Impact of Cadaver Dissection on Medical Students

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Concern has been raised over the psychological trauma some medical students appear to experience when undertaking human dissection. While previous research has been undertaken overseas, the present study sought to further investigate this phenomenon within a New Zealand university. Questionnaires were administered to 100 students attending the Auckland School of Medicine both immediately prior to their first dissection experience and at intervals over the following two years. A small but significant proportion (10%) exhibited a stress reaction one week following the first dissection, with the percentages dropping to 6.3 at one month, 3.6 at 8 months, 2.1 at one year, and zero at 2 years. Multivariate regression analysis associated pre-existing psychological morbidity and stress related to the impending dissection with post dissection trauma. Coping behaviours were used relatively infrequently and associations with gender, ethnicity and baseline psychological variables identified. These results suggest that the initial stress associated with human dissection dissipates relatively rapidly, but such a finding should not be used to undermine efforts to identify and support the relatively few students who may initially be distressed by the experience.

D issection of the human body is employed as a method of instruction in anatomy courses at both the Auckland and Otago medical schools in New Zealand. Although a time-honoured and almost universally accepted educational process, over the last 10-15 years attention has been drawn to the traumatic effects of dissection on some students and the implications of such trauma on subsequent education and practice (Charlton, Dovey, Jones, & Blunt, 1994; Gustavson, 1988; Hafferty, 1988). Aspects of dissection that medical students are reported to find distressing include revulsion at the sight and smell of the cadavers, shock at confronting death, desecration and dismemberment, violation of cultural taboos, dehumanisation, and invasion of privacy (Hafferty, 1988; Jones, 2000). The process is said to confront students with their fears and anxieties regarding life, death and human mortality that require time to resolve (Gustavson, 1988).

Investigations into such 'dissection trauma' have produced varying results, with reported proportions of students exhibiting distress ranging from 5 to 25 percent (Jones, 2000). Some authors found symptoms of severe depression, anxiety, insomnia and intrusive visual imagery that appear to resemble the symptoms of post-traumatic stress disorder (Gustavson, 1988). In an Auckland-based study of physiotherapy and occupational therapy students exposed to cadavers and prosections, Hancock, Williams and Taylor (1998) reported that 9% exhibited an initial post-traumatic stress reaction, but this proportion subsequently dropped to 2.1% on re-testing 18 months later. Many students reported that dissection was their first direct encounter with dead bodies, and that for some it was the first time they had seen 'a naked old person, let alone a naked old and dead person'. The researchers commented that to cut into the human body, to dismember it, to mutilate, and disassemble it, was outside the realm of everyday experience, and one that normally would constitute an extreme violation of societal norms.

In the present study the researchers adopted the concept of stress as being the substantial imbalance between demands that are made and the ability of individuals and groups to respond with the support available (Taylor, 2002a). Since its inception the concept had been defined both as the strain imposed upon an object or person and as the consequence of tension (Taylor, 2002b), but in line with recent empirical and theoretical developments (cf. Zeidner & Endler, 1996), the interactional model just described is preferred. Consistent with that model, when designing the present project the authors considered a cluster of

aetiological factors concerning individuals, their histories and immediate circumstances that McFarlane and Yehuda (1996) presented. Additionally they took into account the coping strategies adopted by medical students were also taken into account, because to some extent those related to active coping and problem solving are known to buffer psychological symptoms, while those related to avoidant coping and denial, such as intellectual detachment, might serve as an adaptive short-term response, but were they to persist, they would be maladaptive and make the clinicians less empathetic in their dealings with patients and their families (Hafferty, 1988; Charlton et al., 1994; Nnodim, 1996).

While overseas studies into the effects of dissection on medical students may have some relevance to New Zealand, differences in student populations suggest the need for a New Zealand-based study. For example, Auckland has a unique ethnic mix of Maori, Pacific and Asian students in the medical school, and unlike their counterparts in North America, they are not required to have an undergraduate degree prior to their entry.

The purpose of the present study therefore was to investigate the psychological impact of dissection and the coping strategies employed by medical students attending the Auckland School of Medicine. In accordance with the model of stress described above, and the authors' previous findings for physiotherapy and occupational therapy students (Hancock et al., 1998), it was expected that medical students would also show elevated levels of psychological stress. Further, given the more intense involvement of medical students with the process of dissection, it was anticipated that they would show greater levels of stress than the previously mentioned allied health students.

Method

Participants

In 1998, 110 students at the University of Auckland School of Medicine were introduced to gross anatomy in the second semester of their first year, and they continued the subject over the following three semesters. With the approval of the Ethics Committee of the University of Auckland, all students were invited to partake in this study by giving their written consent. Those who either did not sign a written consent form, or failed to complete an initial post cadaver exposure stress assessment questionnaire, were subsequently excluded. The anonymity of participants was respected.

Of the 110 students in the course, 100 (90.9%) fulfilled the conditions of participation. Fifty-one were male and the mean age of the group was 18.8 years. Ninety-one percent were between the ages of 17 and 19 years. Forty-four (44%) described themselves as Pakeha/European, six (6%) as Maori, twelve (12%) as Pacific Island or part Pacific Island and twenty-two (22%) as Asian, with the remaining 16 students of assorted ethnicity (Indian, Sri Lankan and Middle Eastern). The majority of students came from urban backgrounds (88%) with twelve (12%) from rural environments. Fifty-nine had previously seen a dead person, and ten of them indicated that they had been "very" or "extremely" traumatised by the event. As expected, the educational standard of the students was high; 95% had achieved a New Zealand "A" Bursary or University Entrance Scholarship during their final secondary school year.

Psychometric measures

The study utilised four psychometrically robust and brief clinical self-report questionnaires that gave reliable indications of key factors in psychological adjustment, different combinations of which had been used successfully with emergency service workers who had been involved in body-recovery after disasters (Alexander & Wells, 1991), and with occupational and physiotherapy students involved with dissection and witnessing prosection during the course of their studies (Hancock et al., 1998). The first, the GHQ-20 (Siegert, McCormick, Taylor, & Walkey, 1987), was a 20 item adaptation of Goldberg's (1978) four-factor General Health Questionnaire (GHQ) for psychological disorder. The instrument investigates general illness, sleep disturbance, anxiety and dysphoria, and severe depression, without implications of chronicity. In common with other screening questionnaires the GHQ does not make a clinical diagnosis. It "focuses on breaks in normal function, rather than lifelong traits... (and) ...concerns itself with two major classes of phenomena: inability to continue to carry out one's normal 'healthy' functions, and the appearance of new phenomena of a distressing nature." (p5 Goldberg & Williams, 1988). Respondents rate themselves on a four-point severity scale, according to how they have recently experienced each GHQ item: better than usual, same as usual, worse than usual, or much worse than usual. A total score is computed by adding the scores of each item. The GHQ binomial scoring method was employed with scores of 0-0-1-1 for the four response options, resulting in a minimum score of 0 and maximum of 20. The conventional cut-off point of 4 was employed as an indicator of psychological morbidity. (Goldberg & Williams, 1988).

The second assessment instrument, the 45 item Stress Arousal Checklist (SACL) (Mackay, Cox, Burrows, & Lazzerini, 1978), touched on certain cognitive and emotional reactions, specifically related to the impending dissection, that comprised the two factors of stress and arousal. Adjectives associated with the stress sub-scale of this instrument include "tense", "peaceful", "apprehensive" and "calm". Those on the arousal sub-scale include "vigour", "drowsy", "activated" and "lively". An ordered four point response scale ranges from "definitely feel" through "definitely do not feel". Items were given a score of one where respondents felt the adjective definitely or slightly described their feelings, and zero where they were either undecided or the adjective did not describe their feelings. Nineteen of the stress related items contributed to the stress subscale score which could range from 0 to 19, and 15 contributed to the arousal sub-scale (range from 0 to 15).

The Impact of Event Scale (IES) (Horowitz, Wilner, & Alvarez, 1979), the third instrument, was employed to

assess the psychological impact of dissection on the students. The IES measures subjective stress related to a specific event and comprises items composed of commonly reported experiences following a potentially traumatic event. Each of the 15 items has four response options, viz., "not at all", "rarely", "sometimes" and "often". Each of these options were scored 0, 1, 3 and 5 respectively. The questionnaire provides an overall scale, sub-scales of intrusion and avoidance, and can be used repetitively. It has good reliability and validity (Alexander & Wells, 1991). Horowitz (1982) described sub-scale scores of 0-8 as a minor reaction, 9-19 a moderate reaction, and a score of 20 or above a clinically important reaction, and McFarlane (1988) employed a cut-off score of 30 on the IES as indicating a traumatic stress reaction. The IES was administered on five separate occasions over a two year period to assess changes in the stress response.

The fourth scale, the COPE questionnaire (Carver, Scheier, & Weitraub, 1989) was administered 12 months after the students' first dissection to assess the dissection-related coping strategies that the students might have used. The COPE is a 60-item multidimensional coping inventory that is reported to be a reliable, relatively stable measure with convergent and discriminant validity, although Lyne & Roger (2000) have strong reservations about the ambitious claims that have been made for its use. The COPE provides 15 scales, two of which (Restraint coping and Drug/Alcohol use) were not employed in this study because the questions were considered either non-applicable (Restraint coping) or ethically questionable (Drug/Alcohol use). Each COPE scale comprises four items and respondents indicate on a 4-point scale how often they employ each coping strategy. Response options are: "I usually don't do this at all"; "I usually do this a little bit"; "I usually do this a medium amount"; "I usually do this a lot". Thus, for each of the 13 COPE scales respondents could score a minimum of 4 and maximum of 16.

Finally, provision was made on all questionnaires for students to make any additional comments they might feel prompted to express, because the set items might overlook significant reactions, and also the subjective expression of such reactions often adds welcome richness and relevance on which the researchers might reflect. As Bracken (2002) is at pains to point out, on epistemological grounds the conventional scientific methods for observing traumatic reactions often fall short by neglecting existential reactions.

Although all of the participating students completed the demographic and background information question-naire, for reasons that are unknown slightly fewer completed the psychometric instruments. The internal consistency of the GHQ in this study was 0.85 (Cronbach's alpha), with corresponding values for the SACL stress and arousal sub-scales of 0.88 and 0.87 respectively. The percentages of students responding to the repeated administrations of the IES were: IES1W (100%), IES1M (95%), IES8M (84%), IES1Y (84%) and IES2Y (60%). The initial (IES1W) yielded an alpha reliability coefficient of 0.87 for the overall scale, and coefficients of 0.86 and 0.79 for the intrusion and avoidance sub-scales. Seventy nine percent of students completed the COPE at one year. In general, the internal consistency of the 13 scales was acceptably high, with alpha coefficients ranging from 0.59 to 0.89.

Procedures

Ethical and legal obligations, and the pedagogic practice of placating anxiety, precluded the adoption of an experimentally 'pure' research design that would have had the intake of students allocated randomly into groups in which one would have been excluded from prior consideration and the other supported. Consequently immediately prior to their first sight of a cadaver, students were given a one-hour preparatory session on the spiritual aspects of death and dying, followed by a standard one-hour orientation to the dissection laboratory in which the obligatory procedural issues con-cerning the donor program and the storage and preservation of cadavers were explained, and it was emphasised that the donated bodies, there to facilitate learning, were to be treated with respect. They were also briefed on the standard of behaviour and conduct required of them in the dissection room.

The psychometric testing took place at predetermined intervals over a period of two years, beginning two weeks prior to the students' attendance at the dissection room with base-line GHQ and SACL stress and arousal levels specifically related to the impending dissection, and gathering demographic and background data. Then the students experienced two successive dissection laboratory sessions in which, over a period of six hours, they either witnessed or assisted in dissection. The IES was administered one week following the first dissection experience (IES1W) to detect the initial response, and it was repeated on four subsequent occasions, i.e. at one month (IES1M), eight months (IES8M), one year (IES1Y) and two years (IES2Y) to detect any subsequent fluctuations of response. After one year the COPE was administered to elicit patterns of coping.

Statistical methods

The statistical package SPSS for MS Windows (10.0) was used for data analysis, with results being considered significant at the usual 5 per cent level or below. The internal consistency of psychometric measures was assessed by Cronbach's alpha. Differences between groups at any one time, and changes over time, were assessed by analysis of variance (ANOVA) and repeated measures ANOVA. Because the primary outcome (IES) scores were not normally distributed, a square-root transformation was employed so that the data better met the assumptions of the parametric tests. Finally, multiple regression procedures were used to identify variables independently predictive of outcomes.

Results

The mean score of the GHQ-20 was 14.9 (SD 7.5). These baseline results showed that 35 of the 76 students (46%) had above threshold GHQ-20 scores. The SACL stress and arousal scales had mean scores of 8.2 (SD 5.1) and 8.6 (SD 4.2) respectively. On this measure 90% of students indicated some degree of

emotional stress on 15 of the 19 items assessing stress associated with the impending dissection. In descending order, the percentages of stress-related adjectives checked by the students were 'apprehension' (65%), 'uneasy' (52%), 'worried' (38%), 'fearful' (29%) and 'distressed' (26%).

The mean values for the overall IES1W scale and its intrusion and the avoidance sub-scales were 12.9 (SD 11.7), 6.4 (SD 6.8) and 6.5 (SD 6.8) respectively. The intrusion items with the highest mean scores were 'pictures about it popped into my mind' and 'thought about it when I didn't mean to'. The corresponding avoidance items were 'I avoided getting myself upset when I thought about it or was reminded of it' and 'my feelings about it were kind of numb'. Ten percent of students exceeded McFarlane's (1988) cut-off score (≥30) for the total IES scale, thereby exhibiting a stress reaction. Percentages of students exhibiting stress reactions to subscales of the IES1W are shown in Table 1.

The dotplots, means and SDs for successive administrations of the IES (but excluding IES8M) are shown in Figure 1. The dots in the Figure depict Total IES scores for each individual who completed the assessment, and the relationship of the scores to McFarlane's cut-off value indicative of a traumatic stress reaction. The mean score for IES1W was significantly higher than for each follow-up administration (p<0.01), and reductions between the means of successive tests were significant (p<0.05) with the exception of that between IES8M and IES1Y (p = 0.182). These reductions in mean IES values were reflected in the progressive reduction in the percentages of students exhibiting stress reactions at each assessment point, i.e. 6.3 at IES1M, 3.6 at IES8M, 2.1 at IES1Y and 0 at IES2Y.

The results also showed that none of the ten initially stressed students exhibited significant stress at the one or two year assessments. However, while eight of these students completed the IES1Y, only three of them completed the IES2Y. One student who had not exceeded the stress threshold at one week did exhibit a stress reaction at one year.

Similar marked reductions were

Table 1. Numbers of students exhibiting stress reactions to subscales of the Impact of Event Scale one week after their first exposure to cadavers (n=100).

IES Subscale	Minor (%) (0-8)	Moderate (%) (9-19)	Clinically Important (%) (≥ 20)
Intrusion	73 (73)	22 (22)	5 (5)
Avoidance	70 (70)	23 (23)	7 (7)

Figure 1. Dotplots of Impact of Event Scale scores at intervals following students' initial dissection.
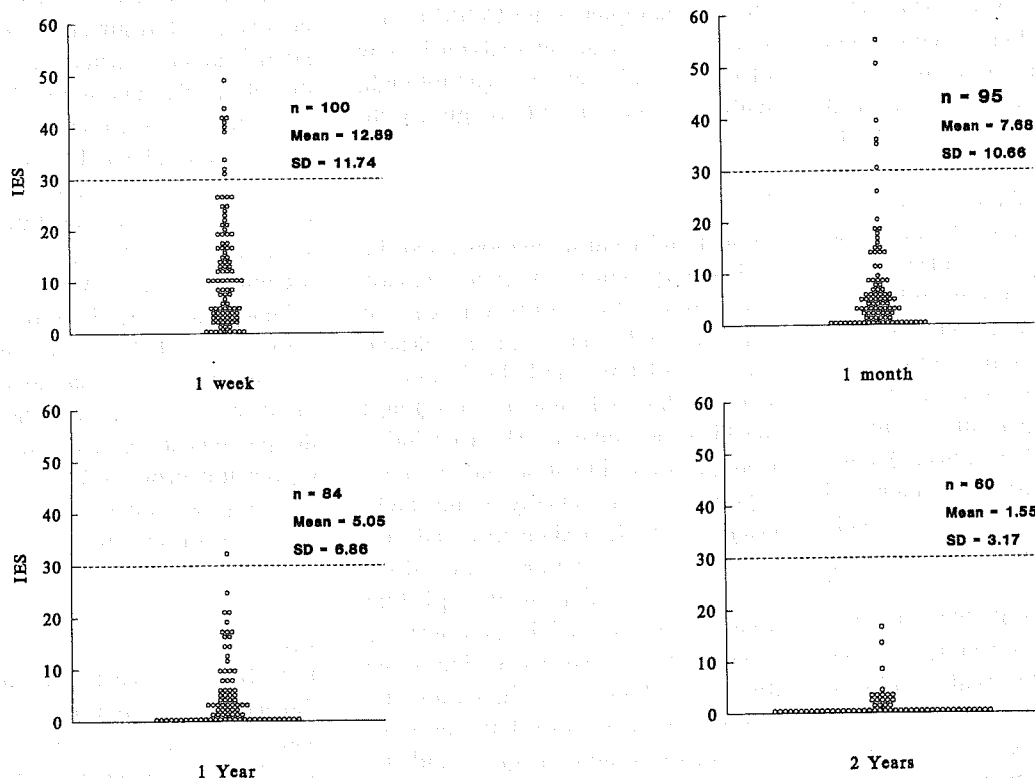
Dots represent individual scores. The dotted lines represent McFarlane's (1988) cut-off value with scores above the line indicating a traumatic stress reaction.

observed in the scores for the successive administrations of the IES sub-scales. Thus, at baseline (IES1W), 5% of students demonstrated stress responses on the Intrusion subscale and 7% for the Avoidance sub-scale. Corresponding figures for the later IES measures were: 3.2% and 4.2% at IES1M and 0% for both subscales at IES8M, IES1Y and IES2Y.

Table 2 presents mean initial scores for the Total IES1W and its sub-scales analysed in relation to demographic, background, GHQ-20 and SACL variables. For convenience of analysis scores for the stress and arousal scales of the SACL were divided into tertiles. Analysis of variance tests showed that:

(1)   Female students had significantly higher initial Total IES and Avoidance mean values than males.

(2)   In contrast to students who had not previously seen dead bodies, or those who had, but not been traumatised by the event, students who had been markedly traumatised by such an experience exhibited significantly higher mean IES intrusion scores.

(3)   Students who gained a University Entrance Scholarship exhibited significantly lower mean IES Intrusion scores than those with an A or B bursary only.

(4)   Students with GHQ-20 scores exceeding the distress cut-point had significantly higher Total and Intrusion IES scores than those falling below the cut-point.

(5)   All three SACL groups differed significantly in terms of their scores on the Total IES and the Avoidance subscale. Tukey post-hoc comparisons revealed that students with the highest scores on the SACL had significantly higher mean Total (p=0.020) and

Avoidance (p=0.019) IES scores than those with intermediary scores on the SACL.

The independent variables depicted in Table 2 were entered as dummy variables into three separate multiple regression models predicting Total IES, Intrusion and Avoidance scores. These models enabled assessment of the unique contribution of each independent variable when controlling for the effects of all the others. GHQ-20 caseness (i.e. scores ≥ 4 indicating psychological morbidity) and the stress related to the impending dissection (SACL) remained significantly (p < 0.05) associated with scores on the Total IES1W. The independent variables explained 34% of the variance in the IES1W scores, leaving 66% of the variance unexplained. Lower school academic achievement and GHQ-20

Table 2. Impact of Event Scale scores one week after students' first cadaver dissection by selected variables (n = 100).

Variable	n	IES intrusion Mean score	IES avoidance Mean score	IES total Mean score
Gender				
Male	51	5.45	4.94*	10.39*
Female	49	7.42	8.06	15.49
Age (yrs)				
17-19	91	6.04	6.21	12.25
≥20	9	10.22	9.11	19.33
Ethnicity				
European New Zealander	44	5.81	6.63	12.45
Maori/Part Maori	6	11.33	4.17	15.50
Pacific Island/Part Pacific Island	12	5.25	5.83	11.08
Asian	22	7.41	7.36	14.77
Other	16	5.75	6.13	11.88
Trauma associated with previous exposure to dead persons				
Not previously seen dead person	41	5.68*	6.92	12.61
Seen dead person, not/slightly traumatised	49	5.59	6.08	11.67
Seen dead person, very/extremely traumatised	10	13.50	6.50	20.00
Highest academic school attainment				
A or B bursary	37	8.43*	5.95	14.38
University Entrance Scholarship	61	4.93	6.69	11.62
GHQ-20				
<4 (Non case)	41	4.83*	5.02	9.85*
≥4 (Case)	35	7.91	8.03	15.94
Stress (SACL)				
0-5	29	6.45	7.86*	14.31*
6-10	31	5.45	4.13	9.58
>10	29	7.62	8.24	15.86
Arousal (SACL)				
0-5	26	6.77	8.81	15.57
6-10	33	6.67	6.09	12.76
>10	30	6.03	5.50	11.53

Differences among groups for each variable assessed by one-way analysis of variance using square root transformations of the IES scores.
*p < 0.05 differences between groups

caseness were significantly (p < 0.05) associated with higher Intrusion and Avoidance scores respectively.

In addition to the above analyses, more parsimonious explanations of the data were sought by submitting the independent variables in Table 2 to stepwise multiple regression procedures. Variables reaching significance (p < 0.05) in these analyses were consistent with the previous models except that, in addition, stress related to the impending dissection (SACL) was also significantly associated with both IES Intrusion and Avoidance scores.

With regard to the COPE, the mean values for each of the scales are shown in Table 3 along with the percentages of students scoring greater than or equal to twelve. Such values indicate students were, on average, employing the coping behaviours underlying each scale a "medium amount" to "a lot". The most frequently employed coping strategies were *Positive reinterpretation and growth*, *Humour* and *Acceptance*. Least used coping behaviours were *Behavioural disengagement*, *Denial*, *Focus on and venting of emotion* and *Suppression of competing activities*.

The COPE scores also showed that females had significantly higher mean scores than males (p < 0.05) for *Active coping* (5.8 vs 4.8) and *Seeking support for emotional reasons* (6.3 vs 5.0), while males had significantly higher mean scores for *Humour* (7.1 vs 8.9). Relative to each of the other ethnic groups, Pacific Island students showed a significantly higher mean score for *Turning to religion*. Students exhibiting symptoms of minor mental disorder (GHQ-20 cases) exhibited significantly (p < 0.05) higher mean scores for *Seeking emotional support, Venting emotions, Denial, Mental disengagement* and *Humour*. Our highest scale means (8.0 - 8.2) indicated that, on average, students were employing the relevant coping behaviours infrequently ("a little bit"). Further, the coping behaviours underlying only three scales (*Humour, Acceptance* and *Turning to religion*) were employed by more than 10% of the students to any significant degree ("medium amount" to "a lot").

Table 3. Coping scores for the individual COPE scales (N=79)

Scale	Mean	SD	% Students scoring ≥12[1]
Active coping	5.2	2.1	3.8
Planning	5.4	2.2	2.6
Seeking social support for instrumental reasons	5.2	2.2	2.6
Seeking social support for emotional reasons	5.6	2.6	5.1
Suppression of competing activities	5.0	1.9	0.0
Turning to religion	6.0	3.2	12.7
Positive re-interpretation and growth	8.2	2.7	9.0
Acceptance	8.0	3.5	17.7
Focus on and venting of emotion	4.9	1.5	0.0
Denial	4.6	1.3	0.0
Mental disengagement	5.8	2.2	1.3
Behavioural disengagement	4.6	1.3	0.0
Humour	8.1	3.7	19.1

1. Scores for each scale can range from 4 to 16. Values ≥ 12 indicate mean use of coping behaviours a "medium amount" to "a lot" of the time.

Total IES scores one week post dissection showed significant but low to moderate (r_s = 0.22 to 0.42) positive correlations with ten of the thirteen COPE scales. Students exceeding McFarlane's (1988) stress reaction cut-off score on the IES showed significantly higher use of *Acceptance* (p<0.05) as a method of coping.

Discussion

Using McFarlane's (1988) criterion, 10 per cent of our medical students displayed initial if transient Total IES reactions of post-traumatic stress, with 5% and 7% exhibiting clinically important reactions for the respective Intrusion and Avoidance scales, and only one student exhibiting significant stress reactions after 12 months, and none after 24 months. These reductions in percentages of students exhibiting symptoms of stress were paralleled by marked reductions in Total IES mean values over time (see Figure 1). In comparison with the values reported in other studies, the Total IES1W means of 10.4 for males and 15.5 for females in the present investigation are slightly higher than the respective mean scores of 6.9 and 12.7 that Horowitz et al. (1979) found in their study of medical students exposed to cadavers. But the values were similar to those obtained in our previous study of physiotherapy

and occupational therapy students, i.e. 12.6 for males and 15.7 for females (Hancock et al., 1998). However, the Total IES1W mean score of 12.9 for the whole group in the present study was considerably lower than that reported for more severe psychological trauma – such as the mean value of 29.7 for patients with advanced cancer (Kassa et al., 1993) and of 28.5 for Swedish survivors of the car ferry m/s Estonia. (Eriksson & Lundin, 1996).

As the students progressed through the course their comments tended to reflect a perceptual change that paralleled the reduction in stress. Initially, some comments indicated marked distress:

"I didn't really like the whole experience. The first time we went in I cried and have since felt like crying about it too. I find it difficult each time we go into the lab and it takes a while before I can participate in dissection. It is improving each time though."

At later stages comments reflected adjustment to the experience and tended to be more reflective and less reactive.

"I think of it as a very unreal experience. It's amazing how you come to think of it as something purely academic. It doesn't always click that it's actually something that would make a normal person feel awkward or scared."

"I haven't found it affected me all that much – you just pretend it's not actually a person if it's getting difficult."

Perhaps as to be expected from university students many of their written comments illustrated the process of intellectualisation.

"It sounds rather mean but the way I dealt with it was to treat the cadaver as a learning tool rather than a dead body."

Some students also expressed concern that they might have adapted too easily to the cadaver experience and they were critical of themselves for having done so.

"It actually bothers me that I have become as desensitised to the whole thing. I was very upset about it but I'm not anymore. This very abnormal thing has become normal and I find that quite disturbing in myself."

A number of factors were identified as predictive of stress following initial exposure to the dissection laboratories. In the bivariate analyses (Table 2), the finding that female students had higher Total IES1W and avoidance mean values than males is consistent with other research (Hancock et al., 1998; Horowitz et al., 1979). The higher Total IES1W scores for those who had been traumatised by a previous death suggests that past traumatic memories may have increased the students' emotional sensitivity to death. While all students in this cohort were high academic achievers, students with the higher school qualification (University Entrance Scholarship) exhibited significantly lower mean Total IES1W intrusion scores. This may indicate that these students were better able to focus on the intellectual aspects of the task and correspondingly avoid, suppress or cope with negative emotional responses, and put the dissection experience into an appropriate philosophical context.

The proportion (46%) of students exceeding the cut-off score on the GHQ appears to be high, but other researchers have also reported high rates of psychological disorder using this measure, and have expressed concern at the stress associated with medical education (Benitez, Quintero & Torres, 2001; Guthrie et al., 1995; Aktekin et al., 2001)

In our previous study of physiotherapy and occupational therapy students (Hancock et al., 1998) we found that psychological distress as measured by the Hopkins Symptom Checklist (Green, Walkey, McCormick & Taylor, 1988) was positively correlated with scores on the Total IES and each of its sub-scales. In the present study we employed the GHQ-20 to assess psychological morbidity, and found that students exceeding the cut-off had significantly higher mean Total IES1W scores for the overall scale and intrusion sub-scale. A similar trend was observed for the avoidance sub-scale but the results fell just short of significance (p = 0.055).

Higher mean Total IES and Avoidance scores were also observed for students exhibiting high pre-exposure stress scores as measured by the SACL. Taken together, the GHQ-20 and SACL findings lend support to our expectation that students experiencing psychological strain are at increased risk of becoming stressed by the additional demands imposed by dissection. However, the finding that students with the lowest level of pre-exposure anxiety had higher IES1W scores than those with moderate levels of apprehension was unexpected. This may indicate that those students who exhibited least anxiety had given little thought to the impending dissection, and therefore were unprepared for the experience.

Our mean COPE scale scores are low compared to values reported in several studies by Carver et al. (1989) In one study undergraduate students were required to complete the COPE when considering their most stressful event of the past two months. In a second study undergraduates completed the COPE by indicating how they generally responded when under "a lot" of stress. These investigations employed 12 of the COPE scales used in the present study. Mean values for our study are consistently lower for each of the scales with our means less than half Carver et al.'s for five of the 12 scales.

The finding in our study that males used more humour in coping than did females, is consistent with studies reported by Hafferty (1988), William

(1992), and Phelps and Jarvis (1994), and together with their significantly less frequent use of *Seeking support for emotional reasons,* it suggests they conformed to the stereotype and were more reluctant than females to discuss their feelings. In contrast, Horne Tiller, Eizenberg, Tashevka, and Biddle (1990) found that Australian medical students did not use humour and suggested its absence was related to the high proportion of non Anglo-Saxons in the class: however, we failed to find a significant relationship between humour and ethnicity. But in a somewhat related study of police officers involved in body handling after a disaster, Alexander and Wells (1991) reported that nearly all respondents found humour helpful, and McGarvey, Farrell, Conroy, Kandiah, and Monkhouse (2001) found that 45% of students at the Royal College of Surgeons in Ireland used humour as a means of coping with their course work.

Regarding the influence of cultural factors on coping responses, Pacific Island students used *Turning to religion* as a means of coping significantly more than other ethnic groups. This finding reflects the integral and important place of religion in Pacific Island culture that Lealaiauloto and Bridgman (1997, p10) described as "a system of powerful spiritual beliefs, both Christian and traditional which... underpin the Pacific views of the world', and Taylor (in press) found to be important in the recovery of Pacific Islanders from stressful experience.

The evidence showed that pre-existing psychological distress (GHQ-20) and that resulting from exposure to dissection (IES1W) were associated with higher COPE scores. It appears that students thus affected, when faced with the stress of dissection and unable to remove it from their academic lives, more frequently resorted to coping strategies to reduce their emotional turmoil and focus on the task at hand.

As noted earlier, it has been suggested that certain coping behaviours adopted by medical students (e.g. detachment) might have adverse consequences for their future roles as clinicians. Charlton, Dovey, Jones, and Blunt (1994) went so far as to contend that students employing such distancing

strategies would develop a less caring attitude. Other researchers described similar defense mechanisms, viz, "objectification," "distancing" (Lella & Pawluch, 1988) and "rationalization" (Nnodim, 1996: Abu-Hijelh, Hamdi, Moqattash, Harris & Heseltine, 1997). Such behaviours are thought to help students to focus on the task at hand, to keep their emotions in check, and to view a potentially negative experience in a positive manner: they appear to be measured by a number of the COPE scale, including *Positive re-interpretation and growth, Acceptance* and *Suppression of competing activities*. However, while these coping behaviours were among the most frequently employed by our students, less than one fifth reported using them to any notable degree.

While this study provides useful information relating to the manner in which students coped with dissection it has a limitation that deserves mention. The COPE questionnaire was administered after the students had completed one year of their gross anatomy course. Such an interval may not have allowed accurate recall of early coping behaviours. Future studies might therefore usefully assess coping strategies closer to the initial dissection. Repeated administration of the measure might then be employed to assess changes in coping strategies over time.

Finally, although positive student perceptions of the value of the dissection experience were not addressed specifically in the present study, many students made spontaneous comments that attested to the positive value of the learning experience, such as:

"This type of learning is an effective, maybe the most effective way to learn, feel and memorise anatomy. Personally it drives me to take my study seriously and to learn as much as I can about the human body. It gives a human face to what I am studying. At the end of the day I will be treating a human being who has a face and feelings and deserves the best of the service of knowledge in my medical training."

In conclusion, this investigation of psychological trauma associated with the process of dissection of human cadavers, the predictors of such trauma, and the behaviours employed to cope

with the experience, shows that a relatively small but significant percentage of medical students had initial adverse affects. While the indications are that the initial stress associated with human dissection dissipates relatively rapidly, the finding should neither be used to trivialise the reactions nor to neglect those students who might initially be traumatised. Educators need to take care to identify and support the few individual students who might be temporarily disturbed by the potentially traumatic experience.

Given that every medical student in New Zealand is exposed to cadaver dissection, further research is warranted to address limitations of the present study. While coping strategies appeared to be infrequently employed by our students, research is required to more adequately investigate the effect of coping strategies on the initial trauma response and to track changes in coping over time.

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