures of human dissections, etc.) before carrying out the first dissection reduce the students' anxiety response. Anat Rec (Part B: New Anat) 279B: 16–23, 2004. © 2004 Wiley-Liss, Inc.

KEY WORDS: cadaver; dissection; anxiety, medical education; anatomy; education

INTRODUCTION

The importance of dissection in human anatomy and its significance in the history of medicine and in medical training have been widely addressed (Dyer and Thorndike, 2000; Aziz et al., 2002). In contrast, very little research has focused on the emotional nature of dissection for students and its possible repercussion on their future professional work.

Medical schools over the centuries adopted prevailing models of pedagogy from society. By the end of the 19th century, the approach was to teach students to approach patients as though faced with a laboratory experiment. This attitude had to be acquired from the dissection room (DR). Dr. Arráez-Aybar

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2002). The earliest descriptions of the emotional response to dissection, in the 1960s, led us to think that the reaction was suppressed or controlled without creating any problems (Lief and Fox, 1963; McGuire, 1966). However, a decade later, Fox (1979) described students as being naturally distressed by dissecting a human subject and as learning to manage that
ANALYSIS OF ANXIETY RESPONSE

Participants

All the students attended compulsory practical classes on the dissection of human cadavers in their first year of the anatomy course. DR has 18 dissection tables and the students carried out the practical work in groups, with a maximum of 36 students per group and 6 students per cadaver. Each practical class was supervised by two teachers.

Instruments

In the three studies, the anxiety status of the student was assessed at different times, i.e., their anxiety at the exact moment they were being assessed. The instrument used was the State Anxiety Scale of State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1982).

In study 2, the student’s anxiety trait was also assessed, i.e., individual’s propensity to present an anxiety response in different situations. The instrument used for this was the Situational and Responses Anxiety Inventory (ISRA) (Miguel-Tobal and Cano-Vindel, 1994). With this instrument, scores were obtained for eight scales. The first three assess the general average: Anxiety Trait. Finally, four more measurements relate to specific characteristics or situational areas: Test Evaluation Anxiety, Interper-
sonal Anxiety, Phobic Anxiety, and Anxiety of Daily Life. Data were analyzed using the SPSS version 11.5 statistical package.

STUDY 1

The aim of this first study was to assess the intensity of the anxiety response to the dissection of human cadavers and changes in this response produced in subsequent exposure experienced by the student during the course. The participants in this study were 92 students in the academic year 2000–2001, matriculated for the first time in human anatomy. Of these, 81 (88%) were women and 11 (12%) were men. Participants had a mean age of 19 years with a standard deviation of 2.21 (Table 1).

The STAI scale was applied immediately before and after four sessions of the practical program. These corresponded to session 1, dissection of the upper limb (first practical class attended by students in DR); session 2, dissection of the lower limb (2 months after the beginning of the practical program); session 3, examination of human brain serial sections (4 months after the beginning of the practical program); session 4, dissection of cardiopulmonary blockages (final practical class attended by students in DR).

Results

After the data matrix has been treated, one-way ANOVA with repeated measures was carried out to calculate the differences between pre- and postmeasurements of each of the four sessions assessed and to study intersession differences (Table 2).

There were significant differences between pre- and postsession anxiety state measurements. These differences were recorded in the first (t = 9.49; P < 0.001), in the second (t = 4.51; P < 0.001), and in the fourth session (t = 2.70; P = 0.0082), i.e., in sessions in which the student carried out procedures in the presence of a human cadaver. However, no statistically significant differences were observed between pre- and postmeasurements in the third session (t = 1.58; P = 0.116), the only session in which brain serial sections were studied without the presence of a cadaver (Table 2). The students’ presession anxiety levels (Figure 1) decreased steadily over the four sessions.

Although death is an inescapable part of the human condition and arouses intense emotions, few studies have focused on death, including cadavers or dissection, from a psychological viewpoint.

### Table 1. Sample description and features assessment in the three studies

<table>
<thead>
<tr>
<th>Student</th>
<th>Age</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1</td>
<td>92</td>
<td>% female</td>
</tr>
<tr>
<td>Study 2</td>
<td>71</td>
<td>88.7</td>
</tr>
<tr>
<td>Study 3</td>
<td>236</td>
<td>91.9</td>
</tr>
</tbody>
</table>

### Table 2. Means, standard deviations, and one-way ANOVA (Study 1 and Study 2)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>t-test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(n = 92)</td>
<td></td>
</tr>
<tr>
<td>Study 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 1</td>
<td>Pre1</td>
<td>26.62</td>
<td>12.94</td>
<td>9.49</td>
</tr>
<tr>
<td></td>
<td>Post1</td>
<td>14.28</td>
<td>10.79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre2</td>
<td>18.21</td>
<td>11.38</td>
<td>4.51</td>
</tr>
<tr>
<td></td>
<td>Post2</td>
<td>13.58</td>
<td>10.20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre3</td>
<td>14.46</td>
<td>9.45</td>
<td>1.58</td>
</tr>
<tr>
<td></td>
<td>Post3</td>
<td>13.61</td>
<td>9.74</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre4</td>
<td>14.34</td>
<td>9.36</td>
<td>2.70</td>
</tr>
<tr>
<td></td>
<td>Post4</td>
<td>13.11</td>
<td>9.60</td>
<td></td>
</tr>
<tr>
<td>Study 2</td>
<td></td>
<td></td>
<td>(n = 71)</td>
<td></td>
</tr>
<tr>
<td>Session 1</td>
<td>Pre1</td>
<td>24.43</td>
<td>9.82</td>
<td>5.439</td>
</tr>
<tr>
<td></td>
<td>Post1</td>
<td>17.97</td>
<td>11.37</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre4</td>
<td>16.25</td>
<td>10.51</td>
<td>1.511</td>
</tr>
<tr>
<td></td>
<td>Post4</td>
<td>14.99</td>
<td>10.60</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>P < 0.001.<br>
<sup>ab</sup>P < 0.01.
On the other hand, the comparison of predissection anxiety levels revealed statistically significant differences between the first and second sessions ($t = 5.89; P < 0.0001$) and between the second and third sessions ($t = 3.72; P = 0.003$). However, the difference between the third and fourth sessions was not significant ($t = 0.18; P = 0.8604$).

Finally, when anxiety levels shown by subjects when the dissection was over were compared with levels just before the following dissection, we found statistically significant differences between the first and the second dissection session ($t = 3.29; P = 0.0014$). However, from the second session onward, no significant differences were observed between the postdissection anxiety levels of each session and the predissection levels for the following session, either between the second and third session ($t = 0.29; P = 0.29$) or between the third and fourth session ($t = 1.82; P = 0.07$).

**Discussion**

The dissection was a new situation for the students and produced a greater or lesser degree of anxiety. Nonetheless, the anxiety levels dropped significantly at the end of the first exposure session, which is observed in the figure. The students’ anxiety levels, therefore, declined significantly as they tackled new exposures and new experiences. We saw how from the third dissection session onward, there were no significant differences between the anxiety levels shown by students before and after the dissection.

From the second exposure session onward, there was no significant difference between the consecutive pre- and postsession anxiety levels. Therefore, as the newness or uncertainty variable decreased, pre-/postsession anxiety levels tended to equalize.

To sum up, the anxiety response of students to the human cadaver was very intense at the start of the first session and then fell sharply when the first session finished, continuing to fall steadily until no pre-/postsession differences in anxiety states were recorded. It therefore seems that novelty or uncertainty could cause the high levels of anxiety prior to exposure.

**STUDY 2**

In the second study, we aimed to determine the relationship between the specific anxiety reaction of a first-year student over his/her dissection practices and his/her anxiety traits as a personality variable. That is, we attempted to determine to what extent the reaction was due to the situation or to the students’ personality traits. For this purpose, a week before the first session, the students filled out the ISRA. They also completed the STAI state scale in the first and final practical session (session 1, dissection of the upper limb; session 4, dissection of cardiopulmonary blockages).

The participants in the second study were 71 students from the academic year 2001–2002, matriculated for the first time in human anatomy. Of these, 63 were women (88.7%) and 8 were men (11.3%). The mean age was 19 years, with a standard deviation of 5.06 (Table 1).

One-way ANOVA with repeated measures was applied to data to determine whether or not there were any differences between the anxiety response immediately before and after the first and last dissection session. Pearson’s correlation matrix was used to analyze the relationship between anxiety state measurements at the different assessment times and the participants’ anxiety traits.

**Results and Discussion**

We found (Table 2) statistically significant differences between the anxiety state before and after the first dissection session ($t = 5.439; P < 0.001$),...
Although these differences were not significant in the final session (t = 1.511; P = 0.135). On the other hand, the data reflected statistically significant differences between the times before the first and last exposure session (pre1 and pre4; t = 6.467; P < 0.001).

The correlations between the anxiety state and anxiety trait measurements help us to establish whether a student’s anxiety reaction during dissection is determined to some extent not by the situation alone, but also by his/her personal characteristics as far as a propensity to anxiety is concerned (Table 3). The data clearly showed how the anxiety reactions shown by subjects just before the first time they were exposed to a cadaver in the DR were not significantly correlated with any of the scales evaluated by the ISRA. Therefore, the anxiety state shown by students at that moment seems to be independent of any individual traits related with their propensity to suffer anxiety reactions. Nonetheless, the correlation between state and trait of anxiety was clearly significant and positive in the fourth dissection session (Table 3). Therefore, once the students had become familiar with the situation of the dissection of a human cadaver, the anxiety reaction in this situation was more conditioned by personal characteristics. Therefore, in this fourth session, the most anxious individuals or those who showed the highest levels for the anxiety trait were those who would regard the situation as most threatening and thus showed more intense reactions than their colleagues. Indeed, the anxiety reaction of the students was initially determined by the situation itself, although later it was the individual differences that enabled a student’s reaction to be predicted.

The above data indicate that successive approaches or gradual exposure (detailed verbal information about the situation, visits to DR without the presence of the cadaver, videos, etc.) before the real dissection of a cadaver would reduce students’ anxiety reaction in their first practical session. In the light of these findings, we decided to design a third study to carry out in the following academic year.

**STUDY 3**

The aim of the third study was to assess whether the students’ anxiety state in their first dissection was reduced by previous viewing of a video with real pictures of dissections of a human cadaver. The participants in the third study were 236 students matriculated for the first time in human anatomy. Of these, 217 (91.9%) were women and 19 (8.1%) were men. The mean age was 19 years and the standard deviation was 3.09 (Table 1).

The participants were randomly subdivided into two groups: experimental group (EG) and control group (CG). The EG (video) comprised 109 pupils (98 women and 11 men) who attended the showing of a video in a room different from the one normally used for the practical classes.

The total duration of the video was 23 min and comprised three main sections: “The Importance of Anatomy” (as a basis for practical medicine and medical communication); “The Problem of Dissection,” and “The Dissection.” The video includes recordings made in the dissection room of our department during the human anatomy practical classes. The student’s anxiety state was assessed after viewing the film and before entering the dissection room for the first time.

The CG (no video) consisted of 127 pupils (119 women and 8 men) who individually filled out the STAI scale before entering the DR without having seen the video or any previous information. One-way ANOVA was applied to data to discover whether differences existed in the anxiety response among the EG (video) and CG (no video) before the first dissection session. One-way ANOVA with repeated measures was also used to determine the response profile of each group separately.

**Results**

The first important result (Table 4) is that the EG showed less anxiety than the CG before entering the dissection room for the first time. Therefore, the group that had seen the video showing images of the dissection of human cadavers similar to what they expected to experience in their first visit to the dissection room experienced less anxiety than the group that had not had any previous visual experience before their first real experience of dissection. This measurement (pre1) was significantly different in the two groups (t = −2.133; f.g. = 234; P = 0.034).

After finishing the first dissection

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**TABLE 4. Means, standard deviations, and one-way ANOVA (study 3)**

<table>
<thead>
<tr>
<th></th>
<th>Video</th>
<th>No video</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n Mean SD</td>
<td>n Mean SD</td>
<td>t</td>
</tr>
<tr>
<td>All participants</td>
<td></td>
<td></td>
<td>d.f.</td>
</tr>
<tr>
<td>Session 1</td>
<td>Pre 109 23.82 11.08</td>
<td>127 26.83 10.57</td>
<td>−2.133</td>
</tr>
<tr>
<td></td>
<td>Post1 109 15.26 10.20</td>
<td>127 13.55 8.60</td>
<td>1.374</td>
</tr>
<tr>
<td></td>
<td>Pre 109 16.20 9.91</td>
<td>127 17.13 9.62</td>
<td>−0.583</td>
</tr>
<tr>
<td></td>
<td>Post 109 16.29 9.42</td>
<td>127 16.23 10.03</td>
<td>0.44</td>
</tr>
<tr>
<td>Participants without fainting group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 1</td>
<td>Pre 80 23.54 10.91</td>
<td>127 26.83 10.57</td>
<td>−2.135</td>
</tr>
<tr>
<td></td>
<td>Post1 80 12.77 8.07</td>
<td>127 13.55 8.60</td>
<td>0.649</td>
</tr>
<tr>
<td></td>
<td>Pre 80 14.71 9.30</td>
<td>127 17.13 9.62</td>
<td>−1.344</td>
</tr>
<tr>
<td></td>
<td>Post 80 17.88 9.72</td>
<td>127 16.23 10.03</td>
<td>1.164</td>
</tr>
</tbody>
</table>

$^aP < 0.05.$
session, there were statistically significant reductions in the students’ anxiety states in both groups. The results for the EG were mean_post1 = 23.82; mean_post4 = 15.26; t = 8.37; f.g. = 108; P < 0.001. For the CG, they were mean_pre1 = 26.83; mean_post1 = 13.55; t = 13.65; f.g. = 126; P < 0.001. A comparison of the anxiety levels of the two groups at this time (post1) revealed that there were no statistically significant differences between these results (t = 1.391; f.g. = 212,380; P = 0.17). However, we found it interesting that the CG showed a greater anxiety reduction than the EG, who had seen the video before entering the dissection room. The CG, which had higher initial anxiety levels (pre1), presented lower anxiety levels after the first dissection session (post1) than the EG.

We therefore decided to study the possible influence on the data of one student fainting during the dissection session. This was witnessed by the other students who were in the dissection room at the time (n = 29). This group had already been subjected to the first measurement of anxiety level (pre1), but their anxiety had not yet been assessed after the dissection (post1). These students belonged to the EG (video). Therefore, another uncontrolled variable comes into play that did not affect the other groups and that could influence anxiety levels. To establish the possible influence of this occurrence, we decided to analyze the data corresponding to the group of students that had witnessed the event and compare them with those obtained for the remaining students. For the group witnessing the fainting, the scores decreased after the first exposure (mean_pre1 = 24.59; mean_post1 = 22.10), but this was not statistically significant (t = 2.15; f.g. = 28; P = 0.054). On the other hand, a comparison of the anxiety level after dissection (post1) of the group that witnessed this event (n = 29) and the other students of the same condition, EG (n = 80), revealed significant differences between the two groups (t = −3.80; f.g. = 37,109; P = 0.001). In the remaining measurements, no statistically significant differences were found between the CG and the group under experimental conditions (EG; Table 4).

In the light of these results, we decided to exclude the group that had witnessed the fainting from the analysis of anxiety states presented by the students in relation to their experimental condition, EG and CG. Therefore, in the final sample for this third study, the CG consisted of 127 participants (119 women and 8 men) and the EG of 80 participants (74 women and 6 men). The results indicate statistically significant differences between the anxiety levels of EG and CG before the first dissection. In the remaining measurements, no statistically significant differences were found between the CG and the group under experimental conditions (EG; Table 4).

Regarding the intragroup measurements for the CG (Table 5), statistically significant differences were found among all possible combinations of the four evaluated measurements of anxiety state. On the other hand, for the EG (Table 6), no statistically significant differences were found between measurements of anxiety state after the first session (post1) and the measurements prior to the fourth session (pre4; t = −1.44; f.g. = 79; P = 0.155) or between the measurements before and after holding the fourth session (pre4 and post4; t = 1.446; f.g. = 79; P = 0.156).

**Figure 2.** Differential profiles between control (no video) and experimental group (video).

**Table 5.** Control group (no video) intragroup differences

<table>
<thead>
<tr>
<th>Compared pair</th>
<th>t</th>
<th>d.f.</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre1 and Post1</td>
<td>13.650</td>
<td>126</td>
<td>&lt;0.001 a</td>
</tr>
<tr>
<td>Pre1 and Pre4</td>
<td>8.373</td>
<td>126</td>
<td>&lt;0.001 a</td>
</tr>
<tr>
<td>Pre1 and Post4</td>
<td>10.628</td>
<td>126</td>
<td>&lt;0.001 a</td>
</tr>
<tr>
<td>Post1 and Pre4</td>
<td>−3.675</td>
<td>126</td>
<td>&lt;0.001 a</td>
</tr>
<tr>
<td>Post1 and Post4</td>
<td>−3.248</td>
<td>126</td>
<td>0.001 a</td>
</tr>
<tr>
<td>Pre4 and Post4</td>
<td>13.650</td>
<td>126</td>
<td>0.017 b</td>
</tr>
</tbody>
</table>

*op < 0.001.
*bp < 0.05.
than in the control group. These find-
the first real exposure was smaller
and the reduction in this anxiety after
lower than those of the control group
levels before the first exposure were
their second exposure. The anxiety
behaves as if their first dissection were
deduce that the experimental group
the fourth session.
measurements made before and after
fourth session (pre4), and among the
measurement made prior to the
after the initial session (post1), the
combinations of averages as-
the CG there are differences among all
two groups analyzed (see
Finkelstein and Mathers, 1990; Druce
et al., 1995). Nonetheless, the stu-
ter's confrontation with the cadaver
removing or reducing cadaver dis-
section from medical education (Aziz
et al., 2002). However, it is worth not-
ing that, to date, this has only been
assessed by highly generalized ques-
tions and not using standardized sci-
etically approved instruments,
making it difficult to generalize the results and to draw comparisons be-
tween the different studies.

The general aim of our research was
to study the characteristics of this
anxiety reaction of anatomy students
by using specific, reliable, valid, and
standardized tests such as the State-
Trait Anxiety Inventory Scale (Spiel-
berger et al., 1982) and the Situations
and Responses Anxiety Inventory
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Also, this study provides evidence about the variables involved in this reaction,
focuses on the weight that the situa-
tion itself (anxiety state) can have on
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ual's internal characteristics (anxiety
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could help us formulate possible strat-
gies to control the students' anxiety re-
action when faced with a dissection, to
modify the causal situation of the anx-
ity, or to help students to develop strat-
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In summary, the consecutive nature of the three studies presented in this
article permits us to draw the follow-

It is useful to know the
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Also, this study provides evidence about the variables involved in this reaction,
faced with a cadaver for the first time (Marks et al., 1997; Tschernig et al., 2000).

It is useful to know the exact nature of this anxiety reaction because this helps us to control it. This control can and should be carried out directly by the Anatomy teacher and can be done using simple, easy, and cheap methods such as showing a video of the dissection that the student is going to perform in a similar environment. The anatomist should complement this by teaching students to have an ethical and humanistic approach to the cadaver. We consider this to be a more suitable and effective strategy than eliminating or reducing cadaver dissection in medical education. Over the last few years, there have been numerous seminars and courses in which the authors try to integrate humanistic values into an anatomy curriculum (Coulehan et al., 1995; Rizzolo, 2002; Stewart and Charon, 2002). Nevertheless, in spite of this future outlook, we must not forget that “nulla medicina sine anatomia” (Di Dio, 1999), and it may be as difficult to convince anatomy teachers as it is students (Marks et al., 1997) that dissection is also necessary to develop a communicative, ethical, and humanistic approach to patient care (Aziz et al., 2002). It would be interesting in future studies to assess the anatomists’ attitude in the dissection room.

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LITERATURE CITED


