Received: 20 March 2021 | Revised: 22 March 2022 | Accepted: 23 March 2022

DOI: 10.1002/ase.2180

Anatomical Sciences Education | AMERICAN ASSOCIATION FOR ANATOMY | WILEY

RESEARCH REPORT

Altruism in death: Attitudes to body and organ donation in Australian students

Rebekah A. Jenkin[1] | Samuel A. Garrett[1,2] | Kevin A. Keay[1]

[1]Anatomy and Histology, School of Medical Sciences, Faculty of Medicine and Health, University of Sydney, Camperdown, New South Wales, Australia

[2]University of Sydney, Camperdown, New South Wales, Australia

Correspondence
Dr. Rebekah A. Jenkin, Laboratory of Neural Structure and Function, Anatomy and Histology, School of Medical Sciences, Faculty of Medicine and Health, The University of Sydney, Sydney, NSW 2006, Australia.
Email: rjen8572@uni.sydney.edu.au

Funding information
NWG Macintosh Memorial Fund

Abstract

Health education, research, and training rely on the altruistic act of body donation for the supply of cadavers. Organ transplantation and research rely on donated organs. Supply of both is limited, with further restrictions in Australia due to requirements for a next-of-kin agreement to donation, irrespective of the deceased's pre-death consent. Research suggests health workers are less likely to support the donation of their own bodies and/or organs, despite recognizing the public good of donation, and that exposure to gross anatomy teaching may negatively affect support for donation. Attitudes to body and organ donation were examined in Australian students studying anatomy. Support for self-body donation (26.5%) was much lower than support for self-organ donation (82.5%). Ten percent of participants would not support the election of a family member or member of the public to donate their body, and just over 4% would not support the election of a family member to donate their organs, with one-to-two percent not supporting this election by a member of the public. Exposure to gross anatomy teaching was associated with an increased likelihood of consideration of issues about body and organ donation, whether for self, family, or the public, and registration as an organ donor. Exposure decreased participants' willingness to donate their own body, with those who practiced a religion least likely to support body donation. Gross anatomy courses provide an opportunity to inform future healthcare workers about altruistic donation, albeit with a recognition that religious or cultural beliefs may affect willingness to donate.

KEYWORDS
anatomical dissection, attitudes, body donation, cadaver, gross anatomy education, organ donation, postgraduate education, undergraduate education

INTRODUCTION

Body and organ donation are profoundly valuable post-mortem altruistic acts. Their value to the community is substantial and enduring. Body donation enables medical education, surgical and other post-graduate clinical training, and defense, pharmaceutical, road safety, and medical device research, with future healthcare workers benefitting from the use of donated bodies (cadavers) in studies of anatomy and the anatomical sciences (O'Neill, 1996; Roach, 2004; Delotte et al., 2008; Cornwall & Stringer, 2009; Jones & King, 2017).

Organ donation saves lives, with the number of eligible organ transplant recipients greatly exceeding the number of donations each year both in Australia (Donate Life, 2022) and internationally (Arshad et al., 2019).

In Australia, unlike in some other jurisdictions (Riederer, 2016; Habicht et al., 2018), all cadavers used in education and research are donated. Would-be donors sign up for their local (university-based) body donation program prior to death. The consent process includes explicit engagement of next-of-kin and family and does not involve remuneration. Likewise, organ donation in Australia operates on an "*opt-in*" system with explicit next-of-kin consent required at the time of death for a donation to occur, irrespective of the deceased's election to donate prior to death. Little has been reported about the support of the Australian community for body donation. Support for organ donation is high, with surveys reporting consistent levels of 85%–90% of those Australians surveyed in favor of organ donation (Irving et al., 2012, 2014; Sharpe et al., 2017). However, actual donor registrations are much lower with only one in three Australians on the donor register (Sharpe et al., 2017; Donate Life, 2022), and the unique and limited circumstances in which organ donation is possible further restrict the number of available organs.

The Australian community is highly multi-cultural and it is known that both body and organ donation are less common among some ethnic groups (Khanal et al., 2018; Donate Life, 2022), despite public health campaigns aimed at addressing misconceptions about donation. The reasons for these disparities are complex; notwithstanding the Australian commitment to the exclusive use of donated bodies and organs, for many, the use of cadavers and organ donation are challenging, and ethnicity, beliefs, and experiences may influence responses to their use in education, research, and healthcare. However, the disparity in donation rates has tangible consequences in healthcare and education; students from non-Caucasian backgrounds who are training as healthcare workers rarely, if ever, encounter donor bodies that reflect their ethnicity or culture. Thus, their capacity to discuss donation with family and friends and/or with peers and colleagues may be hindered (Curtis et al., 2019). Similarly, acute shortages of donated organs from donors of non-Caucasian ethnicities may delay or compromise the chances of transplantation because of less than ideal tissue and genotype matching (Khanal et al., 2018).

The critical role of health professionals in informing and supporting families about, and through, the donation process has been documented in a number of studies (Williams et al., 2003; Dubois & Anderson, 2006; Zambudio et al., 2006; Demir et al., 2011; Sellers et al., 2018). Reluctance to raise the issue of organ donation, particularly with distressed family members, is a significant barrier to donation occurring (Dubois & Anderson, 2006; Potter et al., 2017). There is also evidence to suggest that donation and discussion of organ donation are more common among individuals who know others who have donated, are recipients of organs, or are on a transplant waiting list (Sung et al., 2008; Phillipson et al., 2015; Sellers et al., 2018). A New Zealand study of registered body donors also reported that knowing someone who had donated or registered to donate their body, was a significant factor in the likelihood of being registered as a body donor (Fennell & Jones, 1992).

A study of 6861 potential organ donors in 2012 across 68 Australian hospitals (Pilcher et al., 2015) reported that discussion by health care professionals with family about donation occurred in 98% of donor cases compared to only 16% of non-donors. It was apparent from this study and others, that successful organ donation was facilitated by knowledge of the wishes of the deceased to participate in organ donation prior to death, the presence of dedicated donation counseling and support staff, and a willingness of all those involved with the care of the patient to discuss donation and its implications (Irving et al., 2014; Neate et al., 2015; Pilcher et al., 2015; Marck et al., 2016).

Health care workers have a critical role in facilitating discussion about body and organ donation, and in advocating for their importance in medical care, education, and research (Rikker & White, 1995; Ghorbani et al., 2011; Irving et al., 2012; Keel et al., 2019; Robert et al., 2021). Their capacity to undertake effective advocacy for donation, and to approach families with confidence and sensitivity, is in no small part dependent upon them having accurate, up-to-date, and nuanced knowledge about body and organ donation programs and processes (Hyde & Chambers, 2014; Marck et al., 2016; Keel et al., 2019). Understanding the ethnic, cultural, and religious context in which such attitudes are formed and held is also important.

Despite continued debate about the need for gross anatomical dissection in medical education (Winkelman, 2007; Ghosh, 2017a), international research consistently reports that exposure of students to gross anatomical dissection, whether through active dissection or instruction using prosected specimens, is beneficial (Pawlina & Lachman, 2004; Winkelman, 2007; Sugand et al., 2010; Estai & Bunt, 2016; Ghosh, 2017a,b). Students themselves value the experience of cadaveric dissection and consider it integral to their learning (Quince et al., 2011; Mwachaka, et al., 2016; Flack & Nicholson, 2017; Alamneh, 2021; Asante et al., 2021; Bahşi et al., 2021), despite their reservations or anxiety about their first encounter with the dead body, or other unpleasant aspects of dissection (Quince et al., 2011; Dissabandra et al., 2015; Allison et al., 2021). Exposure to cadavers and anatomical dissection is also regarded as an important professional development milestone for students, assisting them to develop broader professional competencies including skills in self-reflection about death and grieving, managing challenging and distressing situations, teamwork, and communication (Pawlina et al., 2006; Drake et al., 2009; Böckers et al., 2010; Johnson et al., 2012; Ghosh, 2017a,b; Allison et al., 2021). It also provides an opportunity for students to consider the altruistic act of donation and to develop an understanding of the legal and ethical framework in which donation occurs, areas where medical student knowledge has been reported to be deficient (Bardell et al., 2003; Essman & Thornton, 2006; Goz et al., 2006; Ghahovac et al., 2007; Tontus et al., 2011; Ciliberti et al., 2018; Robert et al., 2021). These skills are integral to their capacity to treat patients with a terminal illness, communicate with grieving families, and initiate and manage conversations about body, organ, and other tissue donation.

However, exposure to gross anatomical dissection has been suggested as a contributing factor in the development of negative attitudes to the use of the body after death, including for body donation, organ transplantation, and education and research using donated human tissue (Cahill & Ettarh, 2008, 2011; Alexander et al., 2014; Galic et al., 2016; Viljoen & Stephens, 2021). Across many countries, medical and health sciences students exposed to gross anatomical dissection reported diminished support for body donation, with students differentiating between support for the public to donate (recognizing the importance of the use of donated bodies in medical education) and reluctance to support donation by family or themselves. Cahill and Ettarh (2011) reported a negative effect after completion of courses in anatomical dissection on a subgroup of students' willingness to donate their own organs or support their families to donate organs. Other international studies (Fennell & Jones, 1992; McClea & Stringer, 2010; Cornwall et al., 2012; Anyanwu & Obikili, 2012; Rokade & Gaikawad, 2012; Anyanwu et al., 2014; Green et al., 2014; Galic et al., 2016; Dagcioglu et al., 2021; Viljoen & Stephens, 2021) have also reported that medical students and health professionals, including doctors, express less willingness to donate their bodies, despite advocating for the public to do so, and that support for organ donation consistently exceeds support for body donation.

Student attitudes to body donation have not been found to be related to education level (Viljoen & Stephens, 2021), but have been reported to be related to the length of exposure to anatomical dissection or gross anatomy (Alexander et al., 2014; Galic et al., 2016; Vijoen & Stephens, 2021). Students' and health professionals' personal or religious beliefs have also been identified as significant factors mediating their support for body and organ donation (Galic et al., 2016; De Gama et al., 2018; Dagcioglu et al., 2021; Naidoo et al., 2021) with those who identified as atheists or agnostic more likely to support self-body donation compared to their peers who stated that they practiced a religion (Galic et al., 2016; Naidoo et al., 2021). Ignorance of body and organ donation processes has been cited as a significant barrier to donation both in Australia (Neate et al., 2015; Marck et al., 2016) and internationally (Hu & Hang, 2015; Mwachaka et al., 2016; Dagcioglu et al., 2021).

Undertaking studies of anatomy is near-universal for healthcare professionals in Australia and thus may provide an opportunity to introduce, inform and educate students and future healthcare workers about the legal and ethical framework in which both body and organ donation occurs. The multi-cultural nature of Australian society and thus the health workforce, and the people whose health care they will deliver would benefit from broadening knowledge about, and support for, altruistic human tissue donation across all cultural, ethnic, and religious groups. However, it is critical that the attitudes and beliefs of students from all backgrounds about human tissue donation and its use are sensitively considered and accommodated in any programs of instruction aimed at improving knowledge and understanding of donation. This is an area where knowledge is still scant.

This study, therefore, seeks to explore attitudes to body and organ donation of students who undertake courses in anatomical sciences at The University of Sydney. This student cohort encompasses local and international students from many different countries and cultural backgrounds. Drawing on the existing literature, the authors hypothesize that continued and more intense exposure to gross anatomy will be associated with more negative views about body donation than occurs with shorter and less intense exposure. It was also hypothesized that students will be more willing to support body and organ donation by the public than they are to support donation of their own bodies and organs or those of their family members, and that their ethnicity and cultural beliefs will be reflected in their reasons for, or against, supporting donation.

MATERIALS AND METHODS

The study was conducted at The University of Sydney with participants recruited from enrolled students. The research protocol was reviewed and received ethics approval from The University of Sydney Human Research Ethics Committee, protocol approval number 2017/917.

Survey instrument

A thirty-one item questionnaire was developed. The questionnaire had three sections: (1) demographic information including age, identified gender (if any), language spoken at home, practice of religion, home country, previous anatomy study; (2) attitudes to body donation, for themselves, their family and the public; (3) attitudes to organ donation for themselves, their family and the public. All questions were optional.

The questionnaire was piloted on a small group (26 participants) of undergraduate and postgraduate students and academics. Question wording and options were adjusted to reflect feedback. Cronbach's alpha was calculated and was found to be 0.849 indicating a good level of reliability. The questionnaire is available as Supporting Information.

Support for body donation was examined via answers to three questions: (1) Would you be willing to donate your body to The University of Sydney for research and education?, (2) Would you support a member of your family to donate their body?, and (3) Would you support a member of the public to donate their body?

Support for organ donation was examined via answers to three questions: (1) Would you donate your own organs for transplantation?, (2) Would you support a family member to donate their organs for transplantation?, and (3) Would you support a member of the public to donate their organs for transplantation?

For both body and organ donation questions, participants were able to select either “Yes,” “No,” and “Have not thought about it” in response to all questions.

Participants were asked to choose from a list of six possible reasons to support body donation and a list of 14 reasons against supporting it. There were eight reasons to select from to support

organ donation, and nine reasons against supporting it. Participants were able to make multiple choices from each list, provide a free text response (other reason), and indicate reasons both for and against donation.

A printed paper version of the questionnaire was administered to students recruited through the (then) Discipline of Anatomy and Histology at the University of Sydney. An online version of the questionnaire, hosted on the LimeSurvey (GmbH, v2 2006, Hamburg: Germany) platform, was administered to Mathematics students.

Participant recruitment

Recruitment of participants to complete the paper-based questionnaire occurred in 2018 and 2019, and the online survey in 2019. Participation was voluntary. Undergraduate students comprised four groups—Anatomy Experience; Health Sciences; Medical Sciences; Mathematics. Students who were completing a unit of study in the Discipline of Anatomy and Histology (the first three groups) were approached in a timetabled class. Mathematics students were first-year students enrolled in a mathematics unit via the School of Mathematics and Statistics. They were emailed an explanatory invitation written by the authors to participate in the study by the first-year coordinator. The participant information statement and survey link were attached. A reminder email was sent 2 weeks later and then a week before the survey link closed. The online version of the questionnaire remained open for 6 weeks.

Postgraduate students/trainees were approached at the commencement of their first gross anatomy laboratory session. These students included Medical and Dentistryl students, and Postgraduate trainees undertaking a Master's degree. Questionnaire responses were collated across all courses and both years.

Cohort groups for analyses

In total, 2056 participants were included in the analysis. These comprised 1923 students who completed paper questionnaires across 2018 (929) and 2019 (994), and 133 Mathematics students. The largest group of respondents were undergraduate students ($N = 1447$; 70.4%). Response rates (calculated using class enrolment numbers rather than attendance numbers) averaged 58% for the paper survey, and 12.2% for the online survey.

Students were grouped into five cohorts, on the basis of their exposure to gross anatomical dissection and previous anatomy study/experience:

1. Mathematics ($n = 133$) and Anatomy Experience ($n = 172$) students: (total $N = 305$), a minority of whom (14.8%) reported having studied anatomy previously, with more than half stating this occurred in high school (in biology and physical education subjects), and whose current exposure was limited at most to one elective, two-hour laboratory Anatomy Experience class using plastic models and specimens of main organs. The Anatomy Experience course was offered to first-year students in Nursing, Science, and Arts. The majority of the students electing to take the course were from Nursing.
2. Health Sciences students ($N = 279$), comprise those undertaking courses in Sports and Exercise Science; Physiotherapy; Speech Pathology; Occupational Therapy; and Osteology, of whom 37.3% reported having studied anatomy previously, predominantly at the tertiary level. Anatomy lectures and laboratory classes are core course requirements and include guided instruction in organ systems related to their degree specialty, for example, the limb musculature for physiotherapy students.
3. Medical Sciences students ($N = 863$), comprise those students who have chosen to complete courses in anatomy, and who are likely to be pursuing majors in anatomy and/or neuroscience, of whom 36.7% had studied anatomy previously, predominantly at tertiary level. Their course requirements included lectures and laboratories focused on the self-guided discovery of anatomical structures and their relationship to organ systems and human physiology.
4. Postgraduate Medical and Dentistry students ($N = 555$), of whom 68.3% reported having studied anatomy previously, mostly at Australian and overseas universities as part of their undergraduate education. These students' courses include two years of compulsory system-based anatomical studies in lectures and laboratories, with a strong focus on self-guided learning of anatomical structures, their relationship to normal and disease states in humans, and clinical reasoning.
5. Postgraduate trainees ($N = 54$), 89.1% of whom had previously studied anatomy at university in Australia/overseas, and who had enrolled in intensive courses in gross anatomical dissection as a compulsory component of their professional qualifications in surgery, or in intensive courses using prosected cadaveric specimens as a compulsory component of their professional qualifications in critical care. The majority of these students were medical graduates.

Statistical analysis

Survey responses were compiled for analysis using SPSS statistical package, version 26 (IBM Corp., Armonk, NY). Descriptive statistics (percentages) were used to examine the proportions of participants who were supportive of body/organ donation for themselves, their family, and the public. As all variables investigated were categorical, except for age, cross-tab chi-squared statistics (χ^2) were used to examine differences in demographic characteristics, exposure to anatomical dissection, and attitudes to body and organ donation. A significance level of $\alpha < 0.001$ was adopted to account for the large sample correlations and to ensure significant relationships were identified conservatively.

RESULTS

Cohort characteristics

The demographic characteristics of the cohort are described in Table 1.

The majority of the cohort comprised local students, and just over a quarter were international students. Approximately 13% of these students were from Asian countries, predominantly China, and 6.5% were North American (predominantly Canadian). Two of the local students identified as Indigenous. Of the students who spoke a language besides English at home, 30% spoke an Asian language (predominantly Chinese, Mandarin, and/or Cantonese), and 5% each spoke another European language or a Sub-Continental language (predominantly Hindi). Nearly 20% of the local students spoke an Asian language at home, as did 17% of the North American students.

The most commonly practiced religion was Christianity (65%), then Buddhism (12%), with 10% identifying as followers of Islam. Thirty percent of local students who reported practicing a religion identified as Christian, less than 4% as Muslims and less than 3% as Buddhists. The majority of Muslim students came from the Middle East (56%) and the Sub-Continent (22%). Seventy percent of those students who practiced Buddhism came from Asian countries and 11% from the Sub-Continent.

Body donation

Support for body donation and the percentage of participants who self-reported registration as body donor is summarized in Table 2.

Support for self-donation of bodies, across all cohort groups, was low with higher support for a family member or member of the public electing to donate their body. Medical and dentistry students were the most likely to be unwilling to donate their own body. Previous exposure to anatomy was associated with reduced support for self-donation ($p < 0.0001$) and with an increased likelihood that participants had thought about body donation for themselves, their family, and the public. This effect was particularly striking in relation to support for the public to donate their bodies: the majority of postgraduate students and trainees had thought about the question, and none of the postgraduate trainees responded negatively to supporting the public to donate their body, with only one postgraduate medical/dentistry student indicating they would not support such an election (all comparisons significant at $p < 0.0001$). There were no differences across any of the cohort groups in their willingness to support a family member to donate their body.

Religious practice was found to have quite substantial effects on student support for body donation. Support for self-donation of the body was lowest in those students who practiced a religion at home, with 38.5% of students who practiced a religion not supporting self-donation compared to 26.0% of non-practicing participants ($p < 0.0005$). Just over

TABLE 1 Participant demographic characteristics for the whole group and five cohort sub-groups

Participant group	Whole cohort	Mathematics and Anatomy Experience	Health Sciences	Medical Sciences	Postgraduate Medicine and Dentistry	Postgraduate trainees
Number, *n* (%N)	2056 (100)	305 (14.8)	279 (13.6)	863 (42.0)	555 (27.0)	54 (2.6)
Age						
Mean (median)	21.3 (20.0)	19.4 (18.0)	20.2 (19.0)	20.0 (20.0)	24.2 (24.0)	28.7 (28.0)
Standard deviation	±3.8	±3.9	±4.3	±2.2	±3.0	±3.6
Range (Min–Max)	(17–64)	(17–64)	(17–50)	(17–40)	(17–43)	(23–38)
Identified gender[a]						
Identified as female? *n* (%N)	1280 (62.3)	198 (64.9)	225 (80.6)	548 (63.5)	291 (52.4)	18 (33.3)
Identified as male? *n* (%N)	691 (33.6)	94 (30.8)	41 (14.7)	269 (31.2)	251 (45.2)	36. (66.7)
Speak English at home? Yes, *n* (%N)	977 (47.6)	154 (50.5)	118 (42.3)	354 (41.1)	318 (57.4)	33 (61.1)
Practice a religion at home? Yes, *n* (%N)	756 (37.1)	104 (34.2)	151 (54.7)	321 (37.6)	167 (30.3)	13 (24.1)
Local student, Yes, *n* (%N)	1511 (73.6)	240 (78.7)	225 (80.6)	612 (71.2)	382 (69.0)	52 (96.3)
Studied anatomy previously, Yes, *N* (%N)	894 (43.6)	45 (14.8)	104 (37.3)	317 (36.9)	379 (68.4)	49 (90.7)
Where studied anatomy previously?[b]						
At University, Yes, *n* (%N)	789 (88.2)	21 (46.7)	89 (85.6)	278 (87.7)	360 (95.0)	49 (100)
At School, Yes, *n* (%N)	64 (7.2)	24 (53.3)	11 (10.6)	29 (9.1)	1 (0.3)	0 (0)

Note: Participant numbers and demographic information for the whole cohort ($N = 2056$), and five cohort groups. Cohort numbers are expressed as total (*n*) and as (% of whole cohort [*N*]). Identified gender, language spoken at home, religious practice, local student status, and previous anatomy exposure are expressed as a percentage of the number (*n*) of each sub-cohort group who provided this information. Number of students in Mathematics subgroup ($n = 133$) and Anatomy Experience subgroup ($n = 172$).

[a]Not all students reported their identified gender.

[b]Not all students specified where they had studied anatomy previously.

TABLE 2 Attitudes to body donation

Cohorts		Willing to donate own body?				Would support a family member to donate body?				Would support a member of the public to donate body?				Registered as a body donor?		
		Yes	No	Not thought about it	*p*-value	Yes	No	Not thought about it	*p*-value	Yes	No	Not thought about it	*p*-value	No	Yes	*p*-value
Whole cohort, *N* (%)	N^c = 2056 (100)	543 (26.5)	629 (30.7)	878 (42.8)		1479 (72.3)	210 (10.2)	358 (17.5)		1769 (86.3)	53 (2.6)	227 (11.1)		1965 (96.7)	67 (3.3)	
Previous anatomy experience, *n* (%)	n^c = 894 (100)	240 (26.9)	338 (37.8)	316 (35.3)	<0.0001[a]	677 (75.8)	88 (9.9)	128 (14.3)	<0.002	805 (90.0)	15 (1.7)	74 (8.3)	<0.0001[a]	860 (96.5)	31 (3.5)	0.685
No previous anatomy experience, *n* (%)	n^c = 1156 (100)	303 (26.2)	291 (25.2)	562 (48.6)		802 (69.5)	122 (10.6)	230 (19.9)		964 (83.5)	38 (3.3)	153 (13.2)		1105 (96.8)	36 (3.2)	
Mathematics and Anatomy Experience, *n* (%)	n^c = 305 (100)	87 (28.5)	72 (23.6)	146 (47.9)	<0.0001[b]	214 (70.2)	30 (9.8)	61 (20.0)	<0.002	256 (84.0)	15 (4.9)	34 (11.1)	<0.0001[b]	289 (95.7)	13 (4.3)	0.071
Health Sciences, *n* (%)	n^c = 279 (100)	57 (20.4)	95 (34.1)	127 (45.5)		189 (68.2)	28 (10.1)	60 (21.7)		227 (81.7)	11 (3.9)	40 (14.4)		269 (97.1)	8 (2.9)	
Medical Sciences, *n* (%)	n^c = 863 (100)	243 (28.2)	225 (26.1)	395 (45.8)		599 (69.5)	100 (11.6)	163 (18.9)		717 (83.1)	26 (3.0)	120 (13.9)		832 (97.8)	19 (2.2)	
Postgraduate Medicine and Dentistry, *n* (%)	n^c = 555 (100)	139 (25.0)	224 (40.4)	192 (34.6)		440 (79.3)	49 (8.8)	66 (11.9)		522 (94.0)	1 (0.2)	32 (5.8)		528 (95.1)	27 (4.9)	
Postgraduate trainees, *n* (%)	n^c = 54 (100)	19 (35.2)	13 (24.1)	22 (40.7)		42 (77.8)	3 (5.5)	9 (16.7)		52 (96.3)	0 (0)	2 (3.7)		52 (98.1)	1 (1.9)	

Note: Participant support for body donation comparing those with previous anatomy experience and those without, and comparing across the five cohort groups. Responses are expressed as a percentage (%) of the total number *N* (whole cohort) or *n* (cohort sub-groups). Cross-tabs chi-square analysis shows significant differences when comparing those with previous anatomy exposure and those without ($^a p < 0.0001$), and across the across the five cohort sub-groups ($^b p < 0.0001$), for willingness to donate their own body or to support the public to donate their body. No statistical differences were observed in the percentage of those registered to donate their bodies, or in relation to supporting family members to donate body when comparing all cohort groups and those with/without previous anatomy experience. [c]*N* and/or *n* may sum to less than the group *N* and/or *n* as some participants did not answer the question.

40% of both groups had not thought about this issue. More than three-quarters (76%) of participants who did not practice a religion at home would support a family member to donate their body, whereas only two-thirds (66.6%) of those who practiced a religion would. The religious-practicing students were more likely to answer "No" to giving such support (13.1 compared to 8.4% for non-practicing students) and more likely not to have thought about it ($p < 0.0005$). Religious practice did not, however, affect support for a member of the public electing to donate their body. Local students (29%) were also more likely than international students (19.2%) to support self-donation of the body ($p < 0.0005$) and donation by a family member (77.5 local students versus 57.8% international students; $p < 0.0005$). Support for public donation of a body was much higher in local students (91.1%) when compared to international students (73%; $p < 0.0001$). Local students were approximately three times more likely to have thought about body donation for themselves, their family members, and the public ($p < 0.0001$).

Registration as a body donor

Few participants reported being registered to donate their body—67 in total, 43 of whom identified as local students. The accuracy of self-reported registration for these participants was questionable as more than half nominated registration via the National Organ Donor Registry (which is not possible) and a further quarter could not recall where they registered as a body donor. Only one local student nominated a body donor program. Of the 24 international students, approximately half were North American, predominantly Canadian, who nominated established province-related programs. Of the remaining international students, Singaporean students nominated their local legislation (*Human Organ Transplant Act [HOTA], 2012*), and its embedded capacity to make an election to donate your body rather than be included in the automatic organ donation program on death through the companion *Medical (Therapy, Education and Research Act (MERTA)* opt-in scheme. The self-reports of registration as a body donor by international students appear to be more reliable than those of local students.

Reasons to support body donation

Just over two-thirds (67.8%) of the participants provided reasons for why they would donate their bodies (Figure 1). Neither age nor identified gender was related to the reasons chosen to support

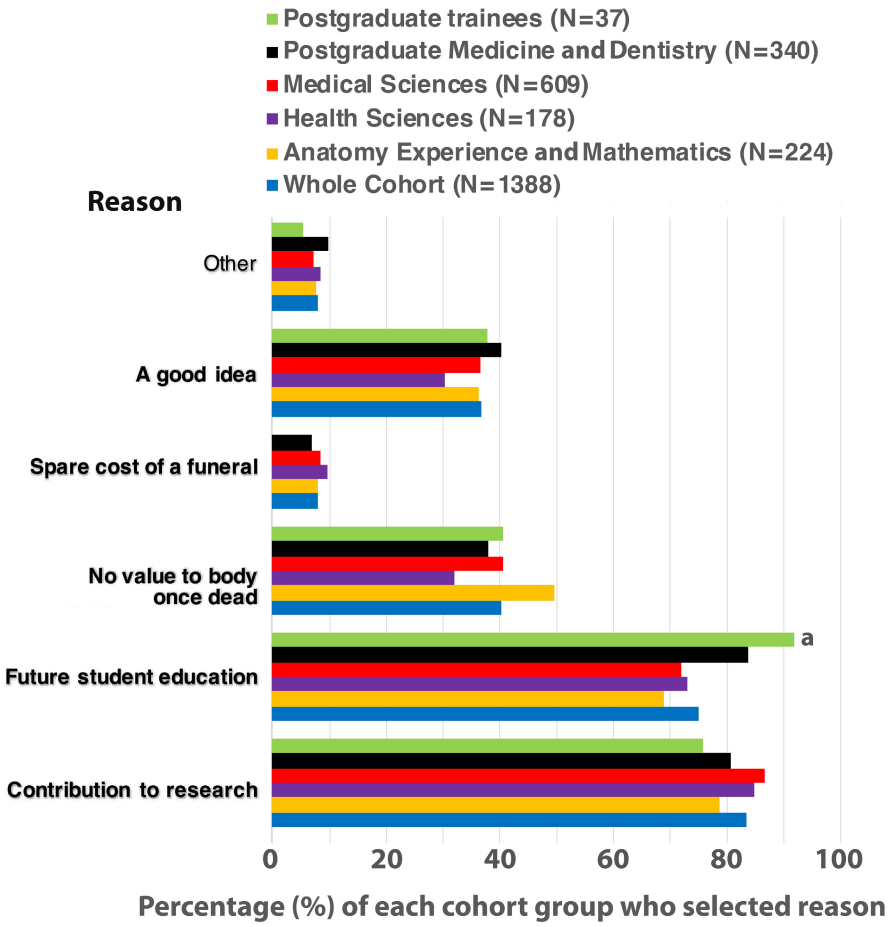

FIGURE 1 Reasons for willingness to donate body selected by participants from the whole cohort, and by those in each of the five cohort groups, who answered the question. Responses are expressed as a percentage (%) of the total number $N = 1388$ (whole cohort) or n (cohort sub-groups). Cross-tab chi-square analysis shows significant differences at $^{a}p < 0.0001$ in reasons selected when comparing across the cohort sub-groups

body donation. Participants from English-speaking backgrounds (46%) were more likely than their non-English-speaking peers (35.2%) to choose the reason "your body has no value once you are dead" ($p < 0.0005$). Participants who stated that they practiced a religion at home were almost half as likely (25.3%) as their non-practicing peers (48%) to choose this reason for unwillingness to donate their body ($p < 0.0005$). Participants with previous anatomy exposure (80.5%) were more likely to select "education of future students" as a reason to support body donation than those without such exposure (71.1%; $p < 0.0005$) and this reason was also selected more often by postgraduate students and trainees ($p < 0.0005$) when comparing responses across the cohorts.

Reasons not to support body donation

Fifty-two percent of the study cohort (1076) chose reasons as to why they would not support body donation (Figure 2). The most commonly cited "other" reason was the wish to donate their body for organ transplantation, nominated most often by postgraduate students and trainees, indicating their greater awareness that body donation generally precludes organ donation (the brain sometimes being an exception).

Neither age nor identified gender were found to be associated with reasons for unwillingness to support body donation. Approximately three times as many participants who spoke another language at home (11.4%) chose "my religion doesn't permit" as a reason compared to those who were English-speaking (4.3%; $p < 0.0005$), although overall this was not a common reason selected by participants. Thirty percent of non-English-speaking background participants chose "my family is not comfortable with it" as a reason for unwillingness to donate, compared to 10.1% of participants from an English-speaking background ($p < 0.0005$). English-speaking participants were more likely to choose "discomfort with the concept" (62.5%), than non-English background students (46.8%; $p < 0.0005$), and "I don't want students like me using my body" (41.8 English-speaking, 25.5% non-English background; $p < 0.0005$).

Participants who stated that they practiced a religion at home were much more likely (17%) to choose "my religion does not permit it" for unwillingness to donate their bodies, than those who did not (1.2%; $p < 0.0005$), and also to nominate "personal beliefs" (32.2 compared to 19.6%; $p < 0.0005$). These participants also nominated "discomfort with the concept" (59 compared to 48.3%; $p < 0.0005$), and "I don't want to contemplate my own death" (19.1 compared to 10.2%; $p < 0.0005$) more frequently than their non-practicing peers. Twice as many local (16.7%) as international students (8.1%) nominated "I do not want to contemplate my own death" ($p < 0.0005$).

Participants with no previous anatomy study were more likely to choose "they did not know enough to make a decision" (38.8%), than participants with previous anatomy exposure (25.6%; $p < 0.0005$). More participants who had studied anatomy previously also nominated "other" and a wish to donate for organ transplantation as a reason not to donate their body ($p < 0.0005$). Together these findings suggest that exposure to anatomical sciences provides opportunities for students to become more informed about donation.

Organ donation

Table 3 presents the responses to each of the three questions about organ donation for the whole cohort and compares those with previous anatomy experience and those without. It also presents the proportion of participants who self-reported registration as an organ donor. Students with previous anatomy experience were more likely to support organ donation for themselves, their family, and the public ($p < 0.0001$). In contrast, students with no previous anatomy experience were approximately twice as likely to indicate they "have not thought about it" in answer to all three questions. Older students were more likely to support the self-donation of their organs for transplantation and to have thought about the issue ($p < 0.0005$).

English-speaking and local students were more likely to support organ donation for themselves, their family, and the public than their non-English-speaking and international counterparts. Their support for self-donation was almost 90%, and for family and public donation of organs for transplantation more than 95%. This difference in support for organ donation by English-speaking participants compared to their non-English-speaking peers was substantial; 15% greater for self-donation; 18% greater for family donation; 12% greater for public donation of organs ($p < 0.0005$ for all three comparisons).

Students who practiced a religion were less likely (76.0%) to support self-organ donation for transplantation compared to non-practicing participants (86.3%; $p < 0.0005$). There were no differences between participants who practiced a religion and those who did not with regard to support for family or public donation of organs for transplantation.

Registration as an organ donor

Self-reported registration as an organ donor was higher across all groups compared to registration as a body donor. However, the postgraduate students and trainees were more likely to report having registered as organ donors, with 58% of the postgraduate trainees reporting being registered organ donors, and 43.8% of postgraduate medical and dentistry students, compared to 11%–15% of the undergraduate participants ($p < 0.0001$). Students with previous anatomy exposure were more than twice as likely to be registered as organ donors (31%) than those without such experience (15%; $p < 0.0001$).

Reasons to support organ donation

The majority of the study cohort (86.4%) selected one or more reasons why they would support organ donation (Figure 3). A smaller

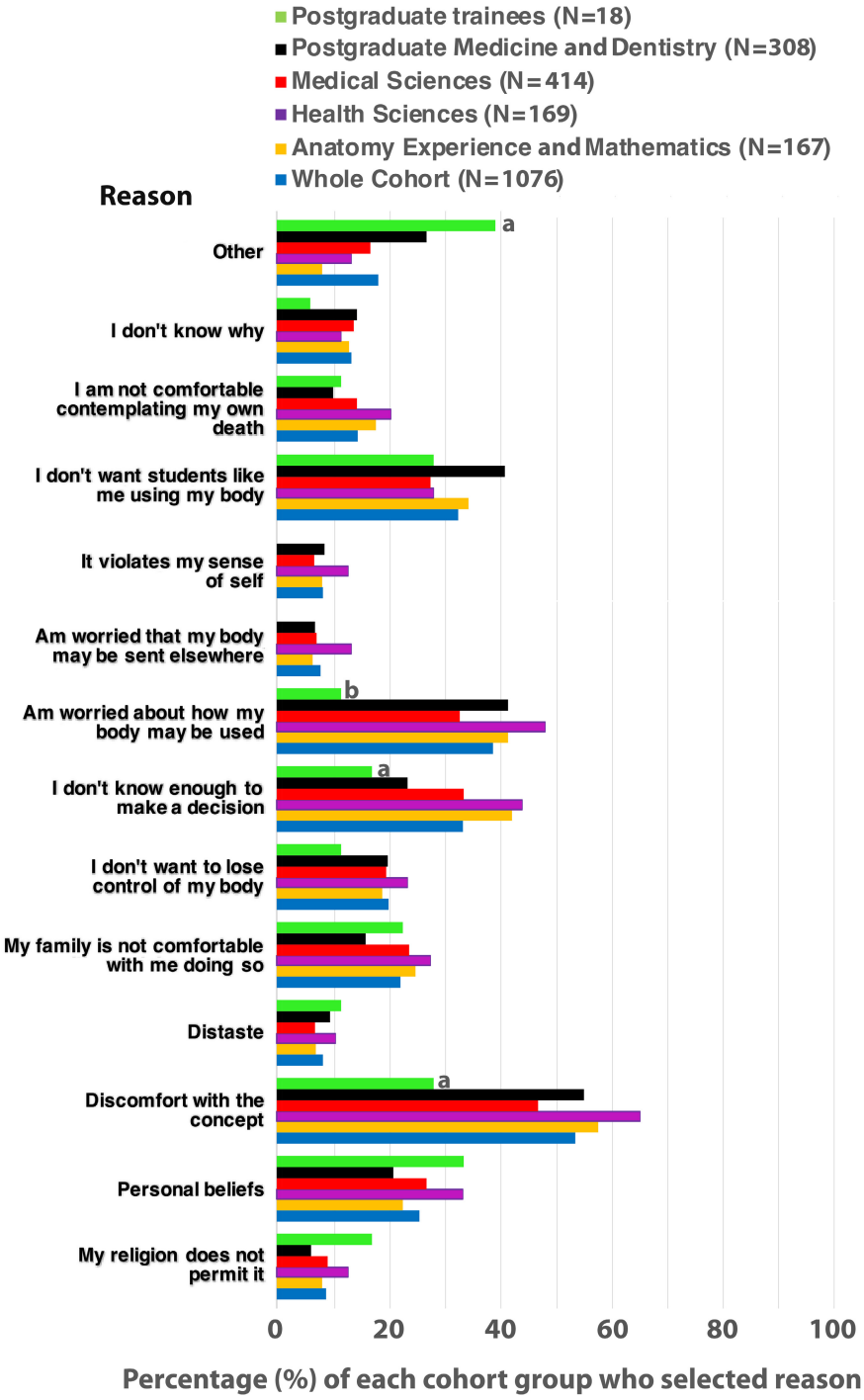

FIGURE 2 Reasons for unwillingness to donate body selected by participants from the whole cohort, and by those in each of the five cohort groups, who answered the question. Responses are expressed as a percentage (%) of the total number $N = 1076$ (whole cohort) or n (cohort sub-groups). Cross-tab chi-square analysis shows significant differences at $^{a}p < 0.0001$ and $^{b}p < 0.001$ in reasons selected when comparing across the cohort sub-groups

proportion of the postgraduate trainees compared to the other cohort groups chose "medical research" and a greater proportion chose "a good idea" ($p < 0.0001$ in both cases), suggesting a greater awareness in this group of the value of organ transplantation.

There were neither age nor identified gender-related differences in the reasons nominated for supporting organ donation. Students who did not speak English at home were less likely (39.6%) to choose "your organs have no value once you are dead" than their English-speaking peers (56.9%; $p < 0.0005$). In contrast, English-speaking students were more likely to select "I hope if I need an organ transplant, someone will donate for me" and "it is a good idea" (77.6 and 57.6%, respectively), compared to those who

TABLE 3 Attitudes to organ donation

Cohorts		Would donate own organs for transplantation?				Would support family member to donate organs for transplantation?				Would support a member of the public to donate organs for transplantation?				Registered as an organ donor?		
		Yes	No	Not thought about it	*p*-value	Yes	No	Not thought about it	*p*-value	Yes	No	Not thought about it	*p*-value	No	Yes	*p*-value
Whole cohort, *N* (%)	N^c = 2018 (100)	1661 (82.5)	104 (5.2)	248 (12.3)		1712 (85.1)	85 (4.2)	215 (10.7)		1814 (90.2)	36 (1.8)	162 (8.0)		1556 (78.0)	438 (22.0)	
Previous anatomy experience, *n* (%)	n^c = 880 (100)	770 (87.5)	40 (4.5)	70 (8.0)	<0.0001[a]	791 (90.1)	31 (3.5)	56 (6.4)	<0.0001[a]	824 (93.7)	10 (1.1)	45 (5.1)	<0.0001[a]	602 (69.0)	270 (31.0)	<0.0001[a]
No previous anatomy experience, *n* (%)	n^c = 1133 (100)	891 (78.7)	64 (5.6)	178 (15.7)		921 (81.2)	54 (4.8)	158 (14.0)		990 (87.4)	26 (2.3)	117 (10.3)		954 (85.0)	168 (15.0)	
Mathematics and Anatomy Experience, *n* (%)	n^c = 295 (100)	231 (78.3)	16 (5.4)	48 (16.3)	<0.0001[b]	239 (81.0)	16 (5.4)	40 (13.6)	<0.0001[b]	264 (89.5)	5 (1.7)	26 (8.8)	<0.0001[b]	254 (86.4)	40 (13.6)	<0.0001[b]
Health Sciences, *n* (%)	n^c = 275 (100)	206 (74.9)	22 (8.0)	47 (17.1)		224 (81.5)	12 (4.4)	39 (14.1)		236 (86.1)	8 (2.9)	30 (11.0)		237 (87.8)	33 (12.2)	
Medical Sciences, *n* (%)	n^c = 848 (100)	680 (80.2)	49 (5.8)	119 (14.0)		686 (81.0)	48 (5.7)	113 (13.3)		735 (86.7)	21 (2.5)	92 (10.8)		741 (88.3)	98 (11.7)	
Postgraduate Medicine and Dentistry, *n* (%)	n^c = 548 (100)	499 (91.1)	15 (2.7)	34 (6.2)		516 (94.2)	9 (1.6)	23 (4.2)		532 (97.1)	2 (0.4)	14 (2.5)		307 (56.2)	239 (43.8)	
Postgraduate trainees, *n* (%)	n^c = 52 (100)	49 (94.2)	2 (3.8)	1 (2.0)		51 (98.1)	0 (0)	1 (1.9)		52 (100)	0 (0)	0 (0)		21 (42.0)	29 (58.0)	

Note: Participant support for organ donation comparing those with previous anatomy experience and those without, and comparing across the five cohort groups. Responses are expressed as a percentage (%) of the total number *N* (whole cohort) or *n* (cohort sub-groups). Cross-tabs chi-square analysis shows significant differences when comparing those with previous anatomy exposure and those without ([a]$p < 0.0001$), and across the across the five cohort sub-groups ([b]$p < 0.0001$#). [c]*N* and/or *n* may sum to less than the group *N* and/or *n* as some participants did not answer the question.

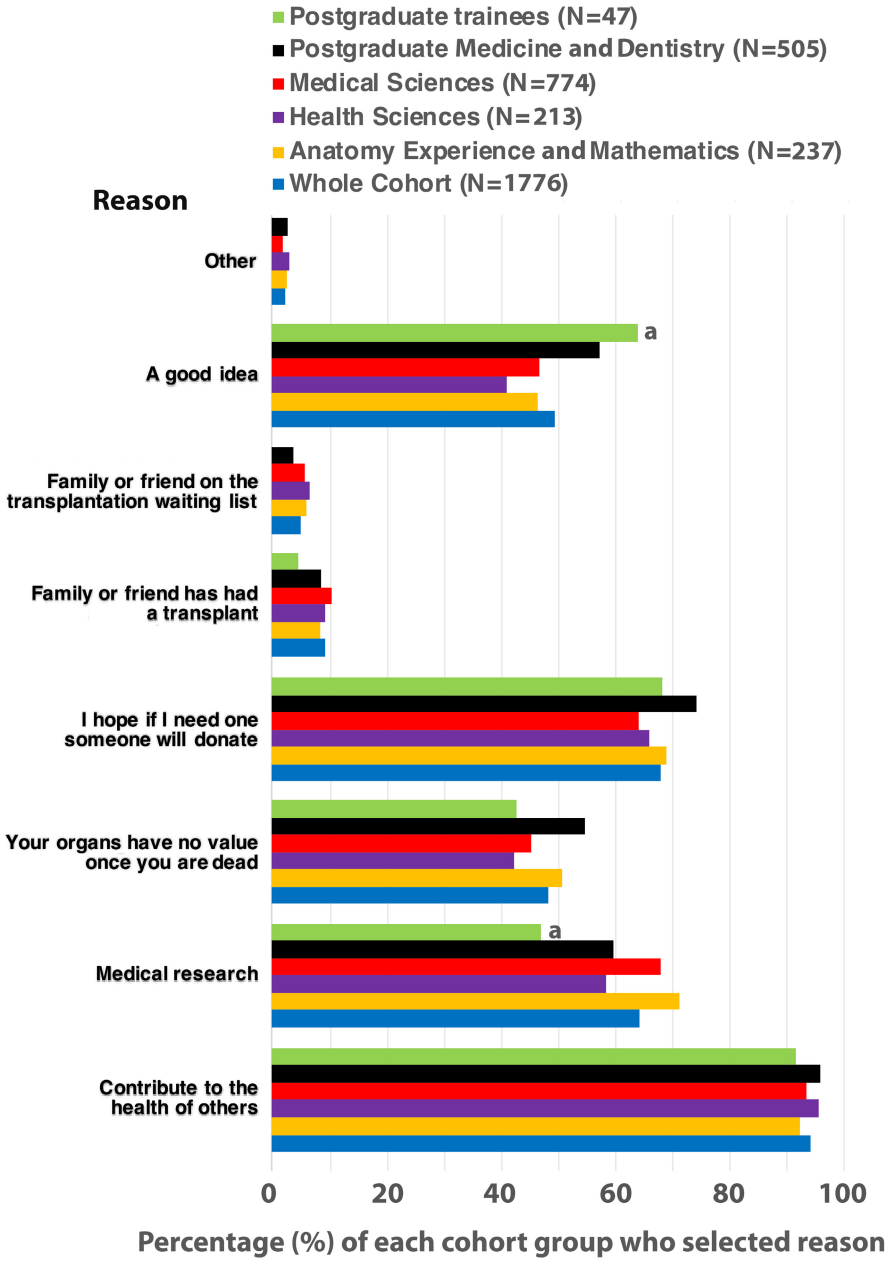

FIGURE 3 Reasons for willingness to support organ donation selected by participants from the whole cohort, and by those in each of the five cohort groups, who answered the question. Responses are expressed as a percentage (%) of the total number $N = 1776$ (whole cohort) or n (cohort sub-groups). Cross-tab chi-square analysis shows significant differences at $^{a}p < 0.0001$ in reasons selected when comparing across the cohort sub-groups

were from non-English-speaking backgrounds (58.3 and 41.0% respectively; $p < 0.0005$ for both comparisons), suggesting a distinct difference between how these two groups regarded organ transplantation.

Local students were more likely to express a belief (50.9%) that "your organs have no value once you are dead" than international students (40.6%; $p < 0.0005$), and that it "was a good idea" (52.3 compared to 40.8% for international students; $p < 0.0005$). Local students were also more likely (73%) to express the "hope that if I need an organ transplant someone will donate for me" than international students (53.6%; $p < 0.0005$), again suggesting there is an interplay between cultural and societal norms, including beliefs about the value of organs, altruistic donation, and reciprocity.

Participants who identified as practicing a religion at home were less likely (35.2%) to nominate their "organs having no value once you are dead" as a reason to donate them compared to those who were non-religious (55.2%; $p < 0.0005$), and also less likely to nominate organ donation as a good idea (41.8 compared to 53.4% for non-religious students; $p < 0.0005$).

Reasons not to support organ donation

Less than a quarter of the cohort ($n = 439$) answered this question, reflecting the generally higher support for organ donation, and a lower level of ambivalence about motivations to donate or not, in comparison to attitudes to body donation (Figure 4).

There were no statistically significant differences in the reasons selected for unwillingness to support organ donation associated with age, identified gender, previous anatomy exposure, or across the five cohort groups.

Approximately one-fifth (19.1%) of the students who practiced a religion and who answered this question, nominated their religious beliefs as a barrier to donation compared to 2.0% of those who did not practice a religion ($p < 0.0005$). Half of this group also nominated "discomfort with the concept" (50%) compared to 29.4% of their non-religion-practicing peers ($p < 0.0005$).

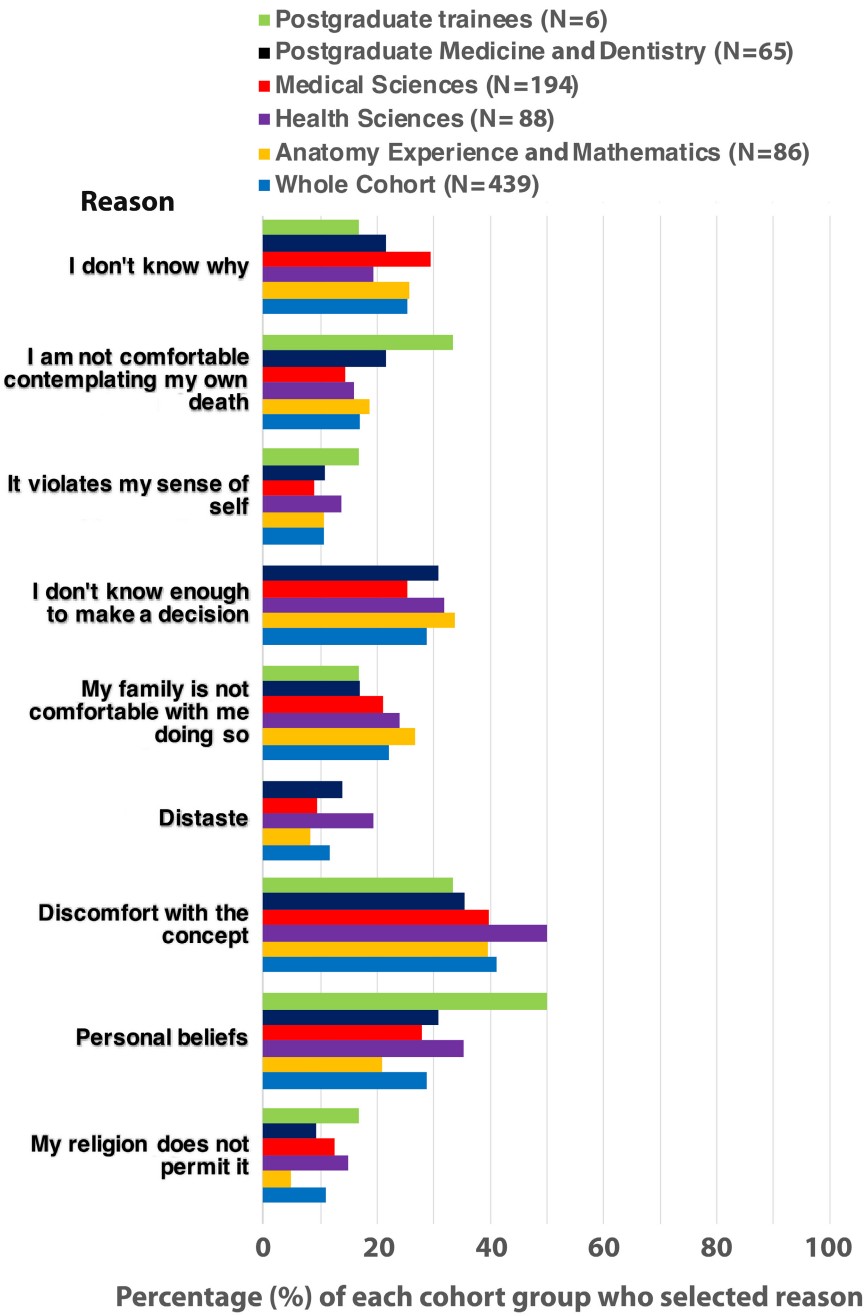

FIGURE 4 Reasons for unwillingness to support organ donation selected by participants from the whole cohort, and by those in each of the five cohort groups, who answered the question. Responses are expressed as a percentage (%) of the total number $N = 439$ (whole cohort) or n (cohort sub-groups). Cross-tab chi-square analyses showed no significant differences when comparing reasons selected across the cohort sub-groups

Comparison of support for body and organ donation

Support for body donation was much lower than support for organ donation (26.5 versus 82.3%) across the whole cohort. However, there was a very high level of support for the public to donate their body (86.3%), especially in comparison to the unwillingness of all participants to donate their own body. While a similar proportion of the whole cohort supported the public to donate their organs (84.2%) as supported the public to donate their body, the disparity between support for own/family donation compared to support for public donation was much greater for body donation compared to organ donation. The difference was also most marked for those students who had undertaken previous anatomy study, who were least likely to indicate they would donate their own body, and the most likely to donate their own organs. Students who supported self-, family-, and public donation of the body were also more strongly in favor of organ donation, for themselves ($p < 0.0001$), their family ($p < 0.0001$), and the public ($p < 0.0001$). Those students who answered affirmatively to both questions were also the most likely to have thought about their attitudes to donation, whether it was body or organ donation, and whether for themselves, their family, or the public.

Support for self-donation of organs ($p < 0.00001$), and the likelihood of registration as a body donor ($p < 0.0001$), or as an organ donor ($p < 0.00001$) increased with age. Otherwise, age was not found to be associated with differences in attitudes to body and organ donation.

DISCUSSION

This study reports a relationship between exposure to anatomical examination using cadaveric tissue, and support for self-, family-, and public-donation of bodies and organs. Previous anatomy exposure and increasing exposure to gross anatomy, are associated with more decisive views (positive and negative) about supporting body and organ donation, strongly stimulate consideration of these issues, and increase the likelihood of registration as an organ donor. Previous anatomy exposure, however, appears to diminish support for self-body donation, while increasing support for public donation, suggesting that students who undertaken studies in anatomy value the opportunity and thus the altruistic gift of donation, but also show reluctance to donate themselves.

Public good and personal decisions

The findings of this study suggest that participation in anatomical studies using donated human tissues prompts students to think about their own feelings and attitudes to donation, and invokes consideration of whether they would support the wishes of their family and the public to donate. In making these decisions, they are required to balance their own personal feelings, and imagined responses to the loss of a family member, against the clear benefit of the donation.

This study suggests that students were capable of, and inclined to, delineate between the public good that donation represents, and recognition of their feelings in the situation where the possibility of donation arises. The dichotomy between supporting body donation overall but not being prepared to donate themselves, or to support donation for family members, suggest a separation of attitudes with regard to the value of anatomical education and the altruistic act of donation. Other studies have also reported this separation (Cahill & Ettarh, 2008, 2011; Galic et al., 2016). Further, the lower level of support for family member body donation compared to organ donation suggests that participants experienced ambivalence in balancing their support for (and benefit from) the use of donated bodies from the public, with their own reluctance to donate or to have family members donate. For participants of diverse religious, cultural, and ethnic backgrounds, this ambivalence and tension may be particularly challenging, but that should be a driver rather than a barrier to engaging with these students (in anatomy class) to assist them in developing and defining their views about donation generally, and the use of donated tissue more specifically.

Participants who were inclined against donation or ambivalent about it, and who thus nominated both reasons for and against donation, also felt that they had insufficient information to make decisions about donation of their body or their organs. These participants were more likely to state that they also felt discomfort with the concept, and for some, discomfort occurred irrespective of their support for donation. This was more apparent in relation to body donation, but a small but significant proportion of the cohort articulated reasons both for and against organ donation, demonstrating insight into the complexity of these issues at a personal level. These findings affirm the lack of knowledge and competence medical and health sciences students feel when asked to consider issues of human tissue use and donation, be it for education, research, or clinical treatment. The students also preferred the word “discomfort” over “distaste” in relation to both body and organ donation, suggesting that the emotional response is not so much the disgust or “ick” factor suggested in some studies as deterring donation (O'Carroll et al., 2011), but a more emotional response to the unknowns associated with having to make a decision about donation while grieving. That emotional response engendered by exposure to a dead human, and dissection of that human, manifested in consideration of a broad range of issues associated with donation. For some, the emotional response will dominate (Morgan et al., 2008; Miller et al., 2019) but the experience and information that accompanies such exposure in anatomy class does provide a factual base on which to deal with the challenging issues that arise at the time of death.

Thus, the lack of support for self- and family-body donation, and in some participants, organ donation, reported here do not seem to reflect an aversive response. Those participants who had more exposure to gross anatomy were most likely to have thought about donation. In addition, the reasons nominated by participants for not supporting body donation, reflected anxiety about participants'

knowledge base, and concerns about future students like themselves handling their bodies, and particularly for a small group of postgraduate students/trainees, the inability to donate organs if they donated their body, rather than antipathy toward dissection. It seems apparent that the participants in the study who had the most exposure to gross anatomy (the postgraduate students/trainees) had been prompted to consider difficult and emotional issues associated with death and donation, and to inform themselves about donation, in a way that those with less exposure had not.

Body donation

The results of this study demonstrate support for self-body donation is much lower than support for the donation of one's organs for transplantation, and that exposure to gross anatomy reduces support for self-donation. The concept of body donation was observed to be novel to many participants; more than 40% of the whole cohort had not thought about body donation for themselves; close to 20% had not thought about it in relation to a family member; over 12% also had not considered the issue of public donation. In contrast, only around 10% of the cohort had not considered organ donation for themselves, their family, or for a member of the public. Body donation is less publicly recognized than organ donation (Cornwall, 2011) and overall measures of public support for body donation have not been reported in Australia. Likewise, little is known about public knowledge of body donation and the processes for effecting it. Most body donor programs in Australia do not advertise or promote their programs, and outreach is mostly limited to aged care, general practice, and other geriatric health-related services. Apart from occasional media reports or first-hand experience through having a family member donate, the general public in Australia is unlikely to have encountered information about body donation. However, the level of support found in this study is lower than the support reported in some other cohorts or countries with similar practices for procurement of bodies. For example, a 2009 Irish study of postgraduate medical students prior to their first dissection session reported that around 40% would support self-donation, although the proportion strongly against self-donation increased with subsequent dissection session attendance (Perry & Ettarh, 2009). Support for family donation was higher, but both were lower than the support for public donation. The findings reported here are consistent overall (in pattern, if not in proportion) with the low level of support by medical students for self-body donation, somewhat higher support for family-member body donation, and the highest support for the public to donate their body (Cahill & Ettarh, 2008; Cornwall et al., 2012; Anyanwu et al., 2014; Galic et al., 2016; Abbasi Asl et al., 2017; Kumar et al., 2020). Postgraduate students and trainees who were least willing to self-body donate were more aware that body donation precludes organ donation, and cited this as a reason not to donate their body. However, 10% of the whole cohort stated that they would not support a family member to donate, suggesting that personal views of next of kin are likely to affect whether an election is honored. This is significant because none of the body donor programs in Australia will accept a body if any of the family or next of kin object.

The use of bodies in education and research is a sensitive issue (Cornwall, 2011; Jones & Whitaker, 2012; Ghosh, 2017a; Jones & King, 2017), not the least because of the unsavory historic practices for body procurement (Richardson & Hurwitz, 1987; Jones & Fennell, 1991; Jones, 2000; Jones & Whitaker, 2012), as well as contemporary cultural and other beliefs (Richardson & Hurwitz, 1995; Larner et al., 2015; Ghosh, 2020). Practices aimed to address concerns about dignity and respect for the deceased, and the respectful, compassionate handling of the body by students are integrated into the pedagogy and policies of many gross anatomy courses (Ghosh, 2020) including those at The University of Sydney. However, for some, the use of bodies for dissection, notwithstanding their value in education and research, is distasteful and unacceptable (Ghosh, 2017b, 2020), a view that may be reflected in the low overall support for self- as opposed to public body donation reported here.

Religious practice and donation

There were clear differences between the views of students from different cultural, ethnic, and religious backgrounds in this study toward donation. It was found that participants who practiced a religion were more likely to decline to support body and organ donation for themselves and their family. The association between religious beliefs and reluctance to donate has been reported previously in both Australian (Edwards et al., 2007; Wakefield et al., 2011; Alexander et al., 2014; Phillipson et al., 2015; Ralph et al., 2016) and international cohorts (Rumsey et al., 2003; Wong, 2010; Galic et al., 2016; Ciliberti et al., 2018; Zhang & Ma, 2020). This study suggests that the way in which the deceased body is viewed, and the need to adhere to cultural and familial norms are factors that engender reluctance to support both body and organ donation. The higher value placed by some cultures on rituals associated with death, and regarding the body as sacred, and, therefore, needing to be intact for funeral rites may be particularly significant for these groups (Wong, 2010; Ralph et al., 2016; Sasi et al., 2020; Donate Life, 2022) and reflected in the reasons they selected to explain their unwillingness to donate. Local and English-speaking participants in this study were more likely to regard their deceased body and organs as having no value after death, a view to which their religious and non-English-speaking peers were much less likely to subscribe. These same students, nevertheless, expressed some discomfort with the concept of body donation and concern about having others like them dissect their body, again suggesting a very personalized response to body donation.

Most religions in Australia have issued public statements of support for donation by religious leaders confirming that donation does not violate religious codes, including those of followers of Buddhism, Hinduism, Islam, and various Christian religions (Donate Life, 2021). However, misconceptions about donation persist within some

religious, cultural, and ethnic sub-groups (Cooper & Taylor, 2000; Shaheen, 2009; Wong, 2010; Phillipson et al., 2015; Ralph et al., 2016; Sasi et al., 2020; Dagcioglu et al., 2021) and have significant detrimental impacts on the capacity of transplantation services to provide organs for culturally diverse patients (Ralph et al., 2016). Australian data show that consent rates for organ donation are much lower in some ethnic and religious communities, including those with a greater clinical need for transplantation, and that there are many fewer registered donors (Donate Life, 2022). Although organs from ethnically diverse donors can be used in recipients of different ethnicity, the success rate for matching is lower due to specific combinations of blood and tissue type being more commonly required in ethnic groups (Khanal et al., 2018).

Morgan et al. (2013) completed a systematic review of both qualitative and quantitative literature examining attitudes to organ donation and donor registration in ethnic minority groups across the United States and the United Kingdom. They reported five areas where ethnic minority groups' attitudes or knowledge constituted barriers to positive attitudes to donation and effective registration: (1) low levels of factual knowledge about donation and registration as a donor; (2) familial factors including reluctance to discuss donation with family members, taboos about death, and respect for parental authority; (3) religious and cultural beliefs, including that donation was prohibited by particular religions; (4) concerns about bodily integrity including the need for rapid burial and an intact body (often in conjunction with cultural and religious beliefs); (5) distrust in healthcare systems and doctors, including in relation to receiving optimal treatment and equitable distribution of donated organs. This study suggests these barriers to donation may exist for some of the participants in this study, particularly those from religious and cultural groups who may be local students of immigrant background, or international students pursuing education in Australia, and may also apply to body donation. The much greater level of support of participants from English-speaking backgrounds for organ donation also suggests that cultural and societal factors such as the widespread promotion of, and support for, organ donation in Australia and other English-speaking countries (e.g., the United Kingdom and the United States) may also be influential in laying a foundation of positive attitudes to donation. The idea of reciprocity reflected in the selection of the "I hope if I need one someone donates for me" as a reason to support organ donation by local and English-speaking participants may also reflect both this promotion and trust in their health systems to manage organ donation equitably and for those in most need.

Value of exposure to anatomical sciences

The exposure to anatomical study is likely to be a positive factor in enabling participants to become more competent in providing factual information and support to family members and the public about donation, and in taking steps to make their own election to donate organs effective by registering as a donor. However, it may dissuade or affirm a reluctance in some for self-body donation. These observations confirm the value of exposure to anatomical sciences over and above the educational value. It is well established that ignorance is a barrier to the use of human tissue: the community and donors have a limited understanding of the processes for donating body, and how they are used (Fennell & Jones, 1992; Richardson & Hurwitz, 1995; Boulware et al., 2004; Ciliberti et al., 2018; Champney et al., 2019). Ignorance may also inhibit the capacity of health professionals to effectively counsel family about body and organ donation (Schaeffner et al., 2004; Zhang et al., 2014), and to inform potential body donors of the implications of donation, including the possibility of permanent retention of body parts, and/or the likelihood that their body will be used for education, not research (Fennell & Jones, 1992; Chung & Lehmann, 2002; Larner et al., 2015; Champney et al., 2019; Farsides & Smith, 2020). Barriers to effective registration as an organ donor include failure to act upon a positive view of organ donation due to ignorance of the need to register prior to death, and failure to ensure the effectiveness of the election by not discussing the wish to donate with family and next-of-kin (Williams et al., 2003; Wakefield et al., 2011; Irving et al., 2014; Potter et al., 2017). Ignorance of organ donation processes, in both the community (Sander & Miller, 2005; Newton, 2011; Wakefield et al., 2011; Rokade & Gaikawad, 2012; Larner et al., 2015) and the health system (Irving et al., 2014; Potter et al., 2017; Keel et al., 2019) are also associated with lower rates of registration as an organ donor (Schaeffner et al., 2004; Figueroa et al., 2013). Research confirms the crucial role friends, family and colleagues have in informing discussion about donation (both body and organ) and registration as a donor (Fennell & Jones, 1992; Conesa et al., 2004; Bolt et al., 2010; Cornwall et al., 2012; Larner et al., 2015; Phillipson et al., 2015; Merola et al., 2016; Cornwall et al., 2018). Body donors have been found to be motivated to register as a donor through their experience of having a friend or family member donate their body (Fennell & Jones, 1992; Bolt et al., 2010; McClea & Stringer, 2010; Cornwall et al., 2012, 2018). Research has also found that potential donors and indeed the general community find initiating conversations about donation with their family and next-of-kin difficult, and sometimes unacceptable (Phillipson et al., 2015; Ralph et al., 2016); the specter of loss of someone dear prompts emotional responses which may be overwhelming and prevent discussion. The lack of factual knowledge about donation, particularly the process of procurement, is thus a barrier to donation and inhibits the capacity of the community and healthcare workers to support donation.

This research suggests significant potential in the opportunity of anatomy class as a forum to provide factual information about donation, giving students a knowledge base that may assist them to make an informed decision for themselves. Possessing such knowledge is also likely to improve their competency and confidence in providing accurate information about donation to their friends and family now, and to their patients and the community as they move into their future careers. The experience of encountering a donor body may be an additional factor promoting contemplation of issues about death, the handling of the deceased, and the role of donation in education,

research, and training. It may also generate opportunities for further discussion about the potential use of donated organs and tissue, and the role of health care professionals, and medical researchers in supporting the transplantation system, and enabling these life-saving procedures. While students, of all backgrounds, may find these discussions and thoughts initially confronting, they are possibly more receptive to thinking about them as a consequence of the exposure to the donor body, and the inherent altruistic qualities of donation (Cornwall & Stringer, 2009; Flack & Nicholson, 2017). It would be important, however, that any program about donation included in anatomy class was constrained to the provision of information, not promotion; the issue of donation is very personal and, as shown here and elsewhere, (Rumsey et al., 2003; Shaheen, 2009; Wong, 2010; Wakefield et al., 2011; Phillipson et al., 2015; Ralph et al., 2016; Naidoo et al., 2021) reflective of cultural, religious beliefs and other factors. Students should not feel pressured to support donation but could be better informed about it, with the provision of facts about the legal and ethical frameworks in which donation is enabled and the implications of donation, equipping them with the knowledge to address misconceptions, including their own, those of their family and friends, and the community. For those participants who did not support either body or organ donation, their move into professional roles, encountering patients and families who support donation, either as donors or recipients of donated organs, may challenge their views and beliefs about donation. The experience of anatomical dissection and exposure to cadaveric tissue provides an opportunity to offer these students knowledge and personal insights that may assist them to manage these challenges. Such outcomes would be of considerable benefit to the students themselves, and the community.

Limitations of the study

There are a number of limitations to this study, and thus the conclusions that can be drawn.

A validated scale to assess knowledge about body and organ donation and which also had the capacity to measure whether respondents had considered these issues was not identified. The new questionnaire developed for this study has not been validated against existing instruments measuring attitudes to organ donation such as the *Attitude Scale* and *Knowledge Scale*, both developed by Sander and Miller (2005), or the *Organ Donation Attitude Scale* (Rumsey et al., 2003). The questionnaire showed good reliability with a Cronbach's alpha = 0.849. However, validation in a different cohort would be desirable.

Another limitation is the possible effect of sampling bias in the cohort selection. The cohort was not intended to be a general population sample, however, the enrolment of students and postgraduate trainees from a health professional and biomedical sciences courses constitutes a potential bias in relation to the key question of the impact of exposure to gross anatomy and attitudes to donation. A recent study (Viljoen & Stephens, 2021) reported that students of biomedical sciences were more positive about body donation than arts students and that postgraduates were more positive than undergraduates. Possibly, participants were more positive about gross anatomy and the use of donated bodies for research and education because of their choice to pursue vocations requiring training in anatomy, rather than their exposure to anatomical examination per se. The value participants place on their anatomical sciences education may also be reflected in positive attitudes to donation, as reported by others (Cahill & Ettarh, 2011; Ciliberti et al., 2018; Kumar et al., 2020; Lee & Lee, 2021; Naidoo et al., 2021).

The study did not examine participants' actual knowledge of donation processes, nor their understanding of how donated bodies and organs were used in Australia, or indeed in their home countries if they were not Australian. Some of the differences in attitudes to body and organ donation, particularly for students coming from non-European/Anglo-Saxon countries, may be attributable to their experiences of, or concerns about, the practices in their home countries and/or ignorance of the donation practices in Australia.

The anomalies between available avenues for registration as a body donor, and the participants' self-reported details of registration as a donor highlight the limitation of self-reported information. It is quite likely that recollection of donor registration details may be inaccurate. Participants may also have felt pressure to support organ donation or to state that they are registered as organ donors because organ donation is regarded as a social good, a phenomenon reported by others (Sehgal et al., 2016). However, the rate of self-reported registration as an organ donor in this cohort was not greater than might be expected given the registration level in the general population of individuals of a commensurate age. National data (Donate Life, 2022) suggest that Australians in this age group are highly supportive of organ donation, but that actual registration rates are very low (around 8%). Thus, even if there was some inaccuracy in self-reporting registration as an organ donor, it was probably not of a substantial level.

Another possible source of bias relates to the order of the choices available to participants when answering questions about their reasons for supporting donation, or not. Ideally, the order of the choices should be randomly presented to avoid primacy and recency bias. Randomization was not practical when using a paper questionnaire, and it was important that the online questionnaire replicated the paper one to avoid introducing other potential biases. Although the order was fixed, responses were selected from all options suggesting that the participants were not unduly influenced by the presented order.

CONCLUSIONS

Overall, this study suggests that exposure to gross dissection invokes complex and difficult thinking in students of anatomy with regard to donation, and their support for it. The findings affirm that there is value in this exposure that goes beyond imparting anatomical knowledge; these students grapple with questions and issues that assist them in forming opinions and views about donation that they may

carry with them into their professional lives. The findings suggest that exposure of students who are likely to work in the health and biomedical sciences professions to anatomical studies using donated human tissue is an opportunity to develop their understanding of the practices, and value of, body and organ donation. Participation in gross anatomical instruction prompts students to think about these issues and thus to contemplate their own thoughts and attitudes about being a donor, and about donation by their family and the public. There is an inherent value in the exposure of students in health, biomedical, and medical sciences to gross anatomy as a means of opening up discussion about post-mortem human tissue donation. These opportunities could be used to explore and develop student awareness, knowledge, and understanding of the value of body and organ donation in education, research, and health, and of the legal and ethical frameworks in which these occur in Australia.

ACKNOWLEDGMENTS

The authors are grateful for the support of their colleagues in the (then) Discipline of Anatomy and Histology, and staff in the (then) Faculty of Health Sciences, and the School of Mathematics and Statistics in facilitating the study and student recruitment. The authors are thankful also to all the students and trainees who took the time to participate in the study. This work was supported by funding received from the NWG Macintosh Memorial Fund. Open access publishing facilitated by The University of Sydney, as part of the Wiley - The University of Sydney agreement via the Council of Australian University Librarians.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest, financial or otherwise.

ORCID

Rebekah A. Jenkin https://orcid.org/0000-0002-8071-9183
Kevin A. Keay https://orcid.org/0000-0003-3934-4380

REFERENCES

Abbasi AJ, Nikzad H, Taherian A, Atlasi MA, Naderian H, Mousavi G, Kashani MM, Omidi A. 2017. Cultural acceptability and personal willingness of Iranian students toward cadaveric donation. *Anat Sci Educ 10*:120–126.

Alamneh YM. 2021. Knowledge and attitude towards ethical cadaver dissection among medical and health sciences students, 1997-2020: A systematic review and meta-analysis. *Trans Res Anat 25*:1001–1049.

Alexander M, Marten M, Stewart E, Serafin S, Štrkalj G. 2014. Attitudes of Australian chiropractic students toward whole body donation: A cross-sectional study. *Anat Sci Educ 7*:117–123.

Allison S, Notebaert A, Perkins E, Conway M, Dehon E. 2021. Fear of death and examination performance in a medical gross anatomy course with cadaveric dissection. *Anat Sci Educ 14*:764–773.

Anyanwu EG, Obikili E, Agu AU. 2014. The dissection room experience: A factor in the choice of organ and whole body donation – A Nigerian survey. *Anat Sci Educ 7*:56–63.

Anyanwu EG, Obikili EN. 2012. Dissecting the dissectors: Knowledge, attitude, and practice of body bequests by Nigerian anatomists. *Anat Sci Educ 5*:347–353.

Arshad A, Anderson B, Sharif A. 2019. Comparison of organ donation and transplantation rates between opt-out and opt-in systems. *Kidney Int 95*:1453–1460.

Asante EA, Maalman RS, Ali MA, Donkor YO, Korpisah JK. 2021. Perception and attitude of medical students towards cadaveric dissection in anatomical science education. *Ethiop J Health Sci 31*:867–874.

Bahşi I, Topal Z, Çetkin M, Orhan M, Kervancıoğlu P, Odabaşıoğlu ME, Cihan ÖF. 2021. Evaluation of attitudes and opinions of medical faculty students against the use of cadaver in anatomy education and investigation of the factors affecting their emotional responses related thereto. *Surg Radiol Anat 43*:481–487.

Bardell T, Hunter DJ, Kent WD, Jain MK. 2003. Do medical students have the knowledge needed to maximize organ donation rates? *Can J Surg 46*:453–457.

Böckers A, Jerg-Bretzke L, Lamp C, Brinkmann A, Traue HC, Böckers TM. 2010. The gross anatomy course: An analysis of its importance. *Anat Sci Educ 3*:3–11.

Bolt S, Venbrux E, Eisinga R, Kuks JB, Veening JG, Gerrits PO. 2010. Motivation for body donation to science: More than an altruistic act. *Ann Anat 192*:70–74.

Boulware LE, Ratner LE, Cooper LA, LaVeist TA, Powe NR. 2004. Whole body donation for medical science: A population-based study. *Clin Anat 17*:570–577.

Cahill KC, Ettarh RR. 2008. Student attitudes to whole body donation are influenced by dissection. *Anat Sci Educ 1*:212–216.

Cahill KC, Ettarh RR. 2011. Attitudes to cadaveric organ donation in Irish preclinical medical students. *Anat Sci Educ 4*:195–199.

Champney TH, Hildebrandt S, Jones DG, Winkelmann A. 2019. BODIES R US: Ethical views on the commercialization of the dead in medical education and research. *Anat Sci Educ 12*:317–325.

Chung CS, Lehmann LS. 2002. Informed consent and the process of cadaver donation. *Arch Path Lab Med 126*:964–968.

Ciliberti R, Gulino M, Gazzaniga V, Gallo F, Vellone VG, De Stefano F, Santi P, Baldelli I. 2018. A Survey on the knowledge and attitudes of Italian medical students toward body donation: Ethical and scientific considerations. *J Clin Med 7*:168–177.

Conesa C, Rıos A, Ramırez P, del Mar Rodrıguez M, Rivas P, Parrilla P. 2004. Socio-personal factors influencing public attitude towards living donation in south-eastern Spain. *Nephrol Dial Transplant 19*:2874–2882.

Cooper ML, Taylor GJ (Editors). 2000. *Organ & Tissue Donation, A Reference Guide for Clergy*. 4th Ed. Richmond, VA: South-Eastern Organ Procurement Foundation SEOPF / United Network for Organ Sharing (UNOS). 49 p.

Cornwall J, Perry GF, Louw G, Stringer MD. 2012. Who donates their body to science? An international, multicenter, prospective study. *Anat Sci Educ 5*:208–216.

Cornwall J, Stringer MD. 2009. The wider importance of cadavers: Educational and research diversity from a body bequest program. *Anat Sci Educ 2*:234–237.

Cornwall J, Poppelwell Z, McManus R. 2018. "Why did you really do it?" A mixed-method analysis of the factors underpinning motivations to register as a body donor. *Anat Sci Educ 11*:623–631.

Cornwall J. 2011. Don't ask, don't tell – Who should promote body donation programmes in the public domain? *Australas Med J 4*:458–459.

Curtis E, Jones R, Tipene-Leach D, Walker C, Loring B, Paine S-J, Reid P. 2019. Why cultural safety rather than cultural competency is required to achieve health equity: A literature review and recommended definition. *Int J Equity Health 18*:174–191.

Dagcioglu BF, Simsek E, Tepeli RI, Oztas D. 2021. Organ donation in Turkey: The knowledge, approaches and opinions of family physicians. *Iran J Public Health 50*:1188–1196.

De Gama BZ, Bhengu TT, Satyapal KS. 2018. Attitudes of undergraduate South African students towards body donation. *Int J Morphol 36*:130–134.

Delotte J, Behr M, Thollon L, Arnoux PJ, Baque P, Bongain A, Brunet C. 2008. Pregnant woman and road safety: Experimental crash test with post mortem human subject. *Surg Radiol Anat 30*:185–189.

Demir T, Selimen D, Yildirim M, Kucuk HF. 2011. Knowledge and attitudes toward organ/tissue donation and transplantation among health care professionals working in organ transplantation or dialysis units. *Transplant Proc 43*:1425–1428.

Dissabandara LO, Nirthanan SN, Khoo TK, Tedman R. 2015. Role of cadaveric dissections in modern medical curricula: A study on student perceptions. *Anat Cell Biol 48*:205–212.

Donate Life. 2021. *Organ Donation & Religion 2021 Ed*. Canberra City, ACT, Australia: Australian Government, Organ and Tissue Authority. 4 p. URL: https://www.donatelife.gov.au/sites/default/files/2021-05/religion_facts.pdf [accessed 13 March 2022].

Donate Life. 2022. *2021 Australian Donation and Transplantation Activity Report 2022 Ed*. Canberra City, ACT, Australia: Australian Government, Organ and Tissue Authority. 27 p. URL: https://www.donatelife.gov.au/sites/default/files/2022-02/OTA_2021ActivityReport_Feb2022-Final.pdf [accessed 13 March 2022].

Drake RL, McBride JM, Lachman N, Pawlina W. 2009. Medical education in the anatomical sciences: The winds of change continue to blow. *Anat Sci Educ 2*:253–259.

DuBois JM, Anderson EE. 2006. Attitudes toward death criteria and organ donation among healthcare personnel and the general public. *Prog Transplant 16*:65–73.

Edwards TM, Essman C, Thornton JD. 2007. Assessing racial and ethnic differences in medical student knowledge, attitudes and behaviors regarding organ donation. *J Natl Med Assoc 9*:131–137.

Essman C, Thornton J. 2006. Assessing medical student knowledge, attitudes, and behaviors regarding organ donation. *Transplant Proc 38*:2745–2750.

Estai M, Bunt S. 2016. Best teaching practices in anatomy education: A critical review. *Ann Anat 208*:151–157.

Farsides T, Smith CF. 2020. Consent in body donation. *Eur J Anat 24*:239–248.

Fennell S, Jones DG. 1992. The bequest of human bodies for dissection: A case study in the Otago Medical School. *N Z Med J 105*:472–474.

Figueroa CA, Mesfum ET, Acton NT, Kunst AE. 2013. Medical students' knowledge and attitudes toward organ donation: Results of a Dutch survey. *Transplant Proc 45*:2093–2097.

Flack NA, Nicholson H. 2017. What do medical students learn from dissection? *Anat Sci Educ 11*:325–335.

Galić BS, Drvendžija Z, Štrkalj G. 2016. Attitudes of medical and allied medical students from Serbia toward whole body donation. *Biosci J 32*:1388–1402.

Ghorbani F, Khoddami-Vishteh HR, Ghobadi O, Shafaghi S, Louyeh AR, Najafizadeh K. 2011. Causes of family refusal for organ donation. *Transplant Proc 43*:405–406.

Ghosh SK. 2017a. Cadaveric dissection as an educational tool for anatomical sciences in the 21st century. *Anat Sci Educ 10*:286–299.

Ghosh SK. 2017b. Paying respect to human cadavers: We owe this to the first teacher in anatomy. *Ann Anat 211*:129–134.

Ghosh SK. 2020. The practice of ethics in the context of human dissection: Setting standards for future physicians. *Ann Anat 232*:151577.

Goz F, Goz M, Erkan M. 2006. Knowledge and attitudes of medical, nursing, dentistry and health technician students towards organ donation: A pilot study. *J Clin Nurs 15*:1371–1375.

Grahovac G, Brkljacic T, Topic I, Habek M. 2007. Attitudes towards organ donation among medical students. *Med Teach 28*:745.

Green C, Bowden D, Molony D, Burke N, Felle P, Dudeney S. 2014. Attitudes of the medical profession to whole body and organ donation. *Surgeon 12*:73–77.

Habicht JL, Kiessling C, Winkelmann A. 2018. Bodies for anatomy education in medical schools. *Acad Med 93*:1293–1300.

Hu D. Huang H. 2015. Knowledge, attitudes, and willingness toward organ donation among health professionals in China. *Transplantation 99*:139–175.

Hyde MK, Chambers SK. 2014. Information sources, donation knowledge, and attitudes toward transplant recipients in Australia. *Prog Transplant 24*:169–177.

Irving MJ, Jan S, Tong A, Wong G, Craig JC, Chadban S, Rose J, Cass A, Allen RD, Howard K. 2014. What factors influence people's decisions to register for organ donation? The results of a nominal group study. *Transplant Int 27*:617–624.

Irving, MJ, Tong, A, Jan, S, Cass, A, Chadban, S, Allen, RD, Craig, JC, Wong, G, Howard, K. 2012. Community attitudes to deceased organ donation: A focus group study. *Transplantation 93*:1064–1069.

Johnson EO, Charchanti AV, Troupis TG. 2012. Modernization of an anatomy class: From conceptualization to implementation. A case for integrated multimodal-multidisciplinary teaching. *Anat Sci Educ 5*:354–366.

Jones DG. 2000. *Speaking for the Dead: Cadavers in Biology and Medicine*. 1st Ed. Abingdon, Oxon, UK: Routledge. 290 p.

Jones DG, Fennell S. 1991. Bequests, cadavers and dissections: Sketches from New Zealand history. *NZ Med J 104*:210–212.

Jones DG, King MR. 2017. Maintaining the anonymity of cadavers in medical education: Historic relic or educational and ethical necessity? *Anat Sci Educ 10*:87–97.

Jones DG, Whitaker MI. 2012. Anatomy's use of unclaimed bodies: Reasons against continued dependence on an ethically dubious practice. *Clin Anat 25*:246–254.

Keel I, Schürch R, Weiss J, Zwahlen M, Immer FF. 2019. Is there an association between consent rates in Swiss hospitals and critical care staffs' attitudes towards organ donation, their knowledge and confidence in the donation process? *PLoS ONE 14*:e0211614.

Khanal M, Lawton PD, Cass A, McDonald SP. 2018. Disparity of access to kidney transplantation by Indigenous and non-Indigenous Australians. *Med J Aust 209*:261–266.

Kumar B, Kulkarni JP, Sinha R, Jawed MA, Kumar A. 2020. Awareness of body and organ donation amongst first year MBBS students of Indira Gandhi Institute of Medical Sciences, Patna. *Indian J Clin Anat Physiol 5*:33–36.

Larner SP, McQuone B, Schober JM, Loukas M, Terrell M. 2015. Perceptions of the living dead: An assessment of knowledge and opinions about whole body donation, its process, and willingness to become cadaveric donors in Pennsylvania. *Clin Anat 28*:442–448.

Lee HJ, Lee SB. 2021. A study on the attitudes of nursing students as regards cadaver donation and change of cadaver donation intention after attending cadaver anatomy program. *Ann Rom Soc Cell Biol 25*:1066–1073.

Marck CH, Neate SL, Skinner M, Dwyer B, Hickey BB, Radford ST, Weiland TJ, Jelinek GA. 2016. Potential donor families' experiences of organ and tissue donation–related communication, processes and outcomes. *Anaesth Intensive Care 44*:99–106.

McClea K, Stringer MD. 2010. The profile of body donors at the Otago School of Medical Sciences – Has it changed? *N Z Med J 123*:9–17.

Merola J, Pei KY, Rodriguez-Davalos MI, Gan G, Deng Y, Mulligan DC, Davis KA. 2016. Attitudes toward organ donation among waitlisted transplant patients: Results of a cross-sectional survey. *Clin Transplant 30*:1449–1456.

Miller J, Currie S, O'Carroll RE. 2019. 'What if I'm not dead?' - Myth-busting and organ donation. *Br J Health Psychol 24*:141–158.

Morgan M, Kenten C, Deedat S, Donate Programme Team. 2013. Attitudes to deceased organ donation and registration as a donor among minority ethnic groups in North America and the U.K.: A synthesis of quantitative and qualitative research. *Ethn Health 18*:367–390.

Morgan SE, Stephenson MT, Harrison TR, Afifi WA, Long SD. 2008. Facts versus 'feelings': How rational is the decision to become an organ donor? *J Health Psych 13*:644–658.

Mwachaka PM, Mandela P, Saidi H. 2016. Repeated exposure to dissection does not influence student's attitudes towards human body donation for anatomy teaching. *Anat Res Int 2016*: 9251049.

Naidoo N, Al-Sharif GA, Khan R, Azar A, Omer A. 2021. In death there is life: Perceptions of the university community regarding body donation for educational purposes in The United Arab Emirates. *Heliyon 7*:e07650.

Neate SL, Marck CH, Skinner M, Dwyer B, McGain F, Weiland TJ, Hickey BB, Jelinek GA. 2015. Understanding Australian families' organ donation decisions. *Anaesth Intensive Care 43*:42–50.

Newton JD. 2011. How does the general public view posthumous organ donation? A meta-synthesis of the qualitative literature. *BMC Public Health 11*:791.

O'Carroll RE, Foster C, McGeechan G, Sandford K, Ferguson E. 2011. The "ick" factor, anticipated regret, and willingness to become an organ donor. *Health Psychol 30*:236–245.

O'Neill O. 1996. Medical and scientific uses of human tissue. *J Med Ethics 22*:5–7.

Pawlina W, Hromanik MJ, Milanese TR, Dierkhising R, Viggiano TR, Carmichael SW. 2006. Leadership and professionalism curriculum in the gross anatomy course. *Ann Acad Med Singapore 35*:609–614.

Pawlina W, Lachman N. 2004. Dissection in learning and teaching gross anatomy: Rebuttal to McLachlan. *Anat Rec 281B*:9–11.

Perry GF, Ettarh, RR. 2009. Age modulates attitudes to whole body donation among medical students. *Anat Sci Educ 2*:167–172.

Phillipson L, Larsen-Truong K, Pitts L, Nonu, MM. 2015. Knowledge of, beliefs about, and perceived barriers to organ and tissue donation in Serbian, Macedonian, and Greek Orthodox communities in Australia. *Progr Transplant 25*:91–99.

Pilcher D, Gladkis L, Arcia B, Bailey M, Cook D, Cass Y, Opdam H. 2015. Estimating the number of organ donors in Australian hospitals—Implications for monitoring organ donation practices. *Transplantation 99*:2203–2209.

Potter JE, Herkes RG, Perry L, Elliott RM, Aneman A, Brieva JL, Cavazzoni E, Cheng AT, O'Leary MJ, Seppelt IM, Gebski V. 2017. Communication with families regarding organ and tissue donation after death in intensive care (COMFORT): Protocol for an intervention study. *BMC Health Serv Res 17*:42.

Quince TA, Barclay SI, Spear M, Parker RA, Wood DF. 2011. Student attitudes toward cadaveric dissection at a UK medical school. *Anat Sci Educ 4*:200–207.

Ralph AF, Alyami A, Allen RD, Howard K, Craig JC, Chadban SJ, Irving M, Tong A. 2016. Attitudes and beliefs about deceased organ donation in the Arabic-speaking community in Australia: A focus group study. *BMJ Open 6*:e010138.

Richardson R, Hurwitz BS. 1987. Jeremy Bentham's self-image: An exemplary bequest for dissection. *BMJ 295*:195–198.

Richardson R, Hurwitz B. 1995. Donor's attitudes towards body donation for dissection. *Lancet 346*:277–279.

Riederer BM. 2016. Body donations today and tomorrow: What is best practice and why? *Clin Anat 29*:11–18.

Riker RR, White BW. 1995. The effect of physician education on the rates of donation request and tissue donation. *Transplantation 59*:880–884.

Roach M. 2004. *Stiff: The Curious Lives of Human Cadavers*. 1st Ed. New York, NY: WW Norton & Company, Inc. 303 p.

Robert P, Bégin F, Ménard-Castonguay S, Frenette A-J, Quiroz-Martinez H, Lamontagne F, Belley-Côté E-P, D'Aragon F. 2021. Attitude and knowledge of medical students about organ donation – Training needs identified from a Canadian survey. *BMC Med Educ 21*:368.

Rokade SA, Gaikawad AP. 2012. Body donation in India: Social awareness, willingness, and associated factors. *Anat Sci Educ 5*:83–89.

Rumsey S, Hurford DP, Cole AK. 2003. Influence of knowledge and religiousness on attitudes toward organ donation. *Transplant Proc 35*:2845–2850.

Sander SL, Miller BK. 2005. Public knowledge and attitudes regarding organ and tissue donation: An analysis of the northwest Ohio community. *Patient Educ Counsel 58*:154–163.

Sasi A, Hegde R, Dayal S. Vaz M. 2020. 'Life after death – The dead shall teach the living': A qualitative study on the motivations and expectations of body donors, their families, and religious scholars in the South Indian City of Bangalore. *Asian Bioeth Rev 12*:149–172.

Schaeffner ES, Windisch W, Freidel K, Breitenfeldt K, Winkelmayer WC. 2004. Knowledge and attitude regarding organ donation among medical students and physicians. *Transplantation 77*:1714–1718.

Sehgal NK, Scallan C, Sullivan C, Cedeño M, Pencak J, Kirkland J, Scott K, Thornton JD. 2016. The relationship between verified organ donor designation and patient demographic and medical characteristics. *Am J Transplant 16*:1294–1297.

Sellers MT, McGinnis HS, Alperin M, Sweeney JF, Dodson TF. 2018. deterrents to organ donation: A multivariate analysis of 766 survey respondents. *J Amer Coll Surg 226*:414–422.

Shaheen FA. 2009. Organ donation in the Middle East countries. *Ethn Dis 19*:S1–S17.

Sharpe E, Moloney G, Sutherland M, Judd A. 2017. The power of an immediate donor registration opportunity: Translating organ donation attitudes into registration behavior. *Basic Appl Social Psych 39*:49–59.

Sugand K, Abrahams P, Khurana A. 2010. The anatomy of anatomy: A review for its modernization. *Anat Sci Educ 3*:83–93.

Sung RS, Galloway J, Tuttle-Newhall JE, Mone T, Laeng R, Freise CE, Rao PS. 2008. Organ Donation and Utilization in the United States, 1997–2006. *Am J Transplant 8*:922–934.

Tontus HO, Karabey M, Gurdal, N. 2011. Survey of medical students' attitudes, religious beliefs, and knowledge of organ donation. *Cells Tissues Organs 14*:203–206.

Viljoen JK & Stephens, S. 2021. Assessing the perceptions of individuals with differing levels and backgrounds of education towards whole-body donation. *Ann Anat 233*:151604.

Wakefield CE, Reid J, Homewood J. 2011. Religious and ethnic influences on willingness to donate organs and donor behavior: An Australian perspective. *Progr Transplant 21*:161–168.

Williams MA, Lipsett PA, Rushton CH, Grochowski EC, Berkowitz ID, Mann SL, Shatzer JH, Short MP, Genel M. 2003. The physician's role in discussing organ donation with families. *Crit Care Med 31*:1568–1573.

Winkelmann A. 2007. Anatomical dissection as a teaching method in medical school: A review of the evidence. *Med Educ 41*:15–22.

Wong LP. 2010. Factors limiting deceased organ donation: Focus groups' perspective from culturally diverse community. *Transplant Proc 42*:1439–1444.

Zambudio AR, Conesa C, Ramírez P, Galindo PJ, Martínez L, Rodríguez MM, Parrilla P. 2006. What is the attitude of hospital transplant-related personnel toward donation? *J Heart Lung Transplant 25*:972–976.

Zhang H, Ma C. 2020. Body donation in Beijing, China in the last 20 years: Current status and future development. *Anat Sci Educ 13*:272–273.

Zhang L, Xiao M, Gu M, Zhang Y, Jin J, Ding J. 2014. An overview of the roles and responsibilities of Chinese medical colleges in body donation programs. *Anat Sci Educ 7*:312–320.

AUTHOR BIOGRAPHIES

Rebekah A. Jenkin B.Sc. (Hons.), M.Sc., Ph.D., Dip. Law, is a doctoral student in Anatomy and Histology, School of Medical Sciences, Faculty of Medicine and Health at the University of Sydney, Camperdown, New South Wales, Australia. Her research is focused on the historic and contemporary use of cadavers in education and research, and attitudes to body and organ donation.

Samuel A. Garrett, is an undergraduate student and Dalyell Scholar enrolled in a Bachelor of Arts and Bachelor of Advanced Studies at the University of Sydney, and a research assistant in Anatomy and Histology, School of Medical Sciences, Faculty of Medicine and Health at the University of Sydney, Camperdown, New South Wales, Australia. His research interests range from anatomical history to international relations.

Kevin A. Keay, B.Sc. (Hons.), Grad. Dip. Sci. Med. (Pain Med.), Ph.D., is a professor of neuroscience, Chief Anatomist, and Academic Lead for Anatomy and Histology, in the School of Medical Sciences, Faculty of Medicine and Health at the University of Sydney, Camperdown, New South Wales, Australia. He teaches neuroanatomy and neuroscience to medical, dental, and science students, as well as to postgraduate students and specialist college members. His research interests include: the neurological basis of the transition from acute injury to chronic pain; the neuroanatomy of injury, blood loss, and pain; pedagogical innovation in pre-mortem imaging, augmented reality, and virtual reality, to enhance neuroanatomical education.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

How to cite this article: Jenkin, R. A., Garrett, S. A. & Keay, K. A. (2023). Altruism in death: Attitudes to body and organ donation in Australian students. *Anatomical Sciences Education*, *16*, 27–46. https://doi.org/10.1002/ase.2180