

Students' Physical and Psychological Reactions to Forensic Dissection: Are There Risk Factors?

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The reactions of students to forensic dissection encompass psychologico-emotional and physical components. This exploratory study aimed to determine risk factors for students' adverse physical and psychological reactions to forensic dissection. All sixth-year medical students ($n = 304$) attending the compulsory practical course in forensic medicine in the 2005–2006 academic year were asked to complete a questionnaire at the conclusion of the five-day course. The questionnaire surveyed physical and psychological reactions (outcomes) and 47 student traits, beliefs, and behaviors (risk factors) that might predispose to adverse reactions. Multivariate ordinal logistic regression yielded five independent risk factors for negative psychological reactions: female gender, stereotypic beliefs about forensic pathologists, a less cognitive and more emotional frame of mind relative to forensic dissection, more passive coping strategies, and greater fear of death. The sole independent risk factor for physical symptoms was a less cognitive/more emotional approach to dissection. Students' reactions to forensic dissection integrate a host of inherent and dissection-related risk factors, and future interventions to improve this aspect of medical education will need to take into account the complexities underlying students' experiences with dissection. *Anat Sci Educ* 3:287–294. © 2010 American Association of Anatomists.

Key words: forensic dissection; medico-legal autopsy; coping strategies; stereotypes; symptoms; medical education

INTRODUCTION

Medical students' experience in the gross dissection laboratory has frequently been described as stressful. The reactions of students to dissection encompass both psychologico-emotional responses and physical symptoms. Several studies have portrayed cadaveric dissection as a strong emotional event for medical students, variably reporting associated nightmares, intrusive visual images, insomnia, depression, learning

difficulties (Nnodim, 1996; Abu-Hijleh et al., 1997; Snelling et al., 2003), and symptoms suggestive of post-traumatic stress (Penney, 1985; O'Carroll et al., 2002; Vijayabhaskar et al., 2005). Physical symptoms such as dizziness, eye soreness, nausea, and repulsion to cadavers "horrible smell," have also been described (Penney, 1985; Horne et al., 1990; Abu-Hijleh et al., 1997). Despite these various psychological and physical responses, Penney (1985) found that most medical students are able to adapt to any initial upset in the dissecting laboratory.

Students at the Medical School of the University of Athens attend an obligatory course in Forensic Medicine during the sixth (and final) year of their studies. The five-day course includes brief lectures and longer practical sessions. Previous research by our group has suggested that Greek medical students harbor significant concerns about forensic dissection and that they often experience unpleasant physical and psychological reactions (Papadodima et al., 2008b). In an earlier study, fear or anxiety was reported by approximately half of students on the first day of the course, along with physical symptoms such as nausea, dizziness, tachycardia, sweating,

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and dyspnea. Whereas all physical symptoms diminished as the course progressed, a moderate increase in grief was demonstrated. Our previous findings indicate that students become accustomed fairly quickly to the stresses of forensic dissection, but they also suggest that special strategies may be helpful in limiting such problematic psychological issues as grief and the adoption of negative stereotypes (Papadodima et al., 2008a,b).

If those medical students most susceptible to negative physical and psychological reactions to forensic dissection could be identified proactively, preventive strategies could be implemented. Previous studies have demonstrated some core risk factors for adverse reactions to the dissection experience, including female gender (Snelling et al., 2003; Bataineh et al., 2006), but no comprehensive approach to differentiating physical and psychological susceptibility based on a variety of possible risk factors has yet appeared in the literature.

This study is a follow-up to our previous work (Papadodima et al., 2008b), aimed at identifying those medical students who might require training modifications to achieve maximal benefit from the sixth-year forensic dissection course. This study moves beyond existing knowledge by assessing simultaneously a wide variety of possible risk factors, including sociodemographic, academic, and religious factors; coping strategies and substance use; students' prior experience with and fear of death and dying; and stereotypic beliefs about forensic pathologists and concerns about the process of forensic dissection. We identified 47 possible risk factors and measured their respective correlations with physical and psychological reactions reported by students at the conclusion of the forensic dissection course. The distinction between physical and psychological reactions was maintained to identify potential convergent and divergent effects of risk factors.

EXPERIMENTAL PROCEDURES

Study Design

All sixth-year medical students ($n = 304$) attending the compulsory course in forensic medicine at the School of Medicine of the University of Athens, Greece, in the 2005–2006 academic year were asked to complete a questionnaire at the conclusion of the five-day practical experience. Paper questionnaires were distributed by the course director to all students and recollected anonymously during the same session. The questionnaire was designed by the education staff of the Department of Forensic Medicine and Toxicology and has previously been published in full (Papadodima et al., 2008a). Survey items sought to assess 47 student traits, beliefs, and behaviors that might predispose to negative physical or psychological reactions to forensic dissection. Possible risk factors are shown in Tables 1 and 2. Though the term “risk factor” is used to denote all of the traits, beliefs, and behaviors of students that were assessed, it is recognized that some factors may be protective rather than predisposing. The frequencies that students reported experiencing five physical reactions and five psychological reactions were assessed in the same paper questionnaire, as shown in Tables 3 and 4.

Statistical Analysis

Response rates were calculated according to the AAPOR guidelines (AAPOR, 2006): questionnaires with greater than

Table 1.

Traits, Beliefs, and Behaviors of Students Evaluated as Possible Risk Factors for Negative Physical Reactions to Forensic Dissection: Categorical Variables

Categorical variables
Sociodemographics
Gender
Age
Marital status
Religion (monotheism vs. atheism)
Place of residence (rural vs. urban)
Number of siblings
Father or mother is a health professional
Acquaintance with animals
Academics
Previous academic titles
Desire to pursue career in forensic medicine
Desire to pursue career in surgery or internal medicine/ laboratory specialty
Course grades
Participation in gross anatomy practical sessions
Participation in optional classroom-based forensic courses
Religiousness
Identification as a pious/religious individual
Belief in an afterlife
Experience with death and dying
Emotionally affecting death in the student's environment
Dissection of the emotionally affecting dead individual
Substance use on first day of forensic dissection course
Alcohol
Tranquilizer
Beliefs regarding impact of forensic dissection on daily life
“Forensic dissection makes me anxious about death”
“Forensic dissection has no impact on my daily life”
“Forensic dissection motivates me to live every moment of life fully”

Twenty-three categorical variables were assessed using the questionnaire previously published by Papadodima et al. (2008a).

Table 2.

Traits, Beliefs, and Behaviors of Students Evaluated as Possible Risk Factors for Negative Psychological Reactions to Forensic Dissection: Scored Variables

Scored Variables				
Cognitive/emotional frame of mind relative to forensic dissection	No	Yes ^a	Range	
Scientific interest	0	+1	-3 to 2	
Curiosity	0	+1		
Fear/anxiety	0	-1		
Aversion	0	-1		
Grief	0	-1		
Stereotypic beliefs about forensic pathologists	No	Yes	Range	
Forensic pathologists do not deal with human pain	0	+1	0 to 4	
Forensic pathologists must be resistant to odors and disturbing images	0	+1		
Forensic pathologists need special psychological skills to cope with their daily experience with death	0	+1		
Forensic pathologists have a peculiar character	0	+1		
Concerns about process of forensic dissection	No	Yes	Range	
Unpleasant odor	0	+1	0 to 5	
Viewing face of deceased	0	+1		
Viewing body of deceased	0	+1		
Possibility of infection	0	+1		
Sound of electric saw	0	+1		
Coping strategies displayed during forensic dissection ^a	No	Yes	Range	
Focusing on unrelated thoughts	0	+1	-3 to 2	
Shutting eyes when feeling uncomfortable	0	+1		
Discussing dissection with fellow students	0	-1		
Discussing unrelated topics with fellow students	0	-1		
Telling jokes	0	-1		
Fear of death	Never	Sometimes	Frequently	Range
“I am afraid I will die”	0	+1	+2	0 to 10
“I am afraid a loved will die”	0	+1	+2	
“The idea of death crosses my mind”	0	+1	+2	
“I am bothered when others talk about death”	0	+1	+2	
“I am bothered by the idea that life passes quickly”	0	+1	+2	

^aPositive values were assigned to passive coping strategies; negative values, to active coping strategies. Twenty-four scored variables were assessed using the questionnaire previously published by Papadodima et al. (2008a).

Table 3.**Physical Reactions to Forensic Dissection**

Physical reactions	No	Yes
Nausea	0	+1
Dizziness	0	+1
Tachycardia	0	+1
Sweating	0	+1
Dyspnea	0	+1

Five reactions per category were used to calculate outcome scores; Range 0-5.

80% of items answered were considered complete; those with 50 to 80% of items answered were considered partial.

To detect risk factors significantly associated with (1) physical reactions and (2) psychological reactions, univariate analysis was performed with nonparametric statistics. Nonparametric statistics were used because both physical and psychological reactions were expressed as scores with limited ranges (0 to 5 and 0 to 10, respectively) and exhibited significant deviation from a normal distribution (Armitage and Berry, 1994). Specifically, the Mann-Whitney-Wilcoxon test for independent samples was performed to assess the association between outcome scores and categorical variables. The Spearman's rank correlation coefficient was used to assess the correlation between outcome scores and continuous variables (Armitage and Berry, 1994).

Multivariate analysis (multivariate ordinal logistic regression) was also performed so as to create a Generalized Linear Model that treated the ordinal scores (physical and psychological reaction outcome scores) as dependent variables (McCullagh and Nelder, 1989). All risk factors significantly associated with outcome scores were included as independent variables, and the outcome score for physical or psychological reactions was set as the dependent variable. After mutual adjustment, only statistically significant variables were retained in the final model (backward selection statistical procedure). The proportionality-of-odds assumption was evaluated by the likelihood-ratio test. For odds ratios derived from the ordinal logistic model, the ratio of odds is $P(Y > k)/P(Y \leq k)$, where Y denotes the dependent ordinal variable and k denotes any value of the ordinal variable within its range (Stata Corporation, 2003).

Table 4.**Psychological Reactions to Forensic Dissection**

Psychological reactions	Never	Sometimes	Frequently
Recurrent visual images of forensic dissection	0	+1	+2
Imagining one's self or loved one being dissected	0	+1	+2
Sleep disturbances	0	+1	+2
Appetite disturbances	0	+1	+2
Loss of appetite for meat	0	+1	+2

Five reactions per category were used to calculate outcome scores, Range 0-10.

The level of statistical significance was set as $P < 0.05$. Trends toward statistical significance were reported if $0.1 < P < 0.05$, as these correlations may be significant in the context of larger samples. Statistical analysis was performed with Stata 8.0 (Stata Corporation, College Station, TX).

RESULTS

All 304 students enrolled in the forensic dissection course submitted questionnaires, all but 11 of which were complete (response rate 96.4% complete, 100% complete or partial). Physical and psychological reactions were positively associated with each other (Spearman's $\rho = 0.353$, $P < 0.001$). Results of univariate analysis are shown in Table 5. More pronounced physical reactions were reported by students who endorsed more stereotypic beliefs about forensic pathologists, a more emotional frame of mind relative to forensic dissection, more concerns about the process of forensic dissection, and more passive coping strategies. Psychological reactions were more closely associated with female gender, inclination toward a nonsurgical specialty, emotionally affecting death in the student's environment, belief in an afterlife, more stereotypic beliefs about forensic pathologists, a more emotional frame of mind relative to forensic dissection, more concerns about the process of forensic dissection, more passive coping strategies, and greater fear of death. Neither the physical reaction outcome score nor the psychological reaction outcome score was significantly associated with any of the other possible risk factors assessed (full list in Tables 1 and 2).

Results of multivariate analysis are shown in Table 6. Concerning physical reactions, the sole independent risk factor was a more emotional frame of mind relative to forensic dissection. Regarding psychological reactions, five independent risk factors were identified: female gender, stereotypic beliefs about forensic pathologists, a more emotional frame of mind relative to forensic dissection, more passive coping strategies, and greater fear of death.

DISCUSSION

This study suggests that a variety of risk factors may predispose to adverse psychological reactions to forensic dissection. Female gender, stereotypic beliefs about forensic pathologists, a more emotional frame of mind relative to forensic dissection, more passive coping strategies, and greater fear of death were associated with more pronounced psychological reac-

Table 5.

Results of Univariate Analysis of Categorical and Scored Variables

Variables	Physical reaction outcome score (score \pm SD)	<i>P</i> value	Psychological reaction outcome score (score \pm SD)	<i>P</i> value
Categorical variables^a				
Gender		0.673		< 0.001
Male (<i>n</i> = 151)	0.14 \pm 0.53		1.60 \pm 2.07	
Female (<i>n</i> = 153)	0.17 \pm 0.60		2.59 \pm 2.43	
Career interest		0.144		0.037
Surgery (<i>n</i> = 104)	0.15 \pm 0.73		1.66 \pm 1.93	
Internal medicine/laboratory specialty (<i>n</i> = 190)	0.16 \pm 0.46		2.33 \pm 2.46	
Emotionally affecting death in the student's environment		0.111		0.022
Yes (<i>n</i> = 255)	0.18 \pm 0.61		2.22 \pm 2.36	
No (<i>n</i> = 47)	0.04 \pm 0.20		1.41 \pm 1.94	
Belief in an afterlife		0.293		0.068 ^b
Yes (<i>n</i> = 129)	0.23 \pm 0.77		2.47 \pm 2.63	
No (<i>n</i> = 166) ("No afterlife exists" or "I do not ask myself about afterlife issues")	0.10 \pm 0.34		1.82 \pm 2.02	
Scored variables^c				
Less cognitive/more emotional frame of mind relative to forensic dissection		< 0.001		< 0.001
< median (<i>n</i> = 140)	0.26 \pm 0.77		3.06 \pm 2.59	
\geq median (<i>n</i> = 147)	0.04 \pm 0.23		1.12 \pm 1.19	
Stereotypic beliefs about forensic pathologists		0.033		< 0.001
< median (<i>n</i> = 87)	0.03 \pm 0.18		1.08 \pm 1.24	
\geq median (<i>n</i> = 183)	0.19 \pm 0.59		2.34 \pm 2.43	
Concerns about process of forensic dissection		0.015		< 0.001
< median (<i>n</i> = 36)	0.00 \pm 0.00 ^d		0.81 \pm 1.14	
\geq median (<i>n</i> = 207)	0.10 \pm 0.35		1.95 \pm 2.08	
Passive coping strategies displayed during forensic dissection		0.034		< 0.001
< median (<i>n</i> = 119)	0.10 \pm 0.36		1.52 \pm 1.64	
\geq median (<i>n</i> = 179)	0.19 \pm 0.67		2.49 \pm 2.61	
Fear of death		0.507		< 0.001
< median (<i>n</i> = 133)	0.23 \pm 0.74		1.75 \pm 2.08	
\geq median (<i>n</i> = 167)	0.10 \pm 0.38		2.39 \pm 2.46	

^aFor categorical variables, the Mann-Whitney-Wilcoxon test was used to calculate *P* values. Statistically-significant associations (*P* < 0.05) were observed between eight variables (risk factors) and physical reactions, psychological reactions, or both.

^bThough not statistically significant, a trend was observed between psychological reactions and belief in an afterlife.

^cFor scored variables, *P* values were derived from Spearman's rank correlation coefficient.

^dAll values equal to zero.

Table 6.

Results of Multivariate Analysis of Risk Factors

Risk Factors	Category/Increment	Odds Ratio (95% CI)	P value
Physical reactions			
Less cognitive/more emotional frame of mind relative to forensic dissection	1 point increase	0.41 (0.28–0.61)	< 0.001
Psychological reactions			
Gender	female vs. male	1.81 (1.12–2.93)	0.016
Less cognitive/more emotional frame of mind relative to forensic dissection	1 point increase	0.55 (0.44–0.68)	< 0.001
Stereotypic beliefs about forensic pathologists	1 point increase	1.65 (1.04–2.62)	0.033
Passive coping strategies displayed during forensic dissection	1 point increase	1.29 (0.97–1.72)	<i>0.085</i>
Fear of death	1 point increase	1.12 (0.99–1.26)	<i>0.069</i>

Five risk factors were retained after multivariate ordinal logistic regression analysis as showing statistically-significant associations (bold) or trends toward significance (italic) with physical or psychological reactions to forensic dissection.

tions. In contrast, only one risk factor was identified by multivariate analysis as being significantly associated with physical reactions. Students who reported approaching forensic dissection with a less cognitive and more emotional frame of mind experienced more physical symptoms such as nausea, dizziness, racing heart, sweating, and shortness of breath. It is possible that students experienced more psychological than physical reactions to the experience of forensic dissection. It is also possible that the relative predominance of reported psychological reactions was due to the timing of questionnaire administration on the final day of the course. We have previously found that physical symptoms fade significantly during the brief practical course, while psychological symptoms tend to persist (Papadodima et al., 2008b).

Gender effects on students' responses to dissection have previously been reported. In our sample, female students experienced more psychological reactions than their male counterparts. This is in line with previous studies that have shown women to be more distressed and experience stronger physical and emotional reactions to most stimuli in the dissection room (Snelling et al., 2003; Batineh et al., 2006). That female gender is a risk factor to negative psychological reactions to forensic medicine may imply that they harbor more death-related anxiety before and during the dissection course. Similarly, female physicians are more stressed in their medical practice (Dahlin et al., 2005) and more anxious when treating chronic pain patients (Niemi-Murola et al., 2007). Female students are also less likely to agree that physicians need to practice detached concern (Nnodim, 1996; Abu-Hijleh et al., 1997; Dickinson et al., 1997). Notably, the more intense psychological reactions reported by female students in our sample do not seem to deter them from selecting forensic medicine as a career specialty (Papadodima et al., 2008a).

Fear of death positively correlated with adverse psychological reactions, which seems a logical corollary to students' confronting death-related issues during forensic dissection. Fear of death is a significant issue among medical students, who are most anxious about the death of a loved one but

also, to a lesser extent, themselves. Firth-Cozens and Field (1991) found higher fear and stress scores to be associated with behaviors such as avoidance, dismissal, and seeking advice. Interestingly, belief in an afterlife seemed to provide results in line with those regarding fear of death, as the former was associated with worse psychological symptoms in the univariate analysis. In this context, belief in an afterlife most probably represents a coping strategy (Williams et al., 2005), becoming thus a surrogate index of more pronounced fear of death in our sample.

Students develop a variety of coping mechanisms to deal with the challenges of dissection, a decidedly complex learning experience (Winkelmann et al., 2007). Previously reported coping strategies include prayer, denial, humor, rationalization, relaxation, staying with a group, seeking advice from classmates, seeking advice from staff members, and using tranquilizers (Nnodim, 1996; Abu-Hijleh et al., 1997; Snelling et al., 2003). In our study, the passivity of coping strategies was tied to increased psychological symptoms during forensic dissection. Active coping strategies such as engaging in discussion with fellow students or telling jokes seemed more effective at preventing negative psychological reactions than passive strategies such as focusing on unrelated thoughts or shutting one's eyes when feeling uncomfortable.

Endorsing stereotypic beliefs about forensic pathologists was associated with more psychological reactions by multivariate analysis and more physical reactions by univariate analysis. The association between stereotypes and symptoms may be bidirectional: students with a priori stereotypic beliefs may be more susceptible to the effects of forensic dissection, and students who experience more pronounced symptoms may adopt stereotypes about forensic pathologists as a mechanism to explain their own reactions. A similarly complex relationship may exist between the more emotional (less cognitive) frame of mind relative to forensic dissection and negative reactions, which persisted in the multivariate analysis for both physical and psychological outcomes.

Several other results from the univariate analysis, and certain null findings, merit discussion. First, medical students

inclined toward surgery reported less frequent psychological symptoms. This finding echoes an earlier report that medical students who are better able to tolerate stress are more likely to pursue surgical careers (Linn and Zeppa, 1984). Univariate analysis yielded an expected result with respect to concerns about the process of forensic dissection: students reporting no concerns experienced fewer physical and psychological adverse reactions. Interestingly, neither prior participation in gross anatomy practical sessions nor previous attendance at optional classroom-based forensic courses demonstrated any protective effect on physical or psychological symptoms. Preparation of students for dissection through videos or gradual exposure has been reported to alleviate students' negative responses (Penney, 1985; Horne et al., 1990; Marks et al., 1997; Tschernig et al., 2000), so the aforementioned activities at our medical school had been expected to significantly alleviate students' reactions. It should be noted that our optional forensic courses are (1) knowledge-centered didactic sessions that include no special reference to psychologico-emotional matters and (2) occur usually several weeks or months before the forensic dissection practical sessions. Dyer and Thorndike (2000) observed that a growing number of medical students feel that discussion of feelings is healthy and necessary and that they sense pressure to experience dissection as an emotional event rather than simply an intellectual one. These findings, along with the lack of a protective effect against adverse physical and psychological reactions to dissection, indicate that the predissection forensic courses at our institution require some reorientation.

This study has certain weaknesses. First, the questionnaire administered to students represents an exploratory approach to understanding the complex reactions students have to dissection. Future studies should aim to develop standardized, validated survey instruments. Also, the data presented here should be considered preliminary in that they await confirmation by future work. Nevertheless, the novelty of the observed associations and their potential importance for the design of future interventions warrant their being shared now. Another possible limitation of this study is the relatively superficial way in which students' religiousness was evaluated. A better tool may have been the validated but lengthier Daily Spiritual Experience Scale (Underwood and Teresi, 2002). The local particularity of Greece as a predominantly Orthodox Christian nation should be acknowledged in interpreting the results of this study. Finally, though many possible risk factors were assessed in this study, and the multivariate statistical analysis was meant to isolate the effects of individual factors, the presence of unrecognized confounders cannot be completely ruled out.

The observational, cross-sectional design of this study permits neither inference of causality with regard to the observed associations nor prediction of whether any intervention would bring meaningful results. Verification and quantification of our findings with standard measures, such as psychometric tools, may be particularly valuable. A drawback of the rather crude, proxy scores used in this exploratory analysis is the asymmetry about zero for the range of scores for some variables, including students' cognitive/emotional frame of mind relative to forensic dissection and the degree of passivity of coping strategies. Despite its limitations, this study offers some insight into medical students' attitudes at a moment when they seem particularly vulnerable. Other authors have recently documented the value of monitoring students' physical (Unsal et al., 2010) and mental (Arslan

et al., 2009) health as part of the process of refining medical education.

CONCLUSIONS

The key message of this exploratory study is that students' psychological response to forensic dissection seems to be influenced by a variety of disparate factors, including traits such as gender, broad-scope conceptions and perceptions of death, and narrower opinions about forensic pathologists and the dissection procedure. Notably, the nature of particular coping strategies used by students may reveal underlying symptoms and should not be superficially judged by educators as naive, momentary, or spontaneous reactions. The list of risk factors examined herein is long, but it is not exhaustive. For instance, additional coping strategies, passive or active, may be also meaningful. We have shown students' reactions to forensic dissection to depend on many factors, some of which could be targeted by future interventions with the hopes of making forensic dissection a positive learning opportunity for all students.

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LITERATURE CITED

- AAPOR 2006. The American Association for Public Opinion Research. Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys. 4th Ed. Deerfield, IL: American Association for Public Opinion Research. 49 p.
- Abu-Hijleh MF, Hamdi NA, Moqattash ST, Harris PF, Heseltine GF. 1997. Attitudes and reactions of Arab medical students to the dissecting room. *Clin Anat* 10:272-278.
- Armitage P, Berry G. 1994. Statistical Methods in Medical Research. 3rd Ed. Oxford, UK: Blackwell Sciences. 620 p.
- Arslan G, Ayranci U, Unsal A, Arslantas D. 2009. Prevalence of depression, its correlates among students, and its effect on health-related quality of life in a Turkish university. *Ups J Med Sci* 114:170-177.
- Bataineh ZM, Hijazi TA, Hijleh MF. 2006. Attitudes and reactions of Jordanian medical students to the dissecting room. *Surg Radiol Anat* 28:416-421.
- Dahlin M, Joneborg N, Runeson B. 2005. Stress and depression among medical students: A cross-sectional study. *Med Educ* 39:594-604.

- Dickinson GE, Lancaster CJ, Winfield IC, Reece EF, Colthorpe CA. 1997. Detached concern and death anxiety of first-year medical students: Before and after the gross anatomy course. *Clin Anat* 10:201–207.
- Dyer GS, Thorndike ME. 2000. Quidne mortui vivos docent? The evolving purpose of human dissection in medical education. *Acad Med* 75:969–979.
- Firth-Cozens J, Field D. 1991. Fear of death and strategies for coping with patient death among medical trainees. *Br J Med Psychol* 64:263–271.
- Horne DJ, Tiller JW, Eizenberg N, Tashevskaya M, Biddle N. 1990. Reactions of first-year medical students to their initial encounter with a cadaver in the dissecting room. *Acad Med* 65:645–646.
- Linn BS, Zeppa R. 1984. Does surgery attract students who are more resistant to stress? *Ann Surg* 200:638–643.
- Marks SC Jr, Bertman SL, Penney JC. 1997. Human anatomy: A foundation for education about death and dying in medicine. *Clin Anat* 10:118–122.
- McCullagh P, Nelder JA. 1989. *Generalized Linear Models*. 2nd Ed. London, UK: Chapman & Hall. 511 p.
- Niemi-Murola L, Nieminen JT, Kalso E, Pöyhä R. 2007. Medical undergraduate students' beliefs and attitudes toward pain: How do they mature? *Eur J Pain* 11:700–706.
- Nnodim JO. 1996. Preclinical student reactions to dissection, death, and dying. *Clin Anat* 9:175–182.
- O'Carroll RE, Whiten S, Jackson D, Sinclair DW. 2002. Assessing the emotional impact of cadaver dissection on medical students. *Med Educ* 36:550–554.
- Papadodima SA, Sergeantanis TN, Iliakis RG, Sotiropoulos KC, Spiliopoulou CA. 2008a. Students who wish to specialize in forensic medicine vs. their fellow students: Motivations, attitudes and reactions during autopsy practice. *Adv Health Sci Educ Theory Pract* 13:535–546.
- Papadodima S, Sergeantanis T, Iliakis R, Sotiropoulos K, Spiliopoulou C. 2008b. In the university morgue: Medical students' physical symptoms, perceptions, concerns and feelings before and after the forensic practical course. *Med Teach* 30:103–104.
- Penney JC. 1985. Reactions of medical students to dissection. *J Med Educ* 60:58–60.
- Snelling J, Sahai A, Ellis H. 2003. Attitudes of medical and dental students to dissection. *Clin Anat* 16:165–172.
- Tschernig T, Schlaud M, Pabst R. 2000. Emotional reactions of medical students to dissecting human bodies: A conceptual approach and its evaluation. *Anat Rec* 261:11–13.
- Stata Corporation. 2003. *Stata Reference Manual*. 9th Ed. College Station, TX: Stata Press. 1837 p.
- Underwood LG, Teresi JA. 2002. The daily spiritual experience scale: Development, theoretical description, reliability, exploratory factor analysis, and preliminary construct validity using health related data. *Ann Behav Med* 24:22–33.
- Unsal A, Ayrançi U, Tozun M, Arslan G, Calik E. 2010. Prevalence of dysmenorrhea and its effect on quality of life among a group of female university students. *Ups J Med Sci* 115:138–145.
- Vijayabhaskar P, Shankar PR, Dubey AK. 2005. Emotional impact of cadaver dissection: A survey in a medical college in western Nepal. *Kathmandu Univ Med J* 3:143–148.
- Williams CM, Wilson CC, Olsen CH. 2005. Dying, death, and medical education: Student voices. *J Palliat Med* 8:372–381.
- Winkelmann A, Hendrix S, Kiessling C. 2007. What do students actually do during a dissection course? First steps towards understanding a complex learning experience. *Acad Med* 82:989–995.