

Article

Anatomy: An Opportunity for South African Health Science Students to Discuss Their Emotional Responses to Human Remains in the Laboratory

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Abstract: Human dissection remains a cornerstone of the anatomy learning experience. However, the emotional response of students to the use of human remains for learning is influenced by a number of factors and is not always positive. Therefore, this study explored the students' emotional response to and factors affecting their perceptions of the use of human remains for learning anatomy in a South African context. Four hundred and eighty of the 1538 health sciences students enrolled in human anatomy courses at the University of the Witwatersrand, South Africa during 2016 and 2017, completed a voluntary survey. The survey included closed and open-ended questions on students' emotional responses, coping mechanisms and the factors that affected their perceptions of the use of human remains and dissection. Overall, the students had a positive emotional response. Their perceptions of dissection were affected in positive and negative ways by their religious and cultural beliefs. Feelings of gratitude and respect toward the cadaver were informed by belief systems. However, anxiety was caused by the delay of accepted sociocultural burial practices. Peer discussions were the preferred coping method, which may provide an approach for students to discuss how their beliefs influence their dissection experience.

Keywords: human remains; dissection; emotions; religion; anatomy education; beliefs



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1. Introduction

The importance of human dissection in the health sciences curriculum resonates through time [1–12]. Dissection remains the prime medium of instruction for the teaching of human anatomy at most health sciences institutions in Africa [13] and internationally [11,12,14].

Human dissection is generally the first exposure to a dead body for the majority of students [15,16] and the act of cutting up, disarticulating and depersonalizing the individual is said to have an emotional impact on students [17,18]. For many, dissection is a life-changing event. Studies analysing the emotions experienced by undergraduate students at the time of this exposure have concluded that dissection is generally a positive experience [11,19–21]. However, for some, it may be a traumatic occurrence, even inducing symptoms of post-traumatic stress disorder [17,19].

It has been postulated that if students are emotionally well-prepared for the initial encounter with a dead body, then they would also be better prepared for the variety of human emotions that they will face throughout their health sciences careers [22]. Factors such as sex [23–26], religious beliefs [27], philosophical beliefs [27], cultural beliefs [25,28] and academic performance [24,26] as well as prior experiences of death and dying [23,29] have been shown to positively and negatively influence the emotional response to dissection. Kotze and Mole [20] from South Africa report that first-year medical students

experience fear and apprehension about dissecting sensitive areas, dissecting inaccurately, becoming desensitized towards death and experiencing physical symptoms. They also report on the learning that students expect to gain from the experience and the value of peer discussion as a coping mechanism. However, there is a paucity of information on the emotional responses of South African health sciences students to the anatomy laboratory experience and how students perceive their beliefs influence this response. The aim of this study was, therefore, to determine the emotional impact of the use of human remains on undergraduate students in a South African health sciences institution, the University of the Witwatersrand. As we are a multicultural society, we also wished to explore the impact of students' belief systems on their perceptions of the experience and the coping mechanisms that they may employ to navigate challenges in this learning environment.

Context of the Study

At the University of the Witwatersrand (Wits), Johannesburg, South Africa, all undergraduate students undertaking human anatomy make use of human remains for learning. Students undertaking degrees in medicine, physiotherapy, occupational therapy, Bachelor of Health Sciences, dentistry and biomedical engineering are required to participate in a weekly three-hour cadaveric dissection session, spanning the course of the academic year (30 weeks), which are supplemented with prosected materials and skeletal elements. In addition, there is a weekly 90-min practical session for all allied health sciences students (physiotherapy, occupational therapy, pharmacy and nursing and dentistry) utilising prosected human materials, either wet or plastinated specimens and osteological elements.

Prior to beginning the anatomy laboratory sessions, all students attend a special ceremony in the school's anatomy laboratory to dedicate the bodies for use during the year. The dedication ceremony is comprised of a presentation by the Head of the School on the provenance of the bodies, including consent and respect, as well as a welcome from the Dean of the Faculty, poems and songs celebrating the donors. The ceremony is followed by a session orientating students to procedures in the anatomy laboratory that are related to ethical and practical issues of body donation and dissection. Following this session, the students begin their anatomy laboratory curriculum.

2. Materials and Methods

Ethics clearance to undertake this study was obtained from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand (M220164). Bodies are bequeathed to the School through a body donor programme [30] and information pertaining to the age at death of the cadaver as well as the cause of death was provided to the students.

2.1. Development of the Survey Instrument

An online survey (Supplementary Materials S1) was constructed using LimeSurvey (LimeSurvey GmbH./LimeSurvey: An open-source survey tool/LimeSurvey GmbH, Hamburg, Germany).

The authors prepared the survey based on demographic characteristics, positive and negative emotions, physical symptoms and coping mechanisms associated with an emotional response to dissection as reported in the literature. Three senior anatomists in the School of Anatomical Sciences, University of the Witwatersrand reviewed the questions, and their comments were incorporated into the survey before it was distributed to students.

Information on demographic characteristics such as age, sex, population and religious affinities, as well as the degree program for which the respondent was registered were requested. Questions focusing on the respondent's social context were also included, e.g., "categorize your usual place of residence". In addition, the importance of their belief system was also considered as part of establishing the respondent's social context. Respondents rated the importance of their belief system by means of a Likert scale of 1 to 5 (1 = not important, 3 = neutral and 5 = very important).

Respondents were also asked to rate their experience of positive and negative emotions associated with dissection [23,25] both prior to the first anatomy laboratory as well as after two weeks of anatomical laboratory experience, using a 5-point Likert scale (1 = not experienced, 5 = strongly experienced). Open-response questions asked respondents to explain why they felt certain emotions as well as the beliefs and other factors that they thought contributed to their response to the anatomy laboratory experience.

Additional closed and open-response questions explored physical symptoms related to dissection [23,25], the experience of the respondents to seeing a dead body prior to the first anatomy laboratory and their level of active participation in the first two anatomy laboratory sessions. In addition, the coping mechanisms for adjusting to the anatomy laboratory experience [19,21,23–25], the value of the dedication ceremony and other interventions in preparing them for the experience and the value they perceive in using human remains when learning anatomy were also explored.

2.2. Sample and Sampling Method

The 2016 and 2017 cohorts of undergraduate medical, Bachelor of Health Sciences and biomedical engineering students ($n = 821$) as well as allied health sciences students ($n = 717$) were invited to participate in the study. Respondents were recruited during a face-to-face computer-based laboratory session in the third and fourth week of the first academic term of 2016 and 2017. By the third and fourth week of the academic year, the students had completed two weeks of laboratory experience. Surveying students at this time allowed them to report on emotional responses before and after entry into the laboratories. Respondents were given the information sheet including a link to the online survey and were asked to complete the survey within two weeks. Completion of the survey was anonymous and voluntary, and completing the survey was taken as consent to participate in the study.

A second follow-up survey and focus groups planned for later in the academic years could not be distributed and completed due to the #Feesmustfall protests that occurred at Wits. The email addresses requested for focus groups were stored separately from the responses to the survey.

2.3. Data Analysis

Respondents who had undertaken any form of dissection (medicine, Bachelor of Health Sciences, biomedical engineering, physiotherapy, occupational therapy and dentistry degrees) were classified as “dissectors”. Those respondents who had studied prosecutions only (pharmacy and nursing degrees) were classified as “non-dissectors”.

South African minority ethnic groups such as South African Indian/Indian (SAI), South African Coloured (SAC) and Chinese [31] were together categorised as “Other” to allow a sufficient sample size for further statistical analysis. Those students who did not wish to identify with a particular population group were categorised as DNI (Did not indicate).

2.4. Quantitative Data Analysis

Data analysis was conducted using SPSS v26 (IBM, Armonk, NY, USA) as well as Statistica v13 (TIBCO software, Palo Alto, CA, USA). For all analyses, significance was taken as $p \leq 0.05$.

The frequency of responses and 95% confidence interval were calculated for questions with categorical responses (e.g., yes/no). Likert-scale responses to the questions “How important are your philosophical/religious beliefs to you?”, “Is it important for health sciences students to dissect a human cadaver?” and “To what extent did the formal dedication ceremony prepare you for dissection of the human cadaver?” were treated as categorical variables describing the cohort, and the frequency of responses and 95% confidence interval were calculated. Due to the low number of selections of rating 1 and 2 for the questions “How important are your philosophical/religious beliefs to you?” and “Is it important

for health sciences students to dissect a human cadaver?”, these responses were grouped together as the category “not important”.

Likert-scale ratings of positive and negative emotions were treated as ordinal variables and the median and interquartile ranges were calculated according to categories of the demographic variables, as the data were not normally distributed as determined by a Shapiro–Wilks test. In addition, following discussion with a biostatistician, ratings of the negative emotions were subtracted from the positive emotions to calculate an overall score for the emotional response both before and after the commencement of anatomy laboratory sessions for each respondent.

Due to the uneven sample sizes in the majority of comparisons, a Kruskal–Wallace ANOVA by ranks was used to assess significant differences between the categories of the demographic variables. A Wilcoxon sign rank matched pairs test was used to assess the level of change in an individual’s emotional response when comparing emotions before and after the commencement of the anatomy laboratory sessions.

2.5. Qualitative Data Analysis

Thematic analysis, following the phases described by Braun and Clarke [32], was used to identify themes within the answers to open-response questions. Two members of the research team conducted the initial coding independently using a combination of inductive and deductive codes in NVivo 10 (QSR International, Doncaster, Australia). Deductive codes included coding responses as relating to religious, cultural and/or philosophical beliefs. Each response to a question was coded separately, but the same inductive and deductive codes were used across all questions as similar codes were identified. Codes were discussed to achieve consensus and then grouped into themes related to reasons for experiencing an emotional response and factors that affected the response to the anatomy laboratory experience.

3. Results

Six hundred and twenty-four responses were received, of which 144 were excluded from the study as respondents did not rate their experience of emotions both prior to the first anatomy laboratory session *and* after two weeks of anatomical laboratory experience. Therefore, 480 responses (response rate = 31%) of the entire cohort of students (2016 and 2017; $n = 1538$) were included.

3.1. Demographic Profile

Seventy-four percent of respondents were classified as dissectors (Table 1). The majority of the respondents identified as being female (75%), originating from an urban environment (88%) or being Christian (63%) (Table 1). Seventy percent of respondents considered their belief systems to be very important or important (Table 1). Similar frequencies of respondents identified as being South African Black (33%) and South African White (34%). Most respondents (85%) had entered directly into their degrees from secondary school and the mean age was 19 ± 1.50 years.

Table 1. Demographic profile of survey respondents.

		N	%	95% CI
Dissection opportunity ...	Dissectors	355	74	70.08–77.92
	Non-dissectors	115	24	20.18–27.82
	No degree specified	10	2	0.75–3.25
Sex	Male	120	25	21.13–28.87
	Female	359	75	71.13–78.87
	No response	1	0	0–0

Table 1. Cont.

		N	%	95% CI
Population affinity	SAB	158	33	28.79–37.21
	SAW	161	34	29.76–38.24
	SAC	31	6	3.88–8.12
	SAI	80	17	13.64–20.36
	South African Chinese	4	1	0.11–1.89
	Do not wish to be classified	46	10	7.32–12.68
Religious affinity	Christianity	302	63	58.68–67.32
	Islam	54	11	8.2–13.8
	Judaism	22	5	3.05–6.95
	Hinduism	25	5	3.05–6.95
	Tamil	2	0	0–0
	Buddhism	1	0	0–0
	Atheism	9	2	0.75–3.25
	Agnosticism	8	2	0.75–3.25
	None	18	4	2.25–5.75
	Other beliefs *	2	0	0–0
	No response	37	8	5.57–10.43
Importance of belief system	Very important	234	49	44.53–53.47
	Important	102	21	17.36–24.64
	Neutral	76	16	12.72–19.28
	Not important	65	14	10.9–17.1
	No response	3	1	0.11–1.89
Exposure to a dead body	Yes	277	58	53.58–62.42
	No	201	42	37.58–46.42
	No response	2	0	0–0
Usual place of residence	Urban	423	88	85.09–90.91
	Rural	57	11	8.2–13.8
Activity before entering degree program ^{\$}	At school	408	85	81.81–88.19
	Employed	17	4	2.25–5.75
	Other	64	13	9.99–16.01
Importance of human remains for learning	Very important	279	58	53.58–62.42
	Important	105	21	17.36–24.64
	Neutral	56	12	9.09–14.91
	Not important	30	6	3.88–8.12
	No response	10	2	0.75–3.25
Actively engaged with human remains in the first anatomy laboratory sessions	Yes	416	87	83.99–90.01
	No	60	13	9.99–16.01
	No response	4	1	0.11–1.89

Table 1. Cont.

		N	%	95% CI
Extent that the dedication ceremony prepared the student for the anatomy laboratory session	Well prepared	52	11	8.2–13.8
	Prepared	74	15	11.81–18.19
	Neutral	138	29	24.94–33.06
	Not really prepared	114	24	20.18–27.82
	Not prepared	96	20	16.42–23.58
	No response	6	1	0.11–1.89
Do you have specific beliefs which influenced your response to the anatomy laboratory sessions?	Yes	124	26	22.08–29.92
	No	352	73	69.03–76.97
	No response	4	1	0.11–1.89
Experience of physical symptoms	Yes	340	71	66.94–75.06
	No	140	29	24.94–33.06

[§] Eight respondents chose more than one option. * Includes one respondent stating Ancestors and one respondent stating Mother earth. SAB (South African Black); SAW (South African White); SAI (South African Indian/Indian); SAC (South African Coloured) and Chinese [31]. Individuals classified as other included both students who did not wish to be categorized with a specific population group as well as those who did not indicate their population affinity.

Exposure to a dead body prior to entering the anatomy dissection laboratory was relatively common (58%; Table 1). Of those students who had previously seen a dead body, 51% ($n = 142/277$; 95% CI: 46.53–55.47) indicated that the experience had been traumatic, citing examples of exposure within the context of a funeral environment. Alternative environments included instances where students had previously visited an anatomy department as part of a school excursion or had accompanied health care professionals to either the mortuary, a nursing practical or an accident scene as part of a job-shadowing experience.

Seventy-nine percent of respondents considered human remains a very important or important resource for learning the anatomical sciences and 87% actively engaged with the human remains during the anatomy laboratory sessions in the first two weeks of the academic term. However, only 26% of students felt that the dedication ceremony had helped them to prepare for the anatomy laboratory sessions (Table 1).

3.2. Emotional Responses to the Anatomy Laboratory Experience

Respondents reported a generally positive emotional response both before (overall score = 3.5 (−1:7)) and after (overall score = 5 (0:7)) the first laboratory experiences (Table 2), with the overall score being significantly more positive after than before the first laboratory experience ($p = 0.00$). Fear, anxiety and apprehension decreased significantly after the first two weeks of laboratory experience, whereas ratings of excitement and interest remained unchanged (Tables 2 and 3). In contrast, ratings for disgust/revulsion increased ($p = 0.00$) and curiosity decreased ($p = 0.00$) after the first two weeks of laboratory experience (Tables 2 and 3). This pattern of change in the emotional response was apparent within groups for each demographic variable for the majority of groups (Supplementary Table S1).

Table 2. Median and interquartile range values for the overall and positive emotions of respondents before and after the first two weeks of anatomy laboratory sessions.

		Overall Score of Emotions				Excitement			Interest			Curiosity		
		<i>n</i>	Before	After	<i>p</i> -Value *	Before	After	<i>p</i> -Value *	Before	After	<i>p</i> -Value *	Before	After	<i>p</i> -Value *
All Respondents		481	3.5 (−1:7)	5 (0:7)	0.00	3 (2:4)	3 (2:4)	0.09	4 (3:5)	4 (3:5)	0.90	4 (3:5)	4 (3:5)	0.00
Exposure to a dead body	Yes	277	4 (−1:8)	5 (1:8)	0.44	3 (3:4)	3 (2:4)	0.00	4 (3:5)	4 (3:5)	0.00	4 (4:5)	4 (3:5)	0.07
	No	201	2 (−3:6)	4 (0:7)	0.00	3 (2:4)	3 (2:4)	0.00	4 (3:5)	4 (3:5)	0.00	4 (3:5)	4 (3:5)	0.03
	KW <i>p</i> -value		0.00	0.04		0.29	0.36		0.16	0.4		0.53	0.78	
Extent that dedication ceremony prepared for dissection	Well prepared	52	4 (0:8)	7 (3:9)	0.96	4 (3:5)	4 (2:5)	0.00	4 (3.5:5)	5 (4:5)	0.01	5 (4:5)	5 (4:5)	0.65
	Prepared	74	5 (0:8)	6 (3:9)	0.36	4 (3:5)	4 (3.4:5)	0.00	5 (4:5)	4 (3:5)	0.00	5 (4:5)	5 (4:5)	0.08
	Neutral	138	3 (−1:7)	4 (0:7)	0.03	3 (2:4)	3 (2:4)	0.00	4 (3:5)	4 (3:5)	0.00	4 (4:5)	4 (3:5)	0.57
	Not really prepared	114	4 (0:7)	5 (1:7)	0.41	3 (3:4)	3 (2:4)	0.00	4 (3:5)	4 (3:5)	0.00	4 (4:5)	4 (3:5)	0.01
	Not prepared	96	1 (−4:6)	2 (−2.5:6)	0.00	3 (1:4)	3 (1:4)	0.00	4 (2:5)	4 (3:5)	0.00	4 (3:4)	4 (2:5)	0.19
	KW <i>p</i> -value		0.01	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Physical symptoms	Yes	340	2 (−3:6)	3 (−1:7)	0.00	3 (2:4)	3 (2:4)	0.00	4 (3:5)	4 (3:5)	0.00	4 (3:5)	4 (3:5)	0.33
	No	140	6 (3:9)	7 (4:9)	0.00	4 (3:5)	4 (3:5)	0.00	4 (4:5)	4 (3:5)	0.00	5 (4:5)	4 (3:5)	0.00
	KW <i>p</i> -value		0.00	0.00		0.00	0.00		0.00	0.05		0.00	0.00	
Active engagement in the first laboratory sessions	Yes	416	4 (0:7.5)	5 (1:8)	0.08	3 (3:4)	3 (2:4)	0.00	4 (3:5)	4 (3:5)	0.00	4 (4:5)	4 (3:5)	0.01
	No	60	−2.5 (−7:3)	−0.5 (−6.5:4)	0.00	2 (1:3)	2 (1:3)	0.77	3 (2:4)	3 (2:5)	0.02	4 (2:4)	3 (2:5)	0.55
	KW <i>p</i> -value		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Importance of human remains for learning	Very important	279	5 (2:8)	6 (3:9)	0.04	4 (3:5)	4 (3:5)	0.57	4 (4:5)	4 (4:5)	0.54	5 (4:5)	5 (4:5)	0.05
	Important	105	1 (−3:6)	3 (−1:6)	0.00	3 (2:4)	3 (2:4)	0.35	4 (3:5)	4 (3:5)	0.65	4 (3:5)	4 (3:5)	0.20
	Neutral	56	−0.5 (−6:3)	0 (−4.5:3.5)	0.38	3 (2:3)	2 (1:3)	0.08	3 (2.5:4)	3 (2:4)	0.39	4 (3:4)	3 (2:4)	0.21
	Not important	30	−4 (−10:0)	−3.5 (−7:1)	0.51	2 (1:3)	1 (1:3)	0.61	3 (2:3)	2 (1:4)	0.45	3 (2:4)	2 (1:3)	0.00
	KW <i>p</i> -value		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Have specific beliefs that affected response	Yes	124	2 (−3:5.5)	4 (−1:6)	0.00	3 (2:4)	3 (2:4)	0.00	4 (3:5)	4 (3:5)	0.00	4 (3:5)	4 (3:5)	0.12
	No	352	4 (−1:8)	5 (0:8)	0.07	3 (2:4)	3 (2:4)	0.00	4 (3:5)	4 (3:5)	0.00	4 (4:5)	4 (3:5)	0.02
	KW <i>p</i> -value		0.00	0.02		0.48	0.33		0.07	0.26		0.16	0.10	

* Wilcoxon sign rank *p*-value, $p < 0.05$ is considered significant; KW *p*-value is Kruskal–Wallis *p*-value, $p < 0.05$ is considered significant.

Table 3. Median and Interquartile range values for the negative emotions of respondents before and after the first two weeks of anatomy laboratory sessions.

		Fear				Anxiety			Disgust			Apprehension		
		<i>n</i>	Before	After	<i>p</i> -Value *	Before	After	<i>p</i> -Value *	Before	After	<i>p</i> -Value *	Before	After	<i>p</i> -Value *
All Respondents		481	2 (1:3)	1 (1:2)	0.00	2 (1:4)	1 (1:2)	0.00	1 (1:2)	1 (1:3)	0.00	2 (1:3)	2 (1:3)	0.00
Exposure to a dead body	Yes	277	1 (1:3)	1 (1:2)	0.00	2 (1:4)	1 (1:2)	0.00	1 (1:2)	1 (1:2)	0.16	2 (1:3)	1 (1:3)	0.00
	No	201	2 (1:3)	1 (1:2)	0.00	3 (2:4)	2 (1:3)	0.00	1 (1:3)	2 (1:3)	0.26	3 (2:3)	2 (1:3)	0.00
	KW <i>p</i> -value		0.02	0.03		0.00	0.04		0.01	0.11		0.00	0.03	
	Well prepared	52	2 (1:3)	1 (1:1)	0.00	2 (1:4)	1 (1:2)	0.00	1 (1:2)	1 (1:2)	0.95	2 (1:3)	1 (1:2)	0.01
Extent that dedication ceremony prepared for dissection	Prepared	74	2 (1:3)	1 (1:2)	0.00	2 (1:4)	1 (1:2)	0.00	1 (1:2)	1 (1:2)	0.21	2 (1:3)	1 (1:2)	0.00
	Neutral	138	2 (1:3)	1 (1:2)	0.00	2 (1:4)	2 (1:2)	0.00	1 (1:2)	2 (1:3)	0.41	3 (1:3)	2 (1:3)	0.00
	Not really prepared	114	2 (1:3)	1 (1:1)	0.00	2 (1:4)	1 (1:2)	0.00	1 (1:2)	1 (1:2)	0.27	2 (1:3)	2 (1:2)	0.01
	Not prepared	96	2 (1:3)	1 (1:2)	0.00	3 (1:4)	1 (1:3)	0.00	1 (1:3)	2 (1:4)	0.75	2 (1:4)	1 (1:3)	0.31
	KW <i>p</i> -value		0.9	0.07		0.6	0.03		0.12	0.06		0.77	0.08	
Physical symptoms	Yes	340	2 (1:3)	1 (1:2)	0.00	3 (2:4)	2 (1:3)	0.00	1 (1:3)	2 (1:3)	0.02	2 (1:3)	2 (1:3)	0.00
	No	140	1 (1:2)	1 (1:1)	0.00	2 (1:3)	1 (1:1)	0.00	1 (1:2)	1 (1:2)	0.44	2 (1:3)	1 (1:2)	0.00
	KW <i>p</i> -value		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Active engagement in the first laboratory sessions	Yes	416	2 (1:3)	1 (1:2)	0.00	2 (1:4)	1 (1:2)	0.00	1 (1:2)	1 (1:2)	0.04	2 (1:3)	2 (1:3)	0.00
	No	60	3 (2:4)	2 (1:3)	0.00	3 (2:4)	2 (1:3)	0.00	2 (2:3)	3 (1:4)	0.64	3 (2:4)	2 (1:4)	0.34
	KW <i>p</i> -value		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Importance of human remains for learning	Very important	279	1 (1:2)	1 (1:1)	0.00	2 (1:4)	1 (1:2)	0.00	1 (1:2)	1 (1:2)	0.00	2 (1:3)	1 (1:2)	0.00
	Important	105	2 (1:3)	1 (1:2)	0.00	3 (2:4)	2 (1:3)	0.00	2 (1:3)	2 (1:3)	0.01	3 (2:4)	2 (1:3)	0.00
	Neutral	56	2 (1:3)	2 (1:2)	0.01	3 (2:4)	2 (1:3)	0.00	2 (1:3)	2 (1:3)	0.24	3 (1:3)	2 (1:3)	0.17
	Not important	30	2.5 (1:5)	1 (1:3)	0.01	3 (2:5)	1 (1:4)	0.01	2 (1:4)	2.5 (1:5)	0.15	3 (2:5)	2 (1:4)	0.01
	KW <i>p</i> -value		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Have specific beliefs that affected response	Yes	124	2 (1:3)	1 (1:2)	0.00	3 (2:4)	2 (1:3)	0.00	1 (1:3)	2 (1:3)	0.65	3 (2:4)	2 (1:3)	0.00
	No	352	2 (1:3)	1 (1:2)	0.00	2 (1:4)	1 (1:2)	0.00	1 (1:2)	1 (1:2)	0.07	2 (1:3)	1 (1:3)	0.00
	KW <i>p</i> -value		0.13	0.41		0.08	0.21		0.03	0.04		0.00	0.00	

* Wilcoxon sign rank *p*-value, $p < 0.05$ is considered significant; KW *p*-value is Kruskal–Wallis *p*-value, $p < 0.05$ is considered significant.

Variable significant differences in the ratings of positive and negative emotions were evident between groups for each demographic variable of sex, population affinity and place of residence (Supplementary Table S1). Differences for religious specificity could not be determined because of the small sample size across multiple religions.

Respondents who had not been exposed to a dead body prior to the laboratory experience rated negative emotions higher both before and after the anatomy laboratory sessions, than those who had seen a dead body previously (Tables 2 and 3). Respondents who felt the dedication ceremony prepared them for the first anatomy laboratory rated positive emotions significantly higher than those who felt the dedication ceremony did not prepare them. Negative emotions were rated significantly higher and positive emotions were significantly lower both prior to and after the first two weeks of laboratory sessions by those respondents with physical symptoms than those without. A similar response was seen in respondents who did not actively engage during the first laboratory sessions and those who rated the use of human remains as unimportant compared to respondents who engaged or rated the use of human remains as important for learning (Tables 2 and 3).

3.3. Coping Mechanisms

Discussion with peers (75%) and family members (55%) were the two prevalent mechanisms that students used in order to cope and adjust emotionally to the anatomy laboratory experience (Table 4). Students overwhelmingly chose not to consult with the student support services in the Faculty of Health Sciences (Office of Student Affairs) and only a small cohort of students (5%) engaged with a member of the anatomy staff to assist in coping. Despite the importance placed on their belief systems, the majority of students elected not to consult with a religious leader (97%) or engage in religious activity such as prayer (87%). Many students made use of humour to cope (40%), while others made use of creative activities (6%) and denial (19%; Table 4).

Table 4. Coping mechanisms reported by respondents.

	Yes <i>n</i> (%; 95%CI)	No <i>n</i> (%; 95%CI)
Discussion with peers	358 (75; 71.13–78.87)	122 (25; 21.13–28.87)
Discussion with staff in Anatomical Sciences	23 (5; 3.05–6.95)	457 (95; 93.05–96.95)
Discussion with family members	264 (55; 50.55–59.45)	216 (45; 40.55–49.45)
Discussion with religious leaders	14 (3; 1.47–4.53)	466 (97; 95.47–98.53)
Approached the Office of Student Affairs for assistance/counselling	0 (0; 0–0)	480 (100; 100–100)
Denial/detachment	92 (19; 15.49–22.51)	388 (81; 77.49–84.51)
Focusing on religion (e.g., prayer)	63 (12; 9.09–14.91)	417 (87; 83.99–90.01)
Humour	194 (40; 35.62–44.38)	286 (60; 55.62–64.38)
Creative activities (e.g., journaling/poetry)	30 (6; 3.88–8.12)	450 (94; 91.88–96.12)
Other	26 (5; 3.05–6.95)	454 (95; 93.05–96.95)

3.4. Qualitative Analysis Results

Three major themes were identified in the answers to the open-response questions: beliefs and experiences of death, gratitude and respect for the body donor, and educational value.

3.4.1. Beliefs and Experiences of Death

Cultural, religious and philosophical beliefs were described as having both positive and negative influences on the emotional response to the anatomy laboratory sessions. There were strong expressions of views that burial rites and customs should be adhered

to and delay of burial practices was linked to concepts of the soul not being at rest, denial of the needs of the family in mourning, fear of doing harm and disrespect towards the dead (Table 5; see respondents 65, 614, 378 and 101 as examples). However, belief systems also supported the view of the body as a “vessel” with the soul having left the body and being at peace and therefore beyond harm from the dissection process (Table 5; respondents 10, 160 and 351). Additionally, some belief systems influenced students to appreciate the human body and therefore view the anatomy laboratory sessions as a positive experience (Table 5; respondent 397). Past experiences of the death of loved ones and acquaintances also influenced respondents’ emotional responses, as did thoughts of respondents’ own mortality (Table 5; respondents 56, 397 and 29).

Table 5. Selected quotes from answers to the open-response questions illustrating the theme of beliefs and experiences of death #.

“we believe a human should be buried after death so the family can be able to visit the grave and they can meet with their ancestors.”—Respondent 65
“in my culture once someone dies he or she has to be buried such that the family finds closure so I was actually thinking about the families of the cadavers how they had to deal with all these.”—Respondent 528
“Mortal remains are sacred in my cultural beliefs.” Respondent 555
“I feel that they are unclean, they will contaminate me.”—Respondent 117
“it did not feel right. it felt as if cutting up someone else’s body was not ethical”—Respondent 387
“I felt as if I was disrespecting him because I was cutting his body and not letting it lie in peace”—Respondent 442
“it is disconcerting to dissect a human being, one imagines the same being done on oneself, you feel it to be causing harm to the cadaver” Respondent 378
“I believe that a body should be put to rest in order for a soul to be at peace.”—Respondent 614
“I felt like I’m disrespecting because when you face death people you wear black cloths and face down”—Respondent 101
“In my religion we are not allowed to touch the body except for those who wash it and dress it up, so sometimes it becomes hard especially when you see other people playing around with certain parts around the lab.”—Respondent 609 *
“My religious beliefs have supported my approach to dissections in a positive light, as I believe that Man’s design is beautifully created by God, and such a thing should be acknowledged and appreciated.”—Respondent 397
“In my religion we believe that you are not the body, you are the soul and once you die your body remains behind as a once-used vessel. This made it easier for me to detach myself from our cadaver and the life she may have lived.”—Respondent 351
“It’s just science, a human being perhaps but overall “it’s” just cells and tissues, we are all cells and tissue, and water.”—Respondent 10
“I am very much of the opinion that the body is just a vessel & as such the person has long since left the physical plane. Thus, dissecting the body, I am not really dissecting a person but rather the shell of a person left behind. the soul is forever, the body is not.”—Respondent 160
“it just reminded me of all the loved ones I have lost”—Respondent 56
“To be physically interacting with the element of death leads one to consider many other facets of one’s life.” Respondent 397
“Sadness. It made me think about life and how fast you can actually lose it.”—Respondent 29

* Respondent typed in upper case; changed to lower case. # Note all spelling and grammatical errors were corrected.

3.4.2. Gratitude and Respect for the Body Donors

Another strong theme expressed in the answers to open-response questions was an acknowledgement of the sacrifice of the individuals and their families in donating their bodies for dissection (Table 6). This was linked to acknowledgements of the generosity of the donors, the importance of respect for human remains and gratitude for the unique opportunity that the body had given to the respondents for their learning. Respondents

also expressed unease when their colleagues did not show respect towards the human remains (Table 6; respondent 441).

Table 6. Selected quotes from answers to the open response illustrating the theme of gratitude and respect for the body donors #.

<p>“it dawned on me that the cadaver on the dissecting table was once a living social being who had loved ones whom she left behind. this made me appreciate the cadaver more and try to treat her respectfully.” —Respondent 553</p>
<p>“Gratitude for the gift of their bones”—Respondent 9</p>
<p>“I have IMMENSE respect for our body, and treat him in this way, also I make sure all my colleagues are doing the same. He lost his life for us, we owe it to him to be respectful.”—Respondent 508</p>
<p>“feelings of sentiment, honour and respect . . . this is most strongly linked to the fact that I respect and appreciate the initiative taken by the people who donated their bodies, to help us in our learning. I believe it must have taken a whole lot of courage and consideration”—Respondent 30</p>
<p>“I believe that it is of upmost importance that I use the donors’ generosity to further my understanding of the body as much as possible. Their kindness cannot be for nothing.”—Respondent 332</p>
<p>“I resolved myself to be respectful of the life and the body of the person who gave their body so that I may learn.” —Respondent 321</p>
<p>“I felt grateful to those who donated their bodies to science in order for us to learn to become a better health practitioner in the future”—Respondent 284</p>
<p>“I don’t think that it is an easy decision to donate one’s body to science and I respected the individuals that have done so. In doing so, they have afforded me an opportunity to learn anatomy practically. I was in awe as walking into the dissection hall it was a very interesting experience when I saw the dissection hall full of the cadavers. And I was realising the full magnitude of the experience.”—Respondent 436</p>
<p>“I felt like the students didn’t respect the person and their sacrifice, some of them made jokes about the size of their cadaver and if they were a bit fat. I felt like you should respect them and the person they were as well as think about if that was one of your family members, would you like it if someone talked about them like that.”—Respondent 441</p>
<p>“The cadaver is something to be treated with utmost respect—not only because it was a human being, but because of its contribution to my education.”—Respondent 492</p>
<p>“The idea of how much must have been required of these people in order to donate their bodies makes me think that the approach to dissection should be rooted in respect and understanding”—Respondent 159</p>
<p>“It was an incredible privilege and honour to be able to dissect the human body and learn in such a first-hand manner. I was grateful for the contribution this lady, and her family had made.”—Respondent 477</p>
<p>“Any ethical or philosophical concerns which I might have had were largely dispelled by the knowledge that the donors gave of their bodies freely—and that the remains would be returned to relatives. Cadaver donation is a very noble way to give of oneself—and this has given me the greatest respect for my cadaver. This has made the process of adjustment easier”—Respondent 534</p>

Note all spelling and grammatical errors have been corrected.

3.4.3. Educational Value

The sacrifice made by the individuals and donor families was highlighted as a factor motivating respondents to ensure that they maximised their learning from the anatomy laboratory sessions (Table 7). Expectations of the type of practical learning that could be achieved when using human remains, such as touching and visualising structures in 3D, were highlighted as positive influences on respondents’ emotional responses, generating feelings of excitement and interest. Respondents also highlighted the importance of practical learning in studying anatomy and in preparing them for their future roles. Identifying the purpose and value of using human remains to learn anatomy appeared to moderate the negative effect of beliefs (Table 7; respondents 612 and 32 as examples), and not seeing the value appeared to perpetuate negative perceptions (Table 7; respondent 431).

Table 7. Selected quotes from answers to the open response illustrating the theme of educational value #.

<p>“As a Christians we believe when we die our souls leave the body and go to heaven. Therefore, I don’t have any objections towards dissection as it prepares us to be better health care professionals. In the Old Testament there is stated that we are not allowed to touch/cut the dead, but because we are learning from the bodies and have no malicious intentions towards the bodies, I believe we are not overstepping any boundaries set out in my religion.”</p> <p>—Respondent 346</p>
<p>“It caused me to see the body as something once capable of great influence and achievement. It taught me to respect the body and try to use it at its full potential for my education.”—Respondent 598</p>
<p>“I felt extremely privileged to be able to perform dissection on a cadaver. I also felt respect for the person. . . . Not everyone in the world gets the opportunity to dissect using cadavers. I also believe that cadaver dissection is the best way to learn anatomy as we can physically see the structures in real life, instead of only looking at 2D pictures or 3D models in isolation from other important anatomical structures that all coexist within the body together as one complete system.”—Respondent 520</p>
<p>“in Islam the dead are supposed to be buried ASAP. the body also feels an immense amount of pain to any touch. even feather light. but it was for knowledge, so I was excited”—respondent 32</p>
<p>“I was scared of touching them. However, that fear left because I had to utilise that opportunity fully for learning. . . . It would be an invaluable learning experience.”—Respondent 79</p>
<p>“I would rather not have dealt with dead bodies at all, or any human remains of any kind, for that matter. However, I realised that for me to get a complete understanding of the course and ultimately be effective in my profession once I start working, dealing with the situation would be the only way to gain the understanding I needed.”</p> <p>—Respondent 612</p>
<p>“I see it as very dirty to the person and also not something which is needed”—Respondent 431</p>
<p>“But it’s very exciting to be able to work in such close proximity with dead people and to see the different part of the body as they really are in the human body.”—Respondent 48</p>
<p>“the first view of the rib was my changing point where I was like this is actually flipping cool and a great opportunity”—Respondent 391</p>
<p>“My strong opinion on the need for dissection—I believe its integral to effective healthcare for surgeons especially as it gives amazing background and knowledge of location and shape of structures, allowing new training medical staff to not damage patients by having incorrect understandings of organs and tissues and where they are found in the body. Thus I find the dissection imperative to my training and it motivates me to look past anything that might prevent my active participation during dissection.”—Respondent 160</p>
<p>“Disturbed: it felt like we were mutilating them, despite knowing that it was for our education.”—Respondent 507</p>
<p>“Watching my atlas com to live and the way in which I tend to remember things I learn during dissections has affected me positively”—Respondent 554</p>
<p>“experienced feelings of excitement, eagerness to learn and interest in the clinical aspects of anatomy—particularly to consolidate the “book-learned” work with physical, tangible structures in front of me . . . I cannot actively learn by simply watching other individuals dissect; I prefer to be hands-on involved in the dissection process”</p> <p>—Respondent 478</p>
<p>“Positively. It has increased my coping with seeing a dead body and since I will be a nurse I will be exposed more to dead bodies.”—Respondent 14</p>
<p>“I expect that dissection will really allow us to visualize and understand the complexities, beauty as well as variability of the human body.”—Respondent 165</p>
<p>“It’s a great opportunity for practical learning. . . . For practical purposes, handling the specimens and using them for learning helps on better understand what I’ve learned. It just makes more sense.”—Respondent 93</p>

Note all spelling and grammatical errors have been corrected.

4. Discussion

The majority of respondents considered human remains to be an important resource for learning the anatomical sciences and reported largely positive emotional reactions. Although respondents rated their levels of anxiety, fear and apprehension higher before their first laboratory experiences (irrespective of their sex, population affinity and other demographic features), these negative feelings waned and were later surpassed by more positive emotions, particularly when respondents identified the value of the experience for their learning:

“I was scared of touching them. However, that fear left because I had to utilise that opportunity fully for learning. . . . It would be an invaluable learning experience.”—Respondent 79

The dissipation of fear in students following exposure to human remains is not unknown and has been widely reported [20,26,28,33–38]. In addition, increases in interest and excitement over time by medical students to dissection are well-illustrated in the literature [39–41] and Barrientos et al. [42] report that by the end of the course, 100% of students felt confident. While the majority of students may come through their exposure in an anatomy laboratory well-adapted and unscathed, for some, the impact of death and disarticulation may remain a lasting problem [19,39]. It is important that academics are aware of those students who continue to show high levels of anxiety in anatomy laboratories and ensure that these students receive appropriate support. The findings of this study suggest that respondents who have not had prior exposure to a dead body, those who experience physical symptoms, those who feel ceremonies do not prepare them for the laboratory experience, those who do not actively engage with specimens or bodies and those who do not view human remains as important for their learning may experience negative emotions for a longer time than their peers. Therefore, anatomy staff might use these experiences and perceptions to identify students who may need additional support in coping with their emotional response to the dissection and anatomy laboratory experience.

While the emotional responses to the use of human remains by our students did not appear to differ from that of their counterparts around the globe when analysed according to demographic factors such as sex or population affinity, their mechanisms of coping with this “challenge” were different. Wits students responded that they preferred to discuss these matters with their peers or family members rather than their teachers. Preference for discussion with peers was also reported by Kotzé and Mole [20] as one of the coping mechanisms used by their South African medical students. In contrast, Tschernig et al. [19] reported that students said they would not talk to their families or friends. While other researchers have found that some students focussed on religious activities such as praying [23–25], respondents in the current study preferred not to involve religious leaders or focus on religious practices. Wits students also reported the use of denial and detachment, as reported in other contexts [20,23–25]. In addition, humour was a relatively common coping mechanism for respondents in our study, which is similar to students in other contexts using “dark humour” such as jokes, [21,24,25,43], playing tricks in order to scare their classmates [44,45] or naming their cadaver [21]. For some students, these acts are said to introduce some humour into an emotionally difficult period of their lives [21]. However, in the current study, humour was sometimes perceived as a sign of disrespect towards the cadaver, highlighting the diversity of belief systems within the South African context.

“I felt like the students didn’t respect the person and their sacrifice, some of them made jokes about the size of their cadaver and if they were a bit fat. I felt like you should respect them and the person they were as well as think about if that was one of your family members, would you like it if someone talked about them like that.”—Respondent 441

In a multicultural society such as South Africa, although the majority of respondents identified as Christian, it is not surprising that expressions of negative perceptions of the use of human remains for learning were linked to burial rites and customs, the concept of the soul not being at rest, delays in burial practices and fear of doing harm to or disrespecting the dead.

“we believe a human should be buried after death so the family can be able to visit the grave and they can meet with their ancestors.”—Respondent 65

The reason for the cultural conflict within some individuals in relation to donation is based on a belief in ancestors for many on the African continent [46–49]. Also, while they do not make up a majority of the South African population, individuals of the Hindu, Islam and Jewish religions expressed reservations to donation based on burial practices and religious beliefs:

“in Islam the dead are supposed to be buried ASAP (as soon as possible). The body also feels an immense amount of pain to any touch. Even feather light. But it was for knowledge, so I was excited”—Respondent 32

However, belief systems also positively influenced perceptions of the use of human remains for learning and the perceived educational value of the experience helped respondents to reconcile conflicting ideas and values. The educational value acted as a moderator of negative perceptions influenced by cultural and religious beliefs, with a number of students stating that the educational value made the use of human remains for learning permissible:

“ In the Old Testament there is stated that we are not allowed to touch/cut the dead, but because we are learning from the bodies and have no malicious intentions towards the bodies, I believe we are not overstepping any boundaries set out in my religion.”—Respondent 346

Many of our respondents commented on the humanity/sanctity/selflessness of the individuals who had donated their bodies and specified gratitude towards them. This view was frequently linked to acknowledgements of the positive aspect of the use of human remains in their anatomical studies and preparation for their future role:

“I don’t think that it is an easy decision to donate one’s body to science and I respected the individuals that have done so. In doing so, they have afforded me an opportunity to learn anatomy practically. I was in awe as walking into the dissection hall it was a very interesting experience when I saw the dissection hall full of the cadavers. And I was realising the full magnitude of the experience.”—Respondent 436

Students’ gratitude towards the body donor and the perceived educational value of dissection have previously been described in the literature [11,20,39,50,51]. However, the current study appears to be the first to show that the value that students’ place on using human remains to learn anatomy may moderate negative influences of cultural and religious beliefs, and the emotional response to the anatomy laboratory experience. This may suggest that educational interventions that provide students with the opportunity to share their beliefs and perspectives of the experiences in the dissection hall with peers could help them to influence each other’s perceptions of the experience, and to cope with their emotions during their first exposure to the anatomy laboratory.

Previous studies have called for the incorporation of humanities teaching, peer discussions and reflective writing into the curriculum to help students as they learn about death and dying, ethical dilemmas and transitions such as those experienced in the anatomy laboratory [20,27,52]. Similarly, there has been a growing trend among institutions in the use of ceremonies and memorials to assist students with what may be, for most, a difficult experience [22,53–58]. Both large-scale ceremonies and daily rituals have been suggested as a mechanism for developing appropriate attitudes among students [59]. Information relating to the use of human remains could be introduced prior to entry into the anatomy laboratories through videos [60,61], although Dorsani and Neuberger [62] reported an increase in negative emotions towards dissection following the viewing of a video. Cahill and Ettarh [39] suggest that in order to allay the fears of students, educators should emphasize that dissection is focused behaviour, not “mutilation”, that students should not feel guilty of the mistakes they may make during dissection and that the value of dissection will be discernible to them throughout their careers. Kotze and Mole’s [20] suggestion that students could be adequately prepared by seeing a dead body prior to the first dissection would be supported by our finding that students who had previously seen a dead body rated negative emotions lower than those who had not. However, the findings of Druce and Johnson [29] and Nnodim [23], that neither prior exposure to a dead body nor bereavement was a defence against the upset caused by dissection, may suggest that viewing of a dead body may not be sufficient.

Ceremonies are a wonderful way of honouring the dead, saying thank you to the living and developing professional attitudes in health-professional students. However, from the findings of the current study, it does not appear as though a ceremony alone is able to reduce the feelings of anxiety and fear prior to exposure to human remains. Anatomy educators may need to combine a number of ideas and approaches and intentionally include opportunities for students to share their diverse views and experiences. Further studies investigating the underlying causes of negative emotions related to the anatomy laboratory experience may be valuable in identifying discussion points for inclusion in educational interventions that aim to support students as they cope with the emotional response to the anatomy laboratory experience.

5. Conclusions

The initial act of dissection or exposure to human remains is believed to be an impactful but potentially stressful moment in the lives of young health professionals. Yet, most students at the University of the Witwatersrand, South Africa, shed the initial fear and embraced the experience with confidence, excitement, and a strong belief in the value of the learning provided by the exposure. Anatomists need to broaden the educational interventions that allow students to reflect on and communicate their experiences. Sharing their perceptions of the educational value of using human remains and its importance for their future roles may assist students with normalizing their experience and coping with their emotional response.

Limitations of Study

The study was conducted in one institution in South Africa but was advantaged by the wide range of health professional courses (not only medical students) and hence the views of both dissectors and non-dissectors to human remains. The second survey and focus groups were interrupted by the #Feesmustfall movement in South Africa, which disrupted exams and also restricted responses to the second survey. The timing of the first survey in the third or fourth week of the academic term may mean that students had not yet accessed student support services at the University.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/educsci12060367/s1>, S1: Survey tool; Table S1: Emotional responses of respondents according to demographic variables of dissection opportunity, sex, population affinity, religious affinity, importance of belief, usual place of residence.

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