Medical Students' Motivations for Studying Medicine: Changes and Relationship with Altruistic Attitudes, Expectations, and Experiences of Learning at University

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ABBREVIATIONS

SCT	Social Cognitive Theory
SDT	Self-Determination Theory
UK	United Kingdom
GPA	Grade Point Average
SATAC	South Australia Tertiary Admission Centre
ATAR	Australian Tertiary Admission Rank
UMAT	Undergraduate Medicine and Health Sciences Admission Test
UoA	University of Adelaide
CBL	Case-Based Leaning
PBL	Problem-Based Learning
MPPD	Medical Personal and Professional Development

CONFERENCE PRESENTATIONS ARISING OUT OF THIS THESIS

University of Adelaide Faculty of Health Science Postgraduate Research Conference. University of Adelaide, Australia, 31 August, 2012. Poster presentation. M. Xu, M. O'Keefe, C. Laurence. 'Medical school applicants: reasons for applying, expectation of studying at university, and professional attitudes'.

Australian and New Zealand Association for Health Professional Educators Conference. Melbourne, Australia, 24th - 27th June, 2013. Poster presentation. M. Xu, M. O'Keefe, C. Laurence. 'First year at medical school: changes in motives, comparison of expectations and experiences'.

11th Asia Pacific Medical Education Conference. National University of Singapore, Singapore, 15th - 19th January, 2014. Oral poster presentation. M. Xu, M. O'Keefe, C. Laurence. 'Assessing medical students' motives for studying medicine: a scale development and validation'.

11th Asia Pacific Medical Education Conference. National University of Singapore, Singapore, 15th - 19th January, 2014. Oral poster presentation. M. Xu, M. O'Keefe, C. Laurence. 'First year at medical school: changes in motives, comparison of expectations and experiences'.

ABSTRACT

Background

Altruism is regarded as a core attribute of medical practice and an important motivation for medical students to study medicine. Medical students' motivations for studying medicine have also been found to have an impact on multiple aspects of their learning at medical school. These are important areas of investigation because medical students are expected to graduate with the professionalism which prepares them for providing care to patients, and a commitment to continuous learning of skills and knowledge. To date there has been little longitudinal research into changes in medical students' motivations for studying medicine during medical school and factors that affect motivational changes. This study aims to explore medical students' motivations for studying medicine before and during medical school, and its relationships with altruistic attitudes and expectations/experiences of learning at university.

Method

The study was conducted within the University of Adelaide undergraduate entry medical program. The medical applicants completed the entry baseline questionnaire at the application stage for 2012 and then the entry follow-up questionnaire 12 months later in 2013 (as second year medical students). Meanwhile, the fourth year medical students completed the fourth-year baseline questionnaire in the middle of their fourth year in 2012 and then the fourth-year follow-up questionnaire 12 months later in 2013 (as fifth year medical students). Not everyone who completed the baseline questionnaires completed the follow-up questionnaires, and vice versa. The questionnaires included a socio-demographic section and Likert items concerning the reasons for studying medicine, altruistic attitudes, and expectations/experiences of learning at university.

Results

Baseline responses from medical applicants and fourth year medical students showed that desire for helping others and the enjoyment of interacting with people were the most important reasons for studying medicine, followed by scientific curiosity. Four

factors of reasons for studying medicine were identified through factor analysis: people-orientation, science-orientation, job status/security, and external pressure. Those medical applicants who rated people-orientation as more important tended to have significantly higher levels of altruistic attitudes, and to consider ready access to staff and interaction with other students to be significantly more important. The medical applicants who rated science-orientation as more important were in greater agreement about the likelihood of continuing study after graduation. Similar relationships were found among the fourth year medical students.

Comparison between baseline and follow-up responses showed that the second year medical students considered people-orientation and science-orientation significantly less important than the medical applicants, while job status/security and external pressure were significantly more important as reasons for studying medicine than for the medical applicants. However, job status/security and external pressure made only a small contribution overall to student motivations for studying medicine. Importantly, medical students' altruistic attitudes declined significantly after the first year. The first year university experiences also differed significantly from expectations at the application stage in various aspects, such as access to staff, interaction with other students, attending lectures, and activities outside university. These discordances were also detected in the paired baseline and follow-up responses. In contrast, few significant changes in reasons for studying medicine and altruistic attitudes, or differences in experiences of learning at university, were found after the fourth year at medical school.

Discussion

This study finds that altruism is the most important reason for studying medicine and it persists in later years at medical school, despite its decline during the first year. The first year at medical school is a critical year of adjustment. The changes in altruistic attitudes and mismatches between expectations at the application stage and first year experiences may reflect the adaptation to university. This study suggests that medical schools should aim at maintaining and enhancing first year medical students' motivations for studying medicine. Medical schools should also consider assisting students in their professional socialisation and their transition from secondary schools to medical schools.

THESIS DECLARATION

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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CHAPTER 1. INTRODUCTION

1.1 Background

Entry to medical school is highly competitive in Australia. To assist the selection process, prospective students' motivations for studying medicine are often explored as part of the selection process. Typical medical school interview questions related to this topic may be:

- Why do you want to be a doctor?
- Tell me why you're interested in medicine/the medical program.
- What inspired your interest in medicine and what have you done to investigate the field and confirm your decision?
- What is your career plan and what do you think is the purpose of medical school?

Such information provides a guide to understand medical applicants' commitment to medical study and a medical career. This is important, since in Australia a medical career requires long and demanding training, including four to six years of preclinical and clinical training, one to two years of prevocational training, and years of vocational training, followed by life-long professional development (Rotem et al., 1981).

Motivations for studying medicine can be intrinsic, such as being motivated by the intellectual satisfaction of learning personal skills and knowledge, and the social satisfaction of taking care of patients and collaborating with other health professionals. However, these intrinsic motivations for studying medicine may not always be based on a full understanding of the medical profession. For example, they may stem from unrealistic illusions based on popular medical television programs (Weaver et al., 2011b, O'Connor, 1998).

Motivations for studying medicine can also be extrinsic, such as being attracted by the social advantages associated with medicine – a professional career, job security, high prestige, and good income. These aspects of medicine are especially obvious in Australia and many Western countries, which makes medicine a good career choice for people who want to improve their social status (Klimidis et al., 1997). It is difficult to determine how much these extrinsic motivations contribute to the commitment required

for the long and demanding medical training and life-long professional development. It is not clear either how these motivations fit into the ultimate goal of providing care for patients.

Most of the time, various motivations for studying medicine are interrelated and difficult to disentangle (Misch, 2002). Certain motivations may dominate medical students' behaviours in different situations during medical school (Misch, 2002), such as at the application stage, during preclinical training, and during clinical placements. Medical students' motivations may gradually change through certain psychological processes during medical school (Williams et al., 1999, Deci et al., 1985). Experiences within the medical school context may shape medical students' motivations for studying medicine as well.

Although there has been extensive research on motivation in medical education research in recent decades, there is a lack of research into changes in medical students' motivations for studying medicine during medical school and the factors that may be important in any changes observed.

1.2 Research aim, questions, and objectives

The primary aim of this thesis is to explore medical students' motivations for studying medicine before and during medical school, and the relationship between such motivations and altruistic attitudes, expectations, and experiences of learning at university.

The research questions are:

- Do medical students' motivations for studying medicine change during medical school?
- Do medical students' altruistic attitudes change during medical school?
- Do medical students' experiences of learning at university differ from their expectations at the application stage, and do these experiences change during medical school?
- What are the relationships between medical students' motivations for studying medicine and their altruistic attitudes?

- What are the relationships between medical students' motivations for studying medicine and their expectations/experiences of learning at university?

The research objectives are:

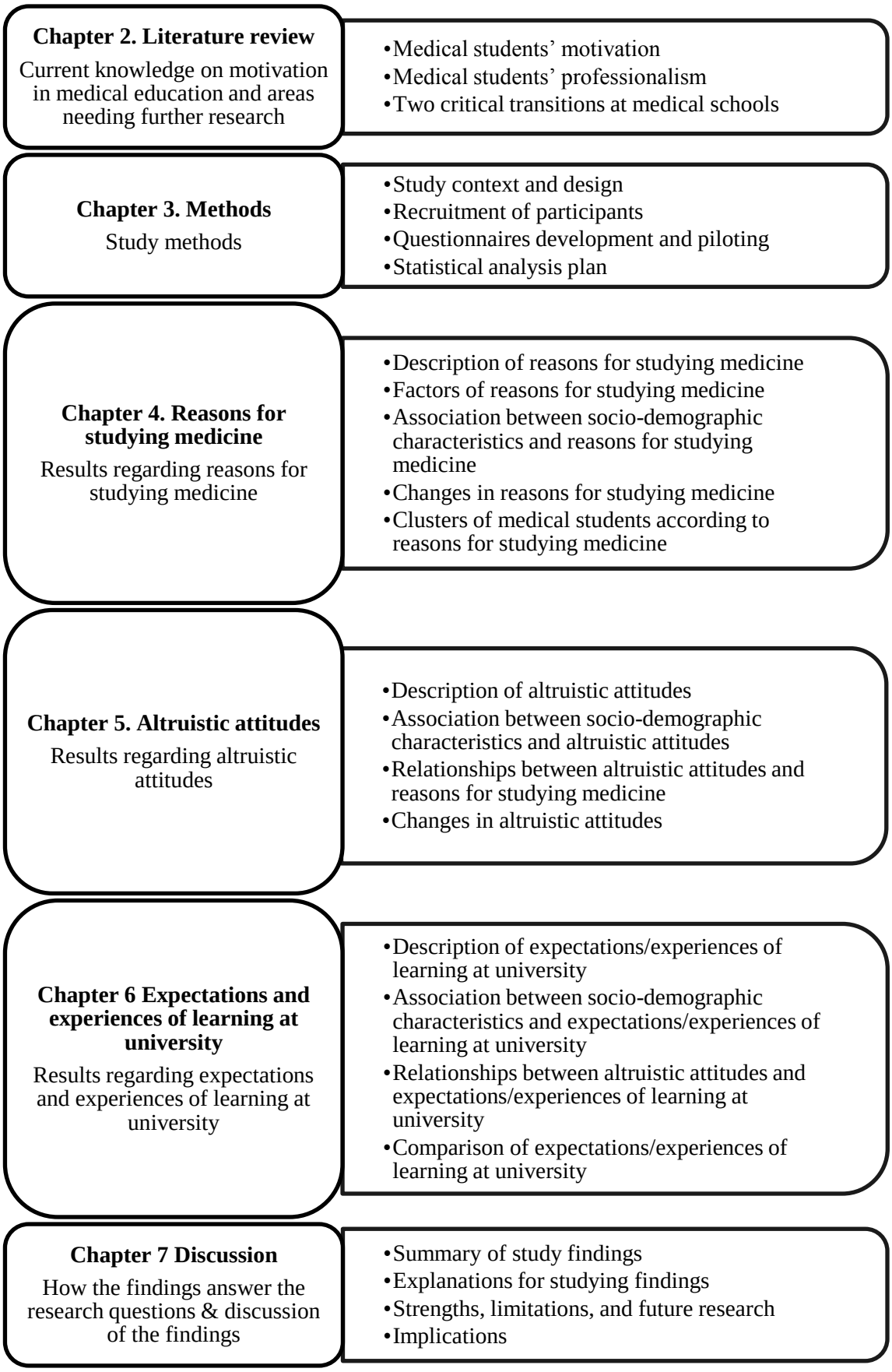
- To compare, before and after the first year in the medical program, medical students':
  - motivations for studying medicine;
  - altruistic attitudes; and
  - expectations of learning at university.
- To compare, before and after the first year of clinical placements in the medical program, medical students':
  - motivations for studying medicine; .
  - altruistic attitudes; and
  - experiences of learning at university.
- To explore the relationships between motivations for studying medicine and altruistic attitudes.
- To explore the relationships between motivations for studying medicine and expectations/experiences of learning at university.

There are a number of ways in which these questions and objectives might be explored. For example, psychological approaches to this topic would adopt in-depth theories relating to motivation, prosocial attitudes and behaviours, then use psychometric measures and corresponding statistical analysis to test certain hypothesis against these models. A sociological analysis would consider exploring medical students' social experiences during medical school, looking for similar patterns of regularity, or understanding individuals' social experiences contextually. A bioethical approach would consider focusing on medical students' altruistic attitudes, investigate changes to such attitudes during medical school, and explore the role of altruistic attitudes in motivation for studying medicine and in university experiences. This multi-disciplinary thesis will draw on aspects of many disciplines without being grounded completely in any particular one.

1.3 Thesis outline

The outline of this thesis and the broad areas covered within each chapter are presented in Figure 1. The next chapter, Chapter 2, reviews the literature and sets the context in which the study is situated. Chapter 3 outlines the methods used in designing the study, recruiting participants, developing questionnaires, and the statistical analysis. Chapters 4, 5, and 6 present findings concerning medical students' reasons for studying medicine, altruistic attitudes, and expectations and experiences of learning at university, respectively. The final chapter discusses the results as a whole in relation to the research questions along with some implications of the study's findings for medical education.

Figure 1 Thesis outline



CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

This chapter provides the context in which the study is situated. It starts with a section on methods describing the process of literature searching used. Then the main motivational theories in medical education are reviewed, thereby providing a history of theoretical development in this area and identifying the dominant motivational theory in recent medical education research. Thirdly, this chapter organises and reports previous research findings around the general topic of 'motivation' at medical school to identify research gaps. These studies are categorised according to how they conceptualise motivation. For each category, this section summarises related studies and their measurement tools, describes the pattern of motivations among subgroups of medical students, and emphasises the importance of understanding medical students' motivations by reporting their influence on multiple outcomes at medical school. Fourthly, this chapter reviews the literature around medical professionalism. This section starts with the importance of altruism in medicine, so as to build the link between motivations and medical professionalism. Then the role of altruism in medical professionalism is examined. Next, the literature on the impact of medical training on medical professionalism is reviewed to understand the possible changes in medical students' professionalism. The last section of this chapter describes the two critical transitions at medical school, with a review of medical students' expectations/experiences, together with findings from general tertiary education. This chapter finishes with a summary and a brief introduction to the next chapter.

2.2 Methods

To identify the literature around medical students' motivation, an automated search was run through PubMed, EMABSE, and PsycoINFO in Jan 2011 and then updated in March 2014 using the key words 'motivation', 'motivated', 'motive', 'motivator', 'incentive', 'aspiration', 'aspire', 'medical student', 'medical school', 'undergraduate medical education'. The additional limits set for the first search were 'in English' and '2006.01.01–present'. The additional limits set for the update were 'in English' and '2011.01.01–present'. Also, hand searching of the references cited in relevant articles was conducted to identify additional resources.

To identify the tools used for measuring medical students' motivations, a narrower search was developed based on the above search strategy with the additional words: 'questionnaire', 'survey', 'measure', 'assess', 'evaluate', 'tool', 'instrument', and 'scale'. This search was conducted in June 2013 and then updated in March 2014. Additional limits set for the first search were 'in English' and '1966.01.01–present'.

Identification of the literature around medical professionalism and learning transitions at medical schools started with hand searching of the references cited in key review articles, reports from authority organisations, and frequently cited articles in the fields. More articles were then identified using 'snow-ball' searching from the reference list of already identified literature until the same references kept reappearing. The searching was updated regularly as the study progressed.

2.3 Theories for understanding medical students' motivations

Motivation is 'the forces that drive people to act' (Williams et al., 1999). A more complicated definition by Brissette and Howes is that motivation is the:

> *'translation of a person's basic psychological needs and drives, filtered through their view of the world, toward an action with an anticipated result'.(Brissette et al., 2010, p.1)*

As a key concept in psychology, the importance of motivation has been realized since early studies of education. In spite of this, it has not been until recent decades that motivation has become the focus of research in medical education.

Theories of motivation related to general education have been developing since the early 20th century. The key theories adopted to understand undergraduate medical education are the following three: Andragogy, Social Cognitive Theory (SCT), and Self-Determination Theory (SDT) (Mann, 1999, Williams et al., 1999, Brissette et al., 2010). Both Andragogy (Knowles et al., 2012) and SDT (Williams et al., 1999, Deci et al., 1985) emphasize the distinction between intrinsic and extrinsic motivations. Intrinsic motivations mean that students are motivated by the internal feeling that an activity itself is interesting, enjoyable, satisfactory or important; extrinsic motivations mean that students are motivated by external drives. In Andragogy, motivation is

dichotomized into intrinsic and extrinsic types, while in SDT a more complex topology of motivations is discussed. In contrast, in SCT (Bandura, 1986) little is discussed about the type of motivations. The focus is put on the level of learner's motivations. The rest of this section describes and compares these three theories in time order, to provide a progressive history of theoretical development of understanding medical students' motivations, and to highlight the dominant role of SDT in recent medical education research.

2.3.1 Andragogy

Andragogy (Knowles et al., 2012) refers to the art and science of adult teaching and learning. Compared with child education (pedagogy), andragogy emphasizes the autonomy of leaners. The objectives of andragogy - mature adults - are considered to be able to direct their learning themselves, while teachers are expected to facilitate the learning. According to andragogy, as adult learners, medical students should be responsible for directing their own educational paths, such as to understand their own reasons for learning, to plan and to implement their learning. Along with such autonomy in learning, the motivations of adult learners have been transferred from extrinsic to intrinsic motivations:

> *'While adults are responsive to some external motivators (better jobs, promotions, higher salaries, and the like), the most potent motivators are internal pressures (the desire for increased job satisfaction, self-esteem, quality of life, and the like).'(Knowles et al., 2012, pp. 68)*

However, Misch (2002) has argued that whether medical students have intrinsic or extrinsic motivations depends on the context of training at medical schools. The intrinsic and extrinsic motivations are difficult to differentiate and are always interrelated. To dichotomise motivations just into intrinsic and extrinsic ones does not reflect the complicated factors motivating medical students in medical education (Misch, 2002). For example, motivations attached to the activity of studying medicine can be both the intrinsic ones of being interested in medicine and the extrinsic ones such as being attracted to the high prestige and high income. These motivations are bound to each other and both types may dominate medical students' behaviours in differing

situations. In summary, Andragogy is too simplistic to be applied to an understanding of the complex motivations related to medical study.

2.3.2 Social Cognitive Theory

Bandura's Social Cognitive Theory (SCT) (1986) emphasizes the association between incentives and motivations. It is asserted that all people are capable of conducting certain strategies towards certain rewards that they value. Therefore, in this theory, appropriate goal setting with rewards is one of the critical strategies involved in the enhancement of medical students' motivations. For example, realistic goals may enhance motivations while too difficult or too easy goals may diminish motivations.

Based on SCT, Mann discussed a few issues in relation to goal setting in medical education (1999) . Mann argued that, though the stated intentions of medical curricula are to teach students 'how to learn', 'how to understand' and 'how to apply, analyse and synthesise information', the assessment system implies that the key for successful performance is to remember the available information. Also, though medical educators accept certain professional qualities, such as being altruistic, dutiful and skilful, as educational goals, medical students may observe that medical faculty have a different set of professional qualities and that students are rewarded for these professional qualities. Again, there is a mismatch between medical institutions' goals and medical students' personal goals. For example, Mann pointed out that though both medical institutions and medical students share the goal of excellent performance, institutions also want to produce caring doctors, which is less appreciated by medical students as personal goals. Mann's principal suggestion is to clarify and negotiate these gaps in goal setting, to match assessment and rewards with institutional goals, and to direct learners to desired learning objectives with appropriate feedback on performance.

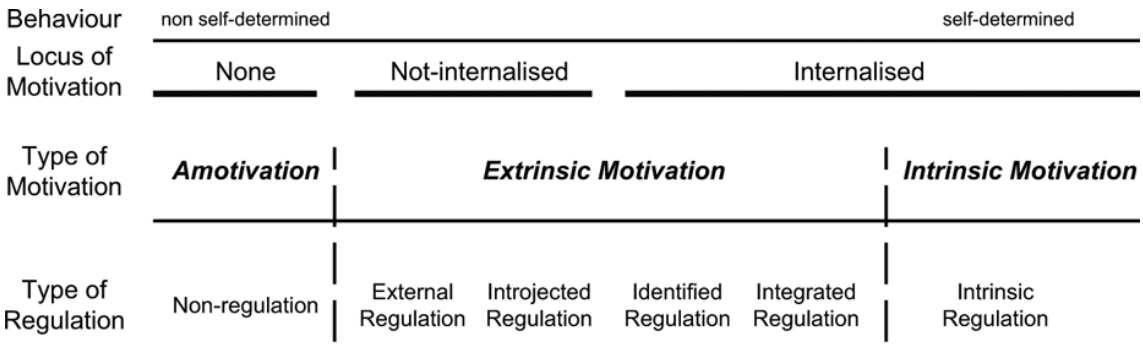
Though SCT serves as a very good framework for discussing the above issues, it has been criticised for placing too much emphasis on the level of motivations (Williams et al., 1999). Researchers who consider motivations only from the perspective of quantity may concentrate on the conditions influencing the level of motivations, while tending to ignore the social factors associated with different types of motivations and the way in which different types of motivations may impact on educational outcomes at medical school.

2.3.3 Self-Determination Theory

In 1999, Williams (1999) suggested the adoption of Self-Determination Theory (SDT) (Deci et al., 1985) in understanding medical students' motivation. Similar to Andragogy, SDT motivation is perceived as not only a variable which varies by quantity, but also a variable which can be categorized by quality. SDT has recently been widely discussed and utilised in medical education (Ten Cate et al., 2011).

According to SDT, motivation is conceptualised as a continuum with intrinsic motivation and amotivation as two opposite extremes (Figure 2). Intrinsic motivation is the most autonomous. Intrinsically motivated behaviours are regulated with the regulation type called self-determination, which means that the motivation is determined and generated by oneself. This type of motivation is called 'intrinsic' because it is an internal personal drive of feeling that an activity is interesting, enjoyable, satisfactory or important. This feeling may arise from discovery, challenge and effective problem solving. On the other end of this continuum is amotivation. Amotivation means lack of motivation, which is the least autonomous and has no particular regulation of behaviours.

Figure 2 The spectrum of motivation according to SDT



Notes: Adapted from Deci and Ryan (Deci et al., 2000)

Between these two extremes, there is a range of extrinsic motivations, with four types of behaviour regulation: integrated regulation, identified regulation, introjected regulation and external regulation (from a high level of autonomy to a low level of autonomy). Integrated regulation means the importance of an activity has been fully integrated into oneself. This occurs when a person finds a certain activity to be congruent with personal needs and beliefs but not enjoyable in itself. Identified regulation means learners have identified the importance and value of an activity and accepted the behaviour in relation to their own intention; such an activity might involve organised learning for examinations. Introjected regulation means the importance of an activity has been realised but the behaviours are still controlled by what they 'should' do, such as an activity demonstrating self-worth. External regulation means that the behaviours are controlled by explicit or implicit external demands, rewards or punishments, such as being motivated by pressure or expectation from others.

Intrinsic motivation, integrated regulation, and identified regulation are autonomous motivations, while introjected regulation and external regulation are controlled motivations. It has been shown that autonomous motivations promote greater learning outcomes while controlled motivations are likely to diminish autonomous motivations and to bring about negative effects (Deci et al., 1996, Koestner et al., 1984, Ryan et al., 1989, Vansteenkiste et al., 2005a, Vansteenkiste et al., 2005b, Deci et al., 1999).To sum up, the type of motivations matters. It is argued in SDT that different types of motivations, even when the level is high, may lead to very different outcomes. Therefore, rather than only emphasising the level of motivations, it is necessary to understand the types of motivations and the conditions in which a certain type of motivation is generated.

According to SDT, intrinsic motivations and extrinsic motivations can be transformed into each other. Extrinsic motivations can be internalised towards intrinsic motivations if the following three physiological needs are met: need for autonomy, need for competence, and need for relatedness (Deci et al., 1985, Ryan et al., 2000). Autonomy refers to the feeling of acting out of one's own desire. It supports a teaching approach in which more freedom and options are provided while less pressure is given (Ten Cate et al., 2011). Competence refers to the perception of confidence in oneself (Ten Cate et al., 2011). Within this domain, the use of selection and assessment, positive feedback and

appropriate learning challenges are areas of research. Relatedness refers to a feeling of belongingness to a significant community (Ten Cate et al., 2011). Studies looking at improving relatedness consider the provision of emotional support, connection of knowledge to actual practice, and contact with real patients (Ten Cate et al., 2011).

SDT has been widely discussed and adopted in recent medical education research. Compared with Andragogy, SDT better reflects the complexity of actual situations in medical training, where motivation is conceptualised into a continuum and factors causing transformation between different types of motivations are also included in the theory. Compared with SCT, SDT takes the types of motivations into consideration, thereby providing theoretical support for research to explore varied combinations of levels and types of motivations in medical education.

2.4 Medical students' motivations

As can be seen from the theories outlined above, the adoption of different theories may provide different perspectives from which to understand medical students' attitudes and behaviours in medical training; the adoption of different theories also leads to different research foci and has different implications for undergraduate medical education. Obviously, motivation is a multi-faceted concept (Mann, 1999). Under the big umbrella of motivation, most existing literature has explored medical students' motivations for studying medicine and/or a medical career, while some has also explored academic motivation, achievement motivation, and motivations for undertaking study/learning. This section reviews the literature on each type of the above mentioned motivations in terms of its definition, measurement, patterns among medical students, and impact.

2.4.1 Motivations for studying medicine and/or a medical career

The literature on medical students' motivations for studying medicine and/or a medical career has mostly focused on the reasons behind the decision for entering medicine. The question asked in research on this type of motivations is 'why do students study medicine/choose a medical career?' A summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career is provided in Table 1. In this table, the citations for each tool include both the studies on the tool development and validation (Nieuwhof et al., 2004, Kusurkar et al., 2011) and the

studies where the measurement tool was applied to medical students. The latter are expanded on in the text.

Table 1 Summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
(Burkett et al., 1981)	Reasons for choosing medical career	Self-administered questionnaire with four items indicating motivational factors; rating the importance of each motivating factor	Not reported	Not reported	N/A	1743 third year medical students from 112 US medical schools (Burkett et al., 1981)
(Harth et al., 1990)	Reasons for choice of medicine as a career	Self-administered multiple response questionnaire with 8 items; choosing reasons decisive for studying medicine	Not reported	Not reported	N/A	164 matured-age and 328 normal-age entrants who graduate from the University of Queensland Medical School (Harth et al., 1990)
(Alfayes et al., 1990)	Interest in pursuing medical education, and social factors motivating students' choice of a medical career	Details not provided	Not reported	Not reported	N/A	153 fifth- and sixth-year medical students at King Abdulaziz University in Saudi Arabia (Alfayes et al., 1990)

Table 1 (Continued) summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
(Price et al., 1994a)	Reasons for wishing to study medicine	Self-administered visual analogue scales; unknown number of items	Not reported	Content: extracted from course entry questionnaire Construct: factor analysis	1) altruistic 2) financial security 3) intellectual challenge 4) social reason	About 480 students entering the university of Queensland MBBS course in 1983 and 1984 (Price et al., 1994a)
(Todisco et al., 1995)	Motivations relevant to choice of medicine as a career	Self-administered questionnaire with ten motivations; ranking the motivations in importance for choice of medicine as a career	Not reported	Content: derived from a previous pilot study and literature review	N/A	645 medical students entering the Faculty of Medicine at the university of Sydney (Todisco et al., 1995)
(Klimidis et al., 1997)	Reasons for studying medicine	Self-administered six-point Likert scale with 18 items indicating reasons for entering medical training; rating the importance of each reason	Not reported	Construct: detect difference by sex Criterion: correlation with Rokeach Value Survey	N/A	110 medical student volunteers in the medical course at the University of Melbourne, Australia (Klimidis et al., 1997)

Table 1 (Continued) summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
(Vaglum et al., 1999a)	Motives influencing the decision to study medicine	Self-administered four-point Likert scale with 14 reasons; rating importance for decision to study medicine	Internal consistency (Cronbach's alpha): 0.51-0.73	Content: developed based on literature review and authors' experiences Construct: factor analysis	1) people orientation 2) interest for natural science 3) status/security orientation	420 first year medical students in four Norwegian universities (Vaglum et al., 1999a) 202 first-year medical students enrolled at the Faculty of Medical Sciences, Nova University (Goncalves-Pereira et al., 2013)
(Crossley et al., 2002)	Motivations towards career choice	Self-administered five-point Likert scale with 17 items addressing six dimensions of motivations; rating the level of agreement	Not reported	Content: based on previous studies	1) status and security 2) nature of occupation 3) career opportunities 4) patient care and working with people 5) use of personal skills 6) interest in science	80 medical students and 80 dental students at University of Manchester (Crossley et al., 2002)

Table 1 (Continued) summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
(Wierenga et al., 2003)	Motivational factors for entering a medical program	Self-administered four-point Likert scale with 15 items; rating how decisive each item is as a factor for entering a medical program	Not reported	Content: items developed from reviewing literature and from discussions with students and lecturers Construct: factor analysis	1) people oriented 2) interest in natural 3) sciences 4) prestige 5) good 6) grades 7) structured programme	219 all first year medical students at two medical schools of University of the West Indies (Wierenga et al., 2003)
(Rolfe et al., 2004, Sulong et al., 2014)	Motivations for studying medicine	Self-administered questionnaire with 11 reasons; giving a 'yes' or 'no' answer to each item as a reason for choosing to study medicine	Not reported	Content: based on graduate survey by Newcastle Medical school (Australia) in 1990 and authors' experiences Face: pilot study	N/A	916 medical graduates from the first 16 graduating years of the University of Newcastle Medical School (Rolfe et al., 2004) 340 graduate-entry medical students and 520 undergraduate-entry medical students from University College Cork and University of Limerick (Sulong et al., 2014)

Table 1 (Continued) summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
Strength of Motivation for Medical School (SMMS) questionnaire (Nieuwhof et al., 2004, Hulsman et al., 2007b, Kusurkar et al., 2010, Kusurkar et al., 2011, Luqman, 2013)	Strength of motivation to start and pursue medical training: (student's readiness to start and continue medical training regardless of sacrifices (time, money, energy), setbacks, or disappointing perspectives)	Self-administered five-point Likert scale with 16 statements describing situations realistic to medical students; rating the level of agreement	Internal consistency (Cronbach's alpha): 0.79 (overall), 0.55-0.70 (three factor solution) Inter-rater: 0.45-0.99 Test-retest: rho=0.71	Content: generated, discussed and rephrased by experts; associations with between SMMS scores and prototypicality judgement of item validity (rho from 0.13 to 0.57). Construct: negative correlation with students 'ambivalence towards study' (rho=-0.28); different SMMS scores between medical students selected by qualitative procedure and lottery procedure; factor analysis; significant correlations with Academic Motivation Scale and exhaustion scale. Criterion: positive correlations with premedical students' determination to start medical school (rho=0.65);	1) Willingness to sacrifice 2) Readiness to start 3) Persistence	329 1st year and 220 2nd year medical students at the University of Amsterdam in Netherland (Hulsman et al., 2007b) 620 non-graduate entry medical students and 161 graduate entry medical students at the University Medical Center Utrecht in Netherland (Kusurkar et al., 2010) 4162 medical students in different years from two universities, UMC Utrecht and VUmc Amsterdam, in Netherlands (Kusurkar et al., 2011) 504 all year medical students at Foundation University Medical College, Islamabad (Luqman, 2013)

Table 1 (Continued) summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
(Frischenschlager et al., 2005)	Reasons for choosing medicine	15 items. Other details not reported.	Not reported	Not reported	N/A	1327 freshman at the Medical University of Vienna (Frischenschlager et al., 2005)
(Haidinger et al., 2005)	Medical study motivations	16 items, on a linear analogue scale from 0 to 100 mm. Other details not reported	Not reported	Not reported	N/A	1327 freshman at the Medical University of Vienna (Haidinger et al., 2005, Frischenschlager et al., 2005)
Medical Situation Questionnaire (MSQ) (McManus et al., 2006)	generic motivations for medicine as a career (attractions of being a doctor)	Self-administered questionnaire; 9 detailed realistic medical scenarios; ranking the attraction of three different aspects of medical practice in each of the scenarios	Internal consistency (Cronbach's alpha): 0.507-0.671	Construct: factor analysis; correlations with background factors such as demographics, personality, and learning styles Face: piloted with medical applicants	1) indispensability 2) helping people 3) respect 4) science	Sample size unknown, responses from 2876 representatives of applicants to medical schools in UK (McManus et al., 2006)

Table 1 (Continued) summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
(Molnar et al., 2006, Molnar et al., 2008)	Motivational factors for choosing the medical profession	Self-administered 5-point Likert scale with 13 items; rating extent of the role played by the given motivational factor in choosing the medical profession	Internal consistency (Cronbach's alpha*): 0.44-0.63 *11 out of 13 items are suitable for factor analysis	Content: based on literature review and previous experiences Construct: factor analysis	1) careerism 2) altruism 3) idealism	1565 second- to sixth-year students of general medicine at two Medical Schools in Debrecen and Szeged (Molnar et al., 2006, Molnar et al., 2008)
(Puljak et al., 2007b)	Motives for medical school enrolment	Self-administered five-point Likert scale with 16 motives in favour of medical school enrolment; rating the level of agreement	Internal consistency (Cronbach's alpha):0.88-0.89	Content: developed from authors' experiences Construct: factor analysis	1) love for medical profession 2) humanity of medicine 3) interest in human body structure and function 4) interest in science 5) opportunity to work with people	1146 applicants to and 98 final-year medical students at Croatian medical schools (Puljak et al., 2007b)

Table 1 (Continued) summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
(Saad et al., 2011)	Factors for choosing medicine as a profession	Self-administered 4-point Likert scale (from no impact to strong) with7 items; indicating how influential the factor are in leading to their choices.	Not reported	Content: items developed based on a pilot study	N/A	150 students from Dow and Sindh Medical Colleges who selected medicine as their profession and 150 non-medical students from another institution (Saad et al., 2011)
(Girasek et al., 2011)	Motivations for choosing medical career	Self-administered five-point Likert scale with 15 items addressing eight dimensions of motivations; rating to what extent each factor influenced the choice of medical career	Not reported	Not reported	N/A	939 first-year medical students and 713 resident doctors in four medical faculties in Hungary (Girasek et al., 2011)

Table 1 (Continued) summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
(Agyei-Baffour et al., 2011)	Professional motivation crowding (conflicts between extrinsic and intrinsic motivations)	Self-administered questionnaire with five items of intrinsic motivation factors and seven extrinsic motivation factors; identifying the top three factors as motivations to study medicine.	Not reported	Content: developed after seven focus groups discussions	1) Intrinsic 2) Extrinsic	310 fourth year medical students from two public universities in Ghana (Agyei-Baffour et al., 2011)
(Vahid Dastjerdi et al., 2012)	Study motives for a professional career	Self-administered five-point Likert scale with 17 motivational factors for medical study; rating the importance of each motive	Internal consistency (Cronbach's alpha): 0.78 Test-retest: mean test-retest intra-class correlation coefficient=0.78	Content: designed according to previous studies. Construct: factor analysis Face: expert and students review; pilot study.	1) social and professional status 2) health care and people 3) Others' recommendation 4) personal interest and nature of occupation 5) occupational experience 6) personal life	350 medical and 470 dental final year students from 4 medical schools (Vahid Dastjerdi et al., 2012)

Table 1 (Continued) summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
(Shahab et al., 2013)	Reason for choosing medical profession	Self-administered questionnaire with five statements each describing one reason for choosing medical profession; indicating yes or no to each reason	Not reported	Content: based on literature review; expert review	N/A	200 medical students from all five years of the MBBS course at Khyber Medical College, Peshawar, Pakistan (Shahab et al., 2013)
(Salem et al., 2013)	Motives to study medicine/enter medical school	Choose one motive from 6 options	Not reported	Content: based on literature review; expert review Face: expert review; pilot study	N/A	232 medical students in the Faculty of Medicine at King Fahad Medical City, King Saud Bin Abdulaziz University (Salem et al., 2013)
(Pagnin et al., 2013)	Reasons for choosing to be a doctor	The question 'Why did I choose to be a doctor' with seven answer options. Only one answer could be checked.	Not reported	Content: answer options were generated from previous written response to the same open-ended question	N/A	327 medical students enrolled in the first, second, fourth, and sixth year at the Fluminense Federal University, Brazil (Pagnin et al., 2013)

Table 1 (Continued) summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
(Hayes et al., 2013)	Factors affecting choosing medicine	Self-administered five-point Likert scale with 13 items; guide question not provided	Not reported	Not reported	N/A	1137 medical students (first and final year) and young doctors (interns and residents) from six medical colleges in Nepal (Hayes et al., 2013)
(Kim et al., 2013)	Motivations and interest in the study of medicine	Self-administered questionnaire; respondents were asked to choose one from a variety of options respectively regarding motivations for getting into medical school, and what was interesting about studying medicine, respondents also rate their levels of interest in the study of medicine on a five-point Likert scale	Not reported	Content: questions derived from the instrument used in a previous study Face: pilot study	N/A	2313 students at six Korean medical schools (Kim et al., 2013)

Table 1 (Continued) summary of tools used for measuring medical students' motivations for studying medicine and/or a medical career

Citation	What is measured?	Description	Psychometric properties*		Factors identified	Study populations
			Reliability	Validity		
(Diwan et al., 2013)	Reasons for opting for a medical career	Not reported	Not reported	Not reported	N/A	Sample size unknown, responses from 792 first year medical students in 5 public and 4 private medical schools (Diwan et al., 2013)
(Morley et al., 2013)	Motivations for pursuing a medical career	Self-administered five-point Liker scale with 11 statements describing factors in considering a career in medicine; rating the level of importance	Internal consistency: good Cronbach's alpha (exact statistics not reported)	Construct: factor analysis	1) Employment and job security 2) Idealism in medicine 3) Attraction to medicine 4) Status and income	640 medical students from year one and year two at an allophathic medical school in the northeastern region of the United States (Morley et al., 2013)

Patterns

Studies from Europe and Australian have reported that students were mainly motivated to study medicine by the humanistic aspects of the profession, followed by the attraction of medicine as a science, including such aspects as wanting to help people, interacting with people, and enjoying science (Vaglum et al., 1999b, Puljak et al., 2007a, Rolfe et al., 2004, Klimidis et al., 1997, Molnar et al., 2008). These motivations were similar to key factors motivating medical students to choose a medical career found in other studies (Girasek et al., 2011, Todisco et al., 1995, Crossley et al., 2002, Pagnin et al., 2013). These motivations are intrinsic ones according to SDT because they arise from the internal feeling that an activity itself is interesting, enjoyable and satisfactory (Deci et al., 1985, Williams et al., 1999).

Similar findings were also reported elsewhere in the world, but in some countries a few extrinsic motivations were also reported to be important. For example, the family's influence was reported as one of the most important motivations for choosing the medical profession in two studies from Pakistan (Shahab et al., 2013, Saad et al., 2011) and one study from India (Diwan et al., 2013). Social and professional status was also found to be one of the top motivations for studying medicine in Iran (Dastjerdi et al., 2012), Nepal (Hayes et al., 2013), and India (Diwan et al., 2013). In a study from Korea, job security was the most common motivation for studying medicine, followed by interest in learning biomedicine (Kim et al., 2013).

It seems from the studies outlined above that, while the humanistic and scientific aspects of medicine are reported as the main factors motivating medical students to study medicine and/or choose a medical career, some cultural differences still exist. The research reporting direct comparison of medical students from different cultural backgrounds is limited. One study in the UK comparing medical applicants of different ethnic groups reported that non-white medical applicants were less motivated to study medicine by the desire for helping people, and were more motivated by the scientific aspects of medicine (McManus et al., 2006). One study in Australia comparing Asian and 'English speaking background' medical students reported that Asian medical students have higher motivations for achieving status and satisfying their parents (Klimidis et al., 1997).

What a number of studies here show is that motivations for studying medicine also vary by sex. Male medical students were more motivated by financial reasons (Klimidis et al., 1997, Price et al., 1994a), social prestige/status (Wierenga et al., 2003, Vaglum et al., 1999a), interest in science and the need to be indispensable (McManus et al., 2006); while female medical students were more motivated by the desire to help people (Burkett et al., 1981, Vaglum et al., 1999a), the opportunity to work with people (Wierenga et al., 2003, Vaglum et al., 1999a), 'exercising personal skills' and 'working with ideas'(Klimidis et al., 1997).

Entry type also results in differences in motivations for studying medicine. It has been found that those students who entered medical school with a tertiary level education (graduate-entry medical students) were more motivated by altruistic reasons, such as the desire for helping others and curing/preventing disease (Harth et al., 1990, Rolfe et al., 2004), while the students who entered medical school directly from high school (undergraduate entrants) were more motivated by parental expectations (Harth et al., 1990, Rolfe et al., 2004, Sulong et al., 2014) and by intellectual satisfaction and financial reasons (Sulong et al., 2014). Undergraduate entrants were more motivated by professional independence (Sulong et al., 2014), while in another study this motivation is more important for graduate-entry medical students (Rolfe et al., 2004).

Research comparing first and second year medical students found that second year students emphasised more the importance of status/income as a motivation for a medical career, while putting less importance on 'desire to serve my community' (Morley et al., 2013). It was also reported that final year medical students reported less interest in both scientific and altruistic aspects of medicine (Puljak et al., 2007a). In contrast, some researchers observed that prestige, money and success were more important for first year students as motivations for studying medicine, while relieving suffering and the importance of medicine for mankind were more important for final year medical students (Powell et al., 1987).

Regarding the overall level of motivation for studying medicine, female students, older students, and graduate-entry medical students had stronger motivation for entering medical school (Kusurkar et al., 2010). Also, those selected by a multifaceted process (composed of essay, academic tests, and social tests) had stronger motivation for entering medical school than those admitted randomly (without any criteria) or selected

solely based on grade point averages (GPAs) (Hulsman et al., 2007a). In addition, the support of parents and teachers also had a positive effect on students' motivations to apply to medical school (McHarg et al., 2007).

One study also found that age, parents' education and marital status were associated with medical students' professional career motivations (Dastjerdi et al., 2012). However, since this study also included a comparable number of dental students in the analysis and there was no further stratified analysis, the findings are less applicable to medical students.

Impacts

Motivations for studying medicine and/or a medical career impact on multiple aspects of medical training. McManus (McManus et al., 2006) found associations between indispensability as motivation for a medical career and a strategic approach to learning, in which individuals were studying out of the need for success and had study styles designed for examination success. McManus also found relationships between the importance of being respected as motivation for a medical career and a surface approach to learning, in which individuals are learning out of fear of failure and are using rote learning (McManus et al., 2006). In contrast, more intrinsic motivations - the interest in science as a motivation for a medical career - was found to be related to openness to experience (McManus et al., 2006).

Motivations for studying medicine and/or a medical career were found to be associated with academic performance. Students with higher level of intellectual motivations for studying medicine had higher GPAs (Price et al., 1994b), while those motivated by social gains, financial benefits, or family wishes were reported to have lower GPAs (Alfayes et al., 1990). Also, a study comparing medical students who gained high scores and those who failed two attempts in a year one test found that the successful students stated more often they 'enjoy acquiring knowledge' and considered study success important (Frischenschlager et al., 2005, Haidinger et al., 2005). However, the associations between motivations for studying medicine and academic performance are not significant in some studies (Salem et al., 2013, Luqman, 2013).

Some studies also reported associations between the motivations for studying medicine and/or a medical career and medical students' mental status. Students, motivated

towards a medical career by external pressure, better economic conditions, and greater occupational satisfaction, tend to have a poorer mental status such as anxiety and depression (Karaoglu et al., 2010). Those who were motivated by personal illness or family member's illness or death were more likely to have burnout (Pagnin et al., 2013).

Regarding future practice, a larger percentage of those who report that they are sure to stay in the medical profession after graduation believed that choosing a helping career and the suitability of the profession was important, compared with those who were not sure whether they would work as doctors in the future (Molnar et al., 2006). Medical students with higher levels of intrinsic professional motivations were more willing to work in rural areas compared with those with weak intrinsic professional motivations; this result was reversed for those with strong extrinsic professional motivations (Agyei-Baffour et al., 2011). However, these differences were no longer significant after adjusting for demographic characteristics (Agyei-Baffour et al., 2011).

In addition, one study found a weak association between medical students' empathy and person-oriented motivations, such as 'opportunities to work/help people' (Goncalves-Pereira et al., 2013).

2.4.2 Academic motivation

Academic motivation refers to one's motivation towards education (Vallerand et al., 1992). A summary of the tools used for measuring medical students' academic motivation is provided in Table 2. As can be seen, there are only three reported tools for measuring academic motivation. The Academic Motivation Scale developed by Vallerand et al. (1992) is the one most frequently used in research. This scale includes seven subscales based on SDT: intrinsic motivations to know, to accomplish things and to experience stimulation; extrinsic motivations with identified regulation, introjected regulation, and external regulation; and amotivation. In this table, the citations for each tool include both the studies on the tool development and validation(Vallerand et al., 1992, Ali et al., 2005) and the studies where the measurement tool was applied to medical students. The latter are expanded on in the text.

Table 2 Summary of tools used for measuring medical students' academic motivations

Citation	What is measured?	Description	Psychometric properties		Types/ Constructs	Study populations
			Reliability	Validity		
Academic Motivation Scale (AMS) (Vallerand et al., 1992, Sobral, 2004, Sobral, 2008, Park et al., 2012, Hommes et al., 2012, Kusurkar et al., 2013a, Kusurkar et al., 2013b, Del-Ben et al., 2013)	Academic motivation	Self-administered seven-point anchored scale with 28 items divided into seven subscales of four items each; rating the extent of each item corresponds to one reason	Internal consistency (Cronbach's alpha): 0.63-0.86 (mean=0.81) Test-retest: rho from 0.71 to 0.83 (mean=0.79)	Content: translated from a French tool using parallel back translation; committee assessment of items. Construct: constructs of the original French tool is based on self-determination theory; factor analysis Criterion: gender difference with the French version were replicated Face: a pretest with 10 junior college students	1) Intrinsic motivations (IM) to know 2) IM to accomplish things 3) IM to experience stimulation 4) extrinsic motivations (EM) from identification 5) EM from introjection 6) EM from external regulation 7) Amotivation	297 medical students registered for the third term at the University of Brasilia (Sobral, 2004, Sobral, 2008) Sample size unknown, responses from 160 medical students entering their third year at the University of Ulsan College of Medicine in Seoul, Korea. (Park et al., 2012) 301 first year medical students at Maastricht University medical school in The Netherlands (Hommes et al., 2012) 2020 medical students from all six years of the medical course at University Medical Center Utrecht, the Netherlands (Kusurkar et al., 2013a) 1742 year two to six medical students of VU University Medical Center Amsterdam (Kusurkar et al., 2013b) 100 year one medical students at the Faculty of Medicine of Ribeira˜o Preto, University of Sa˜o Paulo (Del-Ben et al., 2013)

Table 2 (Continued) summary of tools used for measuring medical students' academic motivations

Citation	What is measured?	Description	Psychometric properties		Types/ Constructs	Study populations
			Reliability	Validity		
Inventory of School Motivation (ISM) (Ali et al., 2005, Yousefy et al., 2012)	Academic motivation	Self-administered five-point Likert scale with 43 items addressing eight dimensions of motivation; rating the level of agreement.	Internal consistency (Cronbach's alpha): 0.67-0.82 (subscales, mean=0.76), 0.93 (overall)	Construct: developed based on Personal Investment Model Criterion: ISM scores are predictors for with school achievement (math, English and GPA) and school attendance	1) Task 2) Effort 3) Competition 4) Social power 5) Affiliation 6) Social concern 7) Praise 8) Token	422 medical students, from 4th to final year at School of Medicine, Isfahan University of Medical Sciences (Yousefy et al., 2012)
Intrinsic Motivation Scale Toward Learning (Tanaka et al., 2009, Tanaka et al., 2012)	Intrinsic academic motivation towards learning	Self-administered four-point Likert Scale, with 30 questions; guide question not provided	Internal consistency and test–retest reliability are generally good	Criterion: satisfactory associations with school records, performance of voluntary homework and evaluation by teachers	Intrinsic motivation	96 year two medical students at Osaka City University Graduate School of Medicine (Tanaka et al., 2009) 120 year two medical students at the Osaka City University (Tanaka et al., 2012)

Patterns

Two studies from Brazil reported that among all sub-categories of academic motivation, medical students have the highest level of extrinsic motivation with identified regulation, followed by intrinsic motivation to know and to achieve (Sobral, 2004, Del-Ben et al., 2013). It was also found that, after the first year at medical school, extrinsic motivation with identified regulation and all three types of intrinsic academic motivation (to know, to accomplish things, and to experience stimulation) declined (Del-Ben et al., 2013).

Similar to the differences in motivations for studying medicine and/or a medical career, research has also reported gender difference in academic motivation. Female medical students had a higher level of academic motivation with identified regulation, while male medical students had a higher level of extrinsic academic motivation, or amotivation (Sobral, 2004, Kusurkar et al., 2013b, Kusurkar et al., 2013a). Male students have also been found to have higher academic motivation in relation to effort and to competition than female medical students (Yousefy et al., 2012).

It has been reported that medical students selected based mainly on GPAs had lower autonomous academic motivation and higher amotivation compared with the students who were selected based on a 'qualitative methods' (Kusurkar et al., 2013b). The 'qualitative methods' were not clearly explained in this study, but these may have involved approaches such as interviews.

Personality traits may also be associated with academic motivation. Tanaka found that persistence, self-directedness, and self-transcendence were positively associated with intrinsic academic motivation (Tanaka et al., 2009).

In addition, medical students who spend more than one hour per day with family and those who take pleasure at school were likely to have higher levels of intrinsic academic motivation (Tanaka et al., 2012).

Impact

Academic motivation impacts on various learning behaviours in medical training, one of which is self-selected activities at medical school. Sobral (2008) reported that intrinsic academic motivation to experience stimulation and extrinsic motivation with

identified regulation drive medical students' quest for optional courses beyond the compulsory subjects, but the associations were weak. Intrinsic academic motivation also drives combined elective courses and peer-tutoring activities (Sobral, 2008), and cross-year peer-tutoring experiences (Sobral, 2004).

Regarding learning orientation, Sobral (2004) found that autonomous academic motivation positively correlated with a meaning orientation of learning while being negatively correlated with a reproductive orientation of learning. With the meaning orientation of learning, students tend to have a deep approach to learning, to relate different ideas, and also to relate evidence to conclusions (Richardson, 1990). With the reproduction orientation of learning, students tend to learn by memorising, to rely on others to define learning tasks, and to be anxious about academic outcomes (Richardson, 1990). In contrast, amotivation is positively correlated with the reproductive orientation of learning, while negatively correlated with the meaning orientation (Sobral, 2004). In the same study, students' reflection in learning, intention to continue with studies, and academic achievement were positively correlated with autonomous motivation while negatively with amotivation (Sobral, 2004).

Intrinsic academic motivation was also found to be positively associated with daily medical school attendance, understanding lectures, and taking pleasure in learning (Tanaka et al., 2012). Kusurkar (2013a) reported that a combination of high intrinsic and low extrinsic motivation, or a combination of high intrinsic and high extrinsic academic motivation, was associated with good study hours and low exhaustion as a result of study. Medical students with a combination of high intrinsic and low extrinsic motivation also showed a high level of deep learning strategies, while those with a combination of high intrinsic and high extrinsic motivation showed a high level of surface learning strategies (Kusurkar et al., 2013a).

It seems that academic motivation also has an impact on academic performance through the above learning behaviours. GPAs were found to be positively correlated with relative autonomous motivation (the balance between autonomous and controlled motivation) through better learning strategies and higher study effort (Kusurkar et al., 2013b). Also, medical students with a higher level of academic motivation towards competition, effort, social concern, and task, were found to have higher average academic marks (Yousefy et al., 2012). Moreover, it was reported that medical students'

academic motivation had an indirect impact on stress through academic performance, while being influenced by stress in return (Park et al., 2012). Nevertheless, one study reported insignificant associations between academic motivation and student learning represented by a factual knowledge test (Hommes et al., 2012).

2.4.3 Achievement motivation

Achievement motivation refers to one's motivation to be successful, to accomplish a task requiring skill and efforts, to obtain high grades, and to enhance ego and self-esteem through competition (Biggs, 1987, Edwards, 1954). A summary of tools used for measuring medical students' achievement motivation is provided in Table 3. As can be seen, there are only three tools for measuring achievement motivation. In this table, the citations for each tool include both the studies on the tool development and validation (Mandel et al., 1996, Deo et al., 1985, Lang et al., 2006) and the studies where the measurement tool was applied to medical students. The latter are expanded on in the text.

Table 3 Summary of tools used for measuring medical students' achievement motivation

Citation	What is measured?	Description	Psychometric properties		Types/ Constructs	Study populations
			Reliability	Validity		
The Achievement Motivation Profile (AMP) (Mandel et al., 1996, Wilkinson et al., 2004) (Wilkinson et al., 2007a)	Motivations for achievement along with related personality characteristics, interpersonal attributes, work style, and other qualities important for school success	Self-administered five-point Likert scale with140 items divided into four domains; rating how true each item is.	Internal consistency (Cronbach's alpha): 0.58-0.84 (median=0.75) Test-retest: estimates from 0.61 to 0.89 (median=0.83)	Construct: developed based on a theory of personality development; factor analysis; correlations with other psychological measures; correlation with students' GPA and cognitive ability; detection of differences in motivations by students' level of achievements	1) Motivations for achievement (Achiever, Motivations, Competitiveness, and Goal Orientation) 2) Inner resources 3) Interpersonal strengths 4) Work habits	All 731 students in Years 2 to 5 in the medical course at the University of Otago (Wilkinson et al., 2004) 213 fourth-year and fifth-year medical students in a six-year curriculum (Wilkinson et al., 2007a)
Achievement Motivation Scale (AMS) (Deo et al., 1985, Srivastava et al., 2007)	Achievement motivations	Self-administered four-point Likert scale with 15 items for measuring hope of success and 15 items for measuring fear of failure.	Internal consistency (Cronbach's alpha): from 0.71 to 0.83 for 'hope of success', and from 0.81 to 0.89 for 'fear of failure'	Construct: developed based on factor analysis (did not clearly support the factor structure) Criterion: AMS predicts participation in school research contest, school grades, and achievement in verbal/numerical tasks	1) Hope of success 2) Fear of failure	120 medical students of one batch in India (Srivastava et al., 2007)

Table 3 (Continued) summary of tools used for measuring medical students' achievement motivation

Citation	What is measured?	Description	Psychometric properties		Types/ Constructs	Study populations
			Reliability	Validity		
Revised Achievement Motives Scale (AMS-R) (Lang et al., 2006, Dumitrescu et al., 2010)	Achievement motives	Self-administered four-point Likert scale with five items for measuring hope of success and five items for assessing fear of failure.	Internal consistency: (Cronbach's alpha): all above 0.70	Content: shortened from the original AMS based on factor analysis Construct: factor analysis; cross-validation of factor structure Criterion: correlations with typical criteria of achievement-related behaviours; correlations with the scale composed of eliminated items from the original AMS (Rho from 0.61 to 0.86)	1) Hope of success 2) Fear of failure	178 first-year medical students at the University of Medicine and Pharmacy 'Carol Davila' (Dumitrescu et al., 2010)

Patterns

An Indian study reported that only around one fifth of second year medical students had a high level of achievement motivation, and this proportion decreased over time at medical school (Srivastava et al., 2007). Having a prior degree was also found to have an impact on medical students' achievement motivation, but its impact is not consistent when the confounding effect of age at admission was taken into account (Wilkinson et al., 2004). This study also found that age at entry to medical school brings certainty and motivation about career choice.

Impact

Higher levels of achievement motivation have been found to predict more time spent on study at medical schools (Wilkinson et al., 2007a), but the author also commented that this does not have to be positive because it may indicate a lack of confidence in study. Medical students with a higher level of hope for success or lower level of fear for failure in their achievement motivation were found to have lower level of depression in everyday life (Dumitrescu et al., 2010).

2.4.4 Motivations for undertaking study/learning

Medical students' motivations for undertaking study/learning appear to be conceptualised as the reasons driving one to learn. In other words, the question asked in research on this type of motivation is 'why do medical students study?' A summary of the tools used for measuring medical students' motivations for undertaking study/learning is provided in Table 4. In this table, the citations for each tool include both the studies on the tool development and validation (Vermunt et al., 2004, Vermunt, 1998, Pintrich et al., 1993) and the studies where the measurement tool was applied to medical students. The latter are expanded on in the text.

Table 4 Summary of tools used for measuring medical students' motivations for undertaking study/learning

Citation	What is measured?	Description	Psychometric properties*		Types/ Constructs	Study populations
			Reliability	Validity		
(Pangercic et al., 2010)	Motives for studying	Self-administered five-point Likert scale with 20 motives divided into four groups; rating how much one is motivated for studying by each item	Internal consistency (Cronbach's alpha):0.58-0.79	Content: developed from results of open-ended questionnaire Construct: factor analysis	1) professional advanced motives 2) self –respect motives 3) academic gains 4) task completion	738 medical students from 2nd year to 6th year at the Zagreb University School of Medicine in Croatia (Pangercic et al., 2010)
The motivational scale of Inventory Learning Style (ILS) (Vermunt, 1998, Vermunt et al., 2004, Marambe et al., 2007)	Learning motivations	Self-administered five-point Likert scale with 25 statements related to five types of motivations (five items each); rating the level of agreement	Internal consistency (Cronbach's alpha): 0.57-0.86 Test-retest: rho from 0.72 to 0.80	Content: based on phenomenographic analyses of interviews with university students Construct: constructs are based on an interactive theory and conceptualization of student learning; factor analysis	1) personally interested 2) certificate orientation 3) self-test oriented 4) vocational orientation 5) ambivalence	175 medical students of the traditional curriculum and 184 medical students of the new curriculum at Faculty of Medicine, University of Peradeniya, Sri Lanka (Marambe et al., 2007)

Table 4 (Continued) summary of tools used for measuring medical students' motivations for undertaking study/learning

Citation	What is measured?	Description	Psychometric properties*		Types/ Constructs	Study populations
			Reliability	Validity		
A revised version of the motivational scale of Inventory Learning Style (ILS) (Hulsman et al., 2007b)	Motives regarding study	Self-administered five-point Likert scale with 14 statements related to four types of motivations; rating the level of agreement	Not reported	Content: derived from ILS	1) certificate orientation 2) vocational orientation 3) intrinsic motivations 4) ambivalence	329 1st year and 220 2nd year medical students at the University of Amsterdam in Netherlands (Hulsman et al., 2007b)
(Artino et al., 2010a, Artino et al., 2011)	Motivational believes	Self-administered five-point Likert scale, composed of a six-item task value subscale and a five-item self-efficacy subscale; rating the level of agreement	Internal consistency (Cronbach's alpha): 0.85-0.87	Content: adapted from a previous scale for measuring on-line learning task value and self-efficacy Construct: factor analysis	1) task value believes 2) self-efficacy	174 2nd year medical students at Uniformed Services University of the Health Sciences (Artino et al., 2010a) 342 second-year medical students from the F. Edward He´bert School of Medicine, Uniformed Services University of the Health Sciences(Artino et al., 2011)

Table 4 (Continued) summary of tools used for measuring medical students' motivations for undertaking study/learning

Citation	What is measured?	Description	Psychometric properties*		Types/ Constructs	Study populations
			Reliability	Validity		
The motivation section of The Motivated Strategies of Learning Questionnaire (MSLQ)'s (Pintrich et al., 1993, Henning et al., 2011, Stegers-Jager et al., 2012, Turan et al., 2012)	Motivational orientations of learning activities	Self-administered seven-point Likert-scale with 31 items about motivations, divided into three constructs; rating how true each statement is for the participant	Internal consistency (Cronbach's alpha): 0.62-0.93	Content: developed based on previous validated versions of MSLQ Construct: constructs are based on a general social cognitive theory of motivations; factor analysis Criterion: correlation with later academic performance (rho from -0.27 to 0.41)	1) value (intrinsic and extrinsic goal orientation, task value) 2) expectancy (control believes of learning, self-efficacy) 3) affect (test anxiety)	Sample size unknown, responses from 97 self-identified Asian medical students and 99 self-identified European Medical students (Henning et al., 2011) Year one students entering in 2008 (n = 408) and 2009 (n = 409) at Erasmus MC Medical School, Rotterdam, the Netherlands (Stegers-Jager et al., 2012) 309 fourth year medical students at Hacettepe University (Turan et al., 2012)

Patterns

One study from Croatia reported that the strongest motivation for studying among medical students across all years was task completion, such as 'to graduate as soon as possible, to have a free summer, and to get rid of the exams as soon as possible' (Pangercic et al., 2010). One study comparing Asian medical students and European medical students in the New Zealand context found that these two groups had similar perceptions relating to motivations to learn (Henning et al., 2011)

Some other studies suggest that medical students' motivations for undertaking study/learning are more complex and are related to other factors. Medical students in an innovative curriculum which emphasised student-centred learning were found to have higher levels of motivation for learning out of personal interest ('interest in the course and to develop oneself as a person') and lower ambivalent-oriented motivations for learning ('uncertain attitudes toward the studies, one's own capabilities, the chosen subject area, and the type of education') than those in the traditional curriculum (Marambe et al., 2007). Medical students selected into medical school by a multifaceted process (composed of essay, academic tests, and social tests) were less motivated to learn in order to graduate compared with students admitted randomly (without any criteria) or selected solely based on GPAs; while those selected solely based on GPAs were less motivated to learn for a career when compared with the other two groups of medical students (Hulsman et al., 2007a).

Impact

The motivational belief in 'task value' (one's judgment of how interesting, important, and useful a course is) was positively associated with course-related enjoyment and deeper learning strategies (Stegers-Jager et al., 2012, Artino et al., 2010b), while negatively correlated with boredom (Artino et al., 2010b). The motivational belief in self-efficacy (one's belief in oneself to accomplish a task) was negatively associated with course-related anxiety (Artino et al., 2010b). Importantly, self-efficacy and task value were reported to be higher among students with better academic performance (Artino et al., 2011, Stegers-Jager et al., 2012, Turan et al., 2012), suggesting an association between this type of motivation and academic performance.

When students who preferred a career of teaching were compared with others who preferred clinical practice and research, the former were more motivated to learn for professional development and academic gains (Pangercic et al., 2010).

2.4.5 Other motivations at medical school

The majority of research on medical students' motivation has focused on the areas outlined previously: the motivations for studying medicine and/or a medical career, academic motivation, achievement motivation, and motivations for undertaking study/learning. However, there are also a number of tools for measuring other types of motivation in relation to medical students (Appendix 1). Studies using these measurement tools conceptualize motivation as one construct within other aspects of learning, such human personality (Borges et al., 2010), learning approach (Wilkinson et al., 2007b, Wilkinson et al., 2007a, Wilkinson et al., 2004, Fox et al., 2001), goal orientation (Perrot et al., 2001, Madjar et al., 2012), and deliberate learning (Madjar et al., 2012). Since, in these studies of aspects of learning, the construct of motivation overlapped with other constructs, interpretations of their results have fewer implications for understanding medical students' motivation in medical study. Therefore, this literature review does not put forward the detailed findings of these studies. In spite of this, some of the above-mentioned studies have been reviewed in previous sections because they also explored the previously outlined types of motivation.

In summary, this section reviews literature on different types of motivation in undergraduate medical education. As demonstrated in Table 1, the majority of research has focussed on medical students' motivations for studying medicine and/or a medical career. This research reported that more intrinsic motivations for studying medicine and/or a medical career were associated with desirable learning approaches and strategies (e.g. open to experiences), better academic performance (e.g., better GPAs), and the willingness to stay in medicine or work in rural areas. In contrast, extrinsic motivations for studying medicine and/or a medical career were associated with superficial and strategic approaches for learning and with problems in mental health. Understanding these associations is important for understanding and facilitating medical students' motivations in acquiring skills and knowledge, in order to ensure that they graduate with a commitment to a life-time of learning.

2.5 Medical students' medical professionalism

As can be seen from the previous section, though research focusing on academic motivation, achievement motivation, and motivations for undertaking study/learning provides rich information about students' motivations during medical study, the research that focused on motivations for studying medicine and/or a medical career also provides insights into medical students' professionalism. The research has demonstrated that one of the top motivations for studying medicine and/or a medical career is altruism, which is defined as the motivation with an ultimate goal of benefiting others (Batson et al., 1991). This motivation indicates that medical students perceive medicine to be a profession of helping and caring for others. This is important because, in addition to being expected to be motivated for continuous learning of skills and knowledge, medical students are also expected to have developed a life time maintenance of professionalism which prepare them to provide 'care' to patients.

In the following section, literature around medical students' medical professionalism is reviewed. The section starts with outlining the importance of altruism in medicine. Then the role of altruism in medical professionalism is examined. Next, the literature on the impact of medical training on medical professionalism is reviewed.

2.5.1 Altruism and medicine

Altruism - the motivation with an ultimate goal of benefiting others - is defined in contrast to egoism, which is the motivation of an action intended to benefit oneself (Batson et al., 1991).

Altruism is important for medicine for a number of reasons. Firstly, the interest of patients is central to the nature of the doctors' work (Stobo et al., 1995, Swick, 2000). Essentially doctors take on the role of 'healer', whose goal is to cure the disease of patients (Cruess et al., 1997). As a result, altruism underpins many codes of professional conduct in medicine (McGaghie et al., 2002). For example the Hippocratic Oath states: 'I will apply dietetic measures for the benefit of the sick according to my ability and judgment; I will keep them from harm and injustice', and 'Whatever houses I may visit, I will come for the benefit of the sick…'(Edelstein, 1989, pp. 3-4).

Secondly, doctors' work is more than just a process of dealing with the complex system of the human body. Doctors are dealing with human beings, requiring multiple personal, psychological, social and cultural factors to be considered. This complicated process needs to be directed to the primary concern of medicine: the care of patients. Ensuring adequate skills and knowledge serves the goal of caring (Medical Board of Australia, 2010).

Moreover, altruism is important when inevitable conflicts of interest between doctors and patients arise. Entering medicine includes entering into an implicit contract between the medical profession and the society: society has granted the medical profession the monopoly over a body of knowledge, autonomy in practice, and a variety of rewards. In return, the medical profession should prioritise patients' needs, and assure competence, morality and integrity in their practice (Cruess et al., 2008, Cruess et al., 2002). Also, good medical practice is based on trust from the public that doctors will act for the best benefit of patients' health (Jones, 2002). This fiduciary relationship may easily be broken by doctors' self-interested behaviour, which leads to difficulty in having open and honest dialogue between doctors and patients (Jones, 2002). Therefore, it is necessary to ensure that doctors prioritize patients' needs above their own, so as to fulfil the contract between the medical profession and patients, and to maintain a healthy relationship between the medical profession and the public to achieve better health outcomes.

Despite the importance of altruism for medical practice, it is argued to be an undesirable outcome for medical students in some extreme situations, since the term 'altruism' may mean utter self-sacrifice (Bishop et al., 2007). Recent recommendations suggest that a balance between self-interest (Bishop et al., 2007), such as self-care, and the interests of others should be reached in medical practice so as to avoid possible problems such as stress, which may decrease doctors' compassion and empathy (West et al., 2007). Therefore 'prosocial behaviour' is recommended as a more balanced expression, which refers to the actions benefiting others while not necessarily at the expense of self-interest (Bishop et al., 2007).

2.5.2 Altruism and medical professionalism

As altruism is important for medicine, it has a unique role in medical professionalism. Medical professionalism has been difficult to define (Riley et al., 2012, Birden et al., 2013a). In a recent systematic review aimed at identifying how professionalism is defined in the medical education literature, a majority of the high-quality definitional papers of medical professionalism were from the USA (Birden et al., 2013a). Some examples of the most frequently cited American definitions of medical professionalism are shown in Table 5. As can be seen, medical professionalism is a comprehensive attribute composed of ideal standards regarding multiple domains to which both the collaborative medical profession and individual medical professional should strive (Stobo et al., 1995, p.5, Swick et al., 1999, p.831, American Board of Internal Medicine et al., 2002).

Table 5 Definitions of medical professionalism provided by leading organisations and scholars

Definition	Source	Key words in relation to altruism
'Professionalism in medicine requires the physician to serve the interests of the patient above his or her selfinterest. Professionalism aspires to altruism, accountability, excellence, duty, service, hono[u]r, integrity and respect for others'.	(Stobo et al., 1995, p.5)	To serve the interests of the patient above his or her self-interest Aspires to altruism
'Professionalism is the basis of medicine's contract with society. It demands placing the interest of patients above those of physicians, setting and maintaining the standards of competence and integrity, and providing expert advice to society on matters of health'.	(American Board of Internal Medicine et al., 2002, p.244)	Placing the interest of patients' above those of physicians
'Four attributes have been recognised as essential elements of professionalism: (1) subordinating one's self-interest to the interest of patients; (2) adhering to high ethical and moral standards; (3) responding to societal needs; and (4) evincing core humanistic values (eg, empathy, integrity, altruism, trustworthiness)'.	(Swick et al., 1999, p.831)	Subordinating one's self-interest to the interest of patients Humanistic values: …altruism…
'Professionalism is demonstrated through a foundation of clinical competence, communication skills, and ethical and legal understanding, upon which is built the aspiration to wise application of the principles of professionalism: excellence, humanism, accountability, and altruism'.	(Arnold et al., 2006, p.19)	Principles of professionalism: …altru ism…

A common element of all these definitions of medical professionalism is the primacy of patient interest and the subordination of self-interest. It was clearly stated by the American Board of Internal Medicine that: 'Altruism is the essence of professionalism. The best interest of patients, not self-interest, is the rule' (Stobo et al., 1995, p.5).

In the definition proposed by Arnold et al. (2006), altruism has a unique place among the four principles of professionalism, because it is closely connected to the other three principles, namely excellence, humanism, and accountability, in multiple ways . Excellence is expressed by doctors' commitment to life-long learning, dedication to the continuous improvement of quality care for patients, and promotion of scientific knowledge and technology (Arnold et al., 2006). All these aim at providing the best service for patients. Since the root of altruism is to prioritise the interest of patients, from this perspective altruism and excellence share some content. The other principle of humanism includes compassion and empathy, the ability to feel connected to the patients and to perceive the world from the patients' perspectives (McGaghie et al., 2002). Empathy is the base and the premise for a doctor to act in the interest of patients; doctors who experienced the strongest empathic reactions toward another were most willing to help (McGaghie et al., 2002, Krebs, 1975). Besides, it is suggested that altruism itself is part of the essence of humanity (Coulter et al., 2007). In addition, accountabilities of doctors, such as readiness for inconvenience to meet patients' needs, also demonstrate the giving of priority to patients with some self-sacrifice when conflicts of interest arise (Arnold et al., 2006). In sum, as one of the four principles of medical professionalism, altruism has a central place and is also closely connected to the other principles (Arnold et al., 2006).

In Australia, altruism also features in statements on medical professionalism. The Australian Medical Associations Position Statement on Medical Professionalism clearly states that:

> *'although individual doctors have their own personal beliefs and values, the medical profession upholds a core set of values, including (but not limited to): respect, trust, compassion, altruism, integrity, justice, accountability, protection of confidentiality, leadership, and collegiality'.(Australia Medical Association, 2010)*

This Australian document also stresses that, in relation to medical professionalism, ‘a key feature of the medical profession is to put patients first’ (Australia Medical Association, 2010).

2.5.3 Measuring medical professionalism

Medical professionalism is one of the expected learning outcomes for medical schools. The American Association of Medical Colleges concluded in its report for the first phase of Medical School Objective Project (1998) that medical students should possess four attributes at the time of graduation, namely being altruistic, knowledgeable, skilful and dutiful. In Australia, assessment of medical students’ professionalism was also recognised as one component of the assessment of their overall fitness to practise (Parker et al., 2010).

However, it is hard to locate and address medical professionalism in medical education systematically because of difficulties in assessment (Veloski et al., 2005). Ginsburg (2000) argued that the difficulty is partly because the assessment of medical professionalism focuses on abstract attitudes. He argued as follows: first, the presence of certain attitudes does not necessarily predict behaviours. Behaviours do not only depend on attitudes, but also on conflicts present in the situation, the context, and the process of resolution. Second, focusing on abstract attitudes may lead to a stereotype of an idealized person. With such a high standard, evaluating medical professionalism tends to be about how unprofessional an individual is. In this case, evaluators of medical professionalism may become reluctant to identify an individual as ‘unprofessional’, even though negative behaviours are observed (Ginsburg et al., 2000). However, if using behavioural assessment alone, educators may pass students with professional behaviours but unprofessional attitudes (students may fake behaviours just for the sake of evaluation) and fail students with unprofessional behaviours but professional attitudes (because of social pressure or contextual constraints) (Rees et al., 2007).

Regarding the specific element of altruism in medical professionalism, similar controversies exist about its measurement. As mentioned in Section 2.5.1, Bishop called for the use of the term ‘prosocial behaviour’ as a more balanced term in place of ‘altruism’ (Bishop et al., 2007). Another reason for this is that ‘prosocial behaviour’,

unlike the abstract concept of altruism, is easier to observe and measure (Bishop et al., 2007).

The question as to whether to assess medical professionalism as abstract attitudes or as identifiable behaviours needs to be addressed when considering a definition of medical professionalism: should medical professionalism be defined as explicit behaviours rather than attitudes (Rogers et al., 2010)? Definitions based on abstract attitudes emphasize the aspirations of fulfilling the principles of medical professionalism (Stobo et al., 1995), while definitions based on behaviours emphasise a list of behaviours demonstrating aspirations of medical professionalism (Swick, 2000, Rogers et al., 2010). These two types of definitions and measurement have two different implications for medical education. A definition and measurement relying on abstract attitudes implies that medical professionalism represents a set of stable traits, so that medical schools should consider selecting applicants with these stable traits and using psychometric instruments for assessment (Ginsburg et al., 2000, Ho et al., 2012). A definition and measurement relying on concrete behaviours implies that medical schools should help students to adjust their behaviours and to explore the conflicts of values, context, and process in having certain behaviours in assessment (Ginsburg et al., 2000, Ho et al., 2012).

In spite of the theoretical dispute in definition and measurement, there are various tools used for measuring medical professionalism. These tools have been well reviewed by a number of researchers. Arnold (2002) conducted a comprehensive review of the professionalism literature from 1966 to 2002 and categorised existing measurement tools into the following categories: the ones evaluating clinical performance; the ones measuring medical professionalism as a comprehensive entity; and the ones measuring individual elements of professionalism: humanism, altruism, duty and service. In this review Arnold also identified three tools for measuring the specific element altruism, but these tools are not directly relevant to medical education, as was pointed out. Lynch (2004) and Veloski (2005) reviewed tools available from 1982 to 2002. Lynch provided a catalogue of 88 tools under four main headings (ethics, personal characteristics, comprehensive professionalism, and diversity), each with brief descriptive summaries for easy reference by researchers. Veloski identified 134 empirical studies with measurement tools for medical professionalism and focused on describing the reliability,

validity, and practicality of these tools. Both reviews concluded that further evidence regarding the measurement properties of existing tools is needed. Jha (2007) published a systematic review of tools measuring medical professionalism as attitudes (excluding those on proxy measures of attitudes, such as skills and behaviours). Jha identified 97 articles in this review but concluded that the majority of tools were aimed at specific aspects of professionalism, such as ethical issues or cultural issues, rather than professionalism as a whole. Jha suggested the development of tools for measuring professionalism as a whole. The same point was also raised up by another systematic review conducted by Wilkinson (Wilkinson et al., 2009)

2.5.4 The impact of medical training on medical professionalism

Though it is challenging to define and measure medical professionalism, how medical training may impact on the cultivation of medical professionalism has been widely discussed in the literature. It is argued that the cultivation of medical professionalism at root is a process of 'professional socialisation' regarding the moral aspect of medicine (Hafferty et al., 1994). Professional socialisation is the:

> *'process by which people acquire the values and attitudes, the interests, skills, and knowledge – in short, the culture – current in the groups of which they are, or seek to become, a member.' (Merton et al., 1957)*

The development of medical students' medical professionalism during medical training occurs in three interrelated dimensions of medical education: the hidden curriculum, the informal curriculum, and the formal curriculum (Hafferty, 2008, Hafferty, 1998, Hafferty et al., 1994, Cruess et al., 1997).

The hidden curriculum and the informal curriculum

Both the hidden curriculum and the informal curriculum are the transmission of the dominant culture without being stated, intended, or formally offered as endorsed curriculum (Hafferty et al., 1994). The hidden curriculum is the 'set of influences that function at the level of organizational structure and culture'; the informal curriculum is the 'unscripted, predominantly ad hoc and highly interpersonal form of teaching and learning that takes place among and between faculty and students' (Hafferty, 1998). The difference is that the hidden curriculum is embedded at an institutional level, where

students learn the norms of medical schools and hospital culture; while the informal curriculum happens more in interpersonal interactions, especially the learning from residents and doctors by unconsciously emulating their behaviours and philosophies through daily interaction (Hafferty, 1998, Fins et al., 2003).

The hidden curriculum includes the learning through common 'understandings', customs, rituals and what has been taken for granted in medical education (Hafferty, 1998). For example, through marking of attendance for tutorials, the rule 'being present and punctual' can be taught. Through professional dress code such as white coat, medical students are reminded that they belong to a professional community, whose values and attitudes should be internalised.

The informal curriculum is closely related to learning through role modelling (Hafferty, 1998). From various interpersonal interactions during medical training, students observed from role models the demonstration of 'professional behaviours' in real practice (Baernstein et al., 2003, Kenny et al., 2003). Medical students may then internalise the implicit values and attitudes behind the behaviours by unconscious emulation (Hafferty, 1998). Role-modelling was referred to as the heart of instilling medical professionalism (Kenny et al., 2003). Students perceived role models to have the most important influence on their professional development and role models could be doctors in clinical settings, the teaching faculty, or peers in classrooms (Baernstein et al., 2009, Ozolins et al., 2008, Byszewski et al., 2012, Riley et al., 2012).

The hidden curriculum and the informal curriculum may extend beyond medical training, such as the depiction of fictional medical professionals and their lives in medical television dramas. Family members working in the medical profession can also be role models for medical students.

The formal curriculum

In contrast to the hidden and the informal curriculum, the formal curriculum is the 'stated, intended, and formally offered and endorsed curriculum' (Hafferty, 1998). Quite opposite to the hidden curriculum and the informal curriculum, the formal curriculum is the structured and explicit teaching of content (Cohen, 2006, Cruess et al., 1997, Swick et al., 1999, Hafferty et al., 1994).

The formal curriculum of medical professionalism may include courses, classes, discussion on rounds, advice, laboratories, clinical clerkships or any other teaching that is overtly intended to instil medical professionalism (Hafferty, 1998, Coulehan et al., 2001). In a study carried out in 1999 (Swick et al.), the 104 out of 116 US medical schools (89%) that responded to the survey reported that they offered some type of formal instruction related to medical professionalism. In 2002, the prevalence of medical schools offering formal curriculum content relating to medical professionalism increased to 99% (110/111) (Kao et al., 2003). The majority of the medical schools reported to hold a 'white-coat ceremony' as a curricular event to impress upon medical students the culture of medicine. A smaller majority of these schools incorporated medical professionalism as a component of multiple courses or as an integrated sequence of courses. Other examples of the formal curriculum include doctor-patient communication, medical ethics, medical history, medical law, medical sociology, and public health (Cohen, 2006, Stephenson et al., 2001). Issues frequently addressed in the formal curriculum of medical professionalism include professional identity and medical virtue or attributes associated with being a good doctor, the moral obligations that arise in the doctor-patient relationship, as well as the role of doctors in society (Coulehan et al., 2001).

Need to combine the hidden, the informal and the formal curricula

The hidden curriculum and the informal curriculum are powerful educational influences in the development of medical professionalism. They are considered to have more weight than the formal curriculum (Asghari et al., 2011). This is because they happen continuously and frequently through daily observation (Coulehan et al., 2001, Hafferty et al., 1994). In contrast, the formal curriculum was claimed to have 'little' effect (Hundert, 1996, Hafferty et al., 1994), because the establishment of professionalism relies more on individual interpretations of experiences rather than on knowledge or skills, and so is less amenable to factual teaching (Howe, 2002). Still, it is argued that the teaching of particular knowledge, methods and skills about medical professionalism are indispensable, because medical professionalism cannot occur in a vacuum (Wear et al., 2000).

Actually, medical professionalism can no longer be sufficiently imparted through professional socialisation without formal teaching. This is for several reasons. First of

all, medical practice has become more complex and diverse with students and faculty members from different socioeconomic and cultural backgrounds (Cruess et al., 1997, Swick et al., 1999). While only a few studies have really explored the social and cultural difference in medical professionalism (Shah et al., 2009, Jiang et al., 2010), it can be easily comprehended that the diversity of medical faculties makes professional socialisation regarding the moral aspects of medicine difficult due to the lack of commonly shared attitudes on which the socialisation is based (Cruess et al., 1997).

Secondly, the learning of medical professionalism through the hidden curriculum and the informal curriculum is not always positive, because it depends heavily on medical learners' experiences, either in medical-clinical interactions or in the general teaching and learning environment (Karnieli-Miller et al., 2011). Though in some studies a majority of medical students reported positive experiences regarding the hidden curriculum and the informal curriculum, they also reported negative experiences (Karnieli-Miller et al., 2010, Lempp et al., 2004). Maheux reported that an unacceptably large number of medical students perceive their teachers to lack compassion and caring in interaction with patients (Maheux et al., 2000). In another study, 98% of students from six medical schools reported hearing instructing doctors speak in a derogatory manner about their patients while on the wards and 61% of students reported seeing team members engaging in behaviours the students deemed unethical (Feudtner et al., 1994). Poor role-modelling of attitudes and behaviours from faculty members, such as offensive remarks and deficiency in dealing with patients' problems, may be observed by and passed on to medical students (Lindstrom et al., 2011). Negative role-modelling may also give students the impression that compassion and humanistic practice are of more theoretical than practical importance (Fins et al., 2003). They may also contribute to a general social environment of medical training which militates against humanism while favouring the development of characteristics like detachment; the entitlement of doctors to high income, prestige and social power; and non-reflective professionalism (Coulehan et al., 2001, Conrad, 1988).

Thirdly, the intrusion of commercialism into medicine is also threatening the traditional patient-centred values (Cohen, 2006, Ludmerer, 1999). This may also have negative influences on medical students' medical professionalism through the hidden curriculum and the informal curriculum. Business values focus on the priority of the provider's

profit, while the traditional values of the medical profession emphasise the priority of patients' interests (Swick, 1998). The increasing interactions of medical centres with the pharmaceutical and medical device industry may heighten this tension in values because it may produce external temptations, leading to corruption in medical practices (Cohen, 2006). This professional environment makes it even more difficult for doctors to act in the interest of patients, which may further lead to negative role modelling for medical students (American Board of Internal Medicine et al., 2002, Ludmerer, 1999, Fins et al., 2003, West et al., 2007).

For these reasons, the current trend in medical education is to incorporate the formal teaching of medical professionalism into the entire medical program, so as to complement the insufficiency of the informal curriculum and to remediate the potential negative influences of the hidden curriculum and the informal curriculum (Cohen, 2006, Cruess et al., 1997, Hundert, 1996). It was found in a recent systematic review that role modelling and personal reflections, ideally guided by faculty members, are considered to be the most effective technique of teaching medical professionalism (Birden et al., 2013b).

Deficiency in combining the hidden, the informal and the formal curricula

The initial aim of incorporating the teaching of medical professionalism into the formal curriculum is based on the assumption that the hidden curriculum, the informal curriculum, and the formal curriculum could complement each other to achieve educational goals. However, this has not always been successful.

Students repeatedly receive mixed messages, because observations in the hidden curriculum and the informal curriculum are often contrary to the goals and content taught in the formal curriculum (Shrank et al., 2004, Fins et al., 2003, Dyrbye et al., 2005, Hafferty et al., 1994, Stern, 1998, Gaufberg et al., 2010, Lamiani et al., 2011, Hafferty, 1998, Coulehan, 2005). For example, North American medical education was noted to favour an explicit commitment to traditional values like empathy, compassion, and altruism, while there was a tacit commitment to detachment, self-interest, and objectivity (Coulehan et al., 2001). Students may interpret the conflicts between curricula as meaning that compassion and humanistic practice are of more theoretical than practical importance (Fins et al., 2003, Coulehan et al., 2001). Medical students

may also re-identify themselves as technicians and patients as objects of technical services, avowing implicitly that this enables their best care of patients (Coulehan et al., 2001). The mismatch of implicit and explicit messages may also cause emotional and ethical dilemmas and distress (Feudtner et al., 1994, Gaufberg et al., 2010, Stern, 1998). It may also lead to a gradual decline of moral reasoning during undergraduate medical training (Feudtner et al., 1994, Hafferty et al., 1994), but this is not clear as Hegazi and Wilson have demonstrated that the decline in moral reasoning is based on moral segmentation (Hegazi et al.,2013)Since the informal curriculum and the hidden curriculum happen continuously and frequently (Coulehan et al., 2001, Hafferty et al., 1994), medical students receive a disproportionate amount of messages from the informal and hidden curriculum. Therefore, any negative influences from the hidden curriculum and the informal curriculum are difficult to be remediated by the didactic formal curriculum. This is why an unfriendly institutional culture can easily undermine the well-intentioned efforts of those trying to impart professionalism by means of the curriculum (Lamiani et al., 2011).

Furthermore, there are still issues existing in the formal curriculum itself. A discourse study analysis undertaken with medical students from England, Australia and Wales demonstrated that teaching materials, such as policy documents, handbooks and didactic lectures alone are insufficient to be effective in instilling medical professionalism (Monrouxe et al., 2011). Supplementing these with other strategies is needed, involving measures such as the provision within the formal curriculum of opportunities for active sense-making activities, patient interaction, faculty-led case scenario sessions, and real cases based on lectured learning (Monrouxe et al., 2011, Byszewski et al., 2012, Hatem, 2003). Moreover, one study revealed that teachers are not consistently teaching the recommended professionalism (Stern, 2006). Furthermore, the formal curriculum for medical professionalism is not well appreciated by medical students, for reasons such as having too abstract ideals, and setting unrealistic goals for students, as well as students having other priorities while stretched for time at medical school (Leo et al., 2008).

Ideally, more effort is need to reconstruct an overall beneficent learning environment for medical education without unprofessional practices. When all faculty members hold to the highest professional standards, medical students' professionalism can mature and be reinforced through every day practice (Baernstein et al., 2009, Hafferty, 1998, Cohen,

2006). In addition, some medical educators support an overt admission of the conflicts between medical curricula so as to make medical students more prepared (Relman, 1998).

2.5.5 Changes in medical professionalism at medical school

Studies have found that medical students' initial professionalism seem to be general, superficial, and idealistic (Hafferty, 2002, Blue et al., 2009). Commencing medical students had not given in-depth thought to what it means to be a doctor (Hafferty, 2002). Though they had enthusiasm for being service-oriented, they had difficulties in accepting the provision of service as their obligation (Hafferty, 2002). They were also likely to neglect altruism as an attribute of medical professionalism (Blue et al., 2009).

A number of studies found that medical students' medical professionalism tends to change in an unfavourable direction during medical school. In a 1974 review (Rezler) of empirical studies, the author concluded that medical students tend to increase in cynicism and decrease in humanitarianism during their medical school experience. Rezler also commented that the best situation is that medical students' initial professionalism are maintained and do not decrease during medical training. In a later study (Wolf et al., 1989), graduating medical students also perceived themselves to be more cynical and more concerned about making money during their medical training. In a cross-sectional study it was found that final year students were less favourably inclined towards caring for the underserved than first year medical students (Crandall et al., 1993). It was claimed in this study that though many students come to medicine avowing compassion, altruism, and sensitivity to the need of others, some reconceptualised themselves primarily as technicians and treated patients as objects of technical services.

Several studies further highlighted that the change in medical professionalism is most likely to occur during clinical training. Medical students at the clinical stage were found to have a lower level of humanistic values compared with students at the preclinical stage (Maheux et al., 1986). A recent systematic review concluded that students' empathy declined at medical school, particularly during clinical training, with distress produced by hidden, informal and formal curriculum (Neumann et al., 2011).

In particular, Griffith and Wilson found that after the first year of clinical training, medical students believed a greater percentage of the elderly are demented and a greater percentage of patients with chronic pain are drug seekers; however, these researchers interpreted the findings as that students' just became less idealistic towards patients and the medical profession (Griffith et al., 2001). Several studies also reported a decline in medical students' empathy before and after the first year of clinical training at medical school (Hojat et al., 2009, Hojat et al., 2004).

Several studies also used the first year at medical school for exploring changes in medical professionalism. One American study reported that after the first year at medical school, medical students' attitudes towards providing for the underserved declined (Crandall et al., 1997). However, this appears to contradict another study conducted within a PBL program, where the researchers observed an increase in students' altruism and a decrease in cynicism at the end of the first year (Roche III et al., 2003).

In summary, this section has reviewed the literature around one of the top motivations for studying medicine – altruism. Altruism is important for medicine and has a unique role in medical professionalism. There is extensive discussion as to how medical training may either positively or negatively influence the medical professionalism of medical students. A number of studies actually observed changes in medical students' medical professionalism. This literature implies that, to some extent, medical students' altruistic attitudes may decline during medical training. However, little is known about how the changes in altruistic attitudes may contribute as a factor in influencing medical students' motivations for studying medicine.

2.6 Learning transitions at medical school

As can be seen from the previous section, the first year at medical school and the first year of clinical training are two critical periods for professional socialisation. These two years are also the critical times of transition at medical school.

Historically, medical programs featured a binary type of curriculum, which generated two distinct stages of training: theoretical teaching of basic knowledge and skills, and practical application of these knowledge and skills through clinical experiences (Hodges,

2010). While there has been a movement to an integrated medical program the most significant clinical exposure still occurs in the last two to three years of the medical program (Medical Training Review Panel, 2013). This leads to two critical years of transition at medical school: the first year at medical school as the transition from secondary school to tertiary training, the first year of clinical training as the transition from preclinical training to clinical training. In this section, the literature on medical students' expectations/experiences during these two learning transitions is reviewed.

2.6.1 Transition from secondary school to medical schools

There is not much reported about medical applicants' experiences during the first year at medical school. One study from the UK highlighted the first year at medical school as being stressful, with changes in life style such as living away from family, changes of social networking, and competition with people of similar or greater intellectual ability (Radcliffe et al., 2003). Similar results were found in a survey of 204 first year medical students in England. They reported high prevalence of stress, which was commonly caused by heavy workload, first experience of dissection, issues with tutors, or feeling inadequate in comparison to peers (Guthrie et al., 2009). As can be seen, these studies mainly focused on the state of being first year medical students, but not how medical students make the transition from secondary school to tertiary education (Teunissen et al., 2011).

In contrast, there is a large amount of discussion and research on this transition in relation to all university students. It indicates that the experiences of learning during this transition are challenging. First of all, there seems to be a mismatch between the learning habits of secondary students and the learning habits expected of university students. High school students spent less time in preparing for classes compared to university students, and they also lack experience in reading assigned materials and writing long papers (McCarthy, 2006). Though university students are aware of the differences between high school study and university study, their learning habits developed in secondary school tend to persist into the first year at university; they retain their expectations of ready access to teachers, and quick feedback on work and reviewing of drafts, in spite of the need for more independent study and the fact of decreased access to staff support (Crisp et al., 2009, Brinkworth et al., 2009, Cook et al., 1999). A series of Australian nation-wide surveys with first year university students

(James et al., 2010, Krause et al., 2005, McInnis et al., 2000, McInnis et al., 1995) found that first year university students reported stable and well-considered reasons for entering university over time, most of which are interest-related and job-related. However, a noticeable proportion of first year students reported being not ready and prepared for university study. Also, there is a continuing trend for students to have increasing commitment to paid-work and decreasing engagement in both academic and social life at university. However, the extent to which these findings outlined above are applicable to medical students is unknown.

2.6.2 Transition from preclinical training to clinical training

It seems from previous research that the first year of clinical training is no less stressful than the first year at medical school or university. A number of new experiences in the clinical phase may lead to anxiety, namely interaction with senior staff, performing clinical tasks on patients, presenting cases on ward rounds, getting diagnoses wrong, and admitting ignorance to consultants (Moss et al., 1992). Multiple studies from America and Europe have reported that students found it difficult to build up their professional identity and to understand their roles, responsibilities, and others' expectations in clinical settings (Babaria et al., 2009, Prince et al., 2000, Prince et al., 2005, Pitkala et al., 2003, O'Brien et al., 2007, Hayes et al., 2004). Adjusting to the culture of patient care and frequent changes in staff, settings, and the content was found to be challenging (O'Brien et al., 2007). Nevertheless, it was reported that medical students' self-image as a doctor rapidly evolved during patient contact in the first clinical year (Pitkala et al., 2003).

Previous research has explored the factors which influence the learning transition from preclinical training to clinical training. Students' preclinical knowledge and skills (Van Hell et al., 2008), prior workplace experiences (Shacklady et al., 2009), and early experience of professional socialisation (Dornan et al., 2004) help the transition into clinical training. Also, several studies found that gender matters. Third-year female medical students perceived that their experiences during clinical placement have been affected by gender in multiple ways, such as defaulted stereotypical gender roles on the wards and workplace inter-relationships (Babaria et al., 2009). Male students felt less anxious in the transition period than female students (Hayes et al., 2004). Moreover, older students were more likely to be positive about their transition into the clinical

environment, and less likely to feel ‘confused, daunted, or overwhelmed’(Shacklady et al., 2009, p. 625). Again, graduate-entry medical students were less anxious about most aspects of the transition than undergraduate-entry medical students (Hayes et al., 2004).

As can be seen, medical students’ transition from preclinical to clinical training has been more extensively discussed and studied than their transition from secondary school to tertiary education. Previous research on the transition from preclinical to clinical training is limited to medical students’ experiences in relation to clinical study. Little is known about their general experiences of learning at university.

In summary, this section reviewed the literature on medical students’ expectations/experiences at medical school during two critical transitions, together with findings relating to tertiary education in general. Research on the first year at medical school is limited and most is focused on the state of being a first year medical student rather than on experiences. Research on the transition from preclinical and clinical training has focused on the experiences relating to clinical study. It is known that both these transitions are full of challenges and stressors. However, little is known about medical students’ expectations/experiences of learning at university during these two transitions and how these may act as a factor in influencing medical students’ motivations for studying medicine.

2.7 Summary

This chapter has shown that in recent decades, motivation has become an increasingly important topic of research in medical education. Theories adopted for understanding medical students’ motivations have been evolving; this has led to a different focus for research on medical students’ motivations at medical school. The bulk of research in this area focussed on medical students’ motivations for studying medicine and/or a medical career. This research reported that along with other factors such as gender, culture and level of medical school entry (e.g. school leaver or graduate entry), altruism also affects motivations for studying medicine and/or a medical career is altruism, which partially informs medical students’ professionalism. Also, medical students’ intrinsic motivations have a positive impact on multiple aspects of learning at medical school. These findings are important because it is expected that medical students

graduate with the commitment to continuous learning and life time maintenance of professionalism which prepare them for providing care to patients.

This chapter has also showed that medical students' motivations for studying medicine and/or a medical career differ by sex, entry/selection type, year of curriculum, and may also be influenced by cultural background, age, marital status, as well as parents or teachers. However, there is a lack of longitudinal studies into changes in medical students' motivations for studying medicine and/or a medical career at medical school and factors that may be important in relation to such motivations.

Nevertheless, there has been extensive discussion on how medical training may either positively or negatively influence medical students' medical professionalism; this implies to some degree that medical students' altruistic attitudes may decline during medical training, but there is no direct exploration of how this may act as a factor in medical students' motivations for studying medicine. In addition, the two critical years for professional socialisation at medical school are also the two critical transitions at medical school, which may be challenging and stressful for medical students. However, little is known about how medical students' expectations/experiences of learning at university may act as a factor in influencing their motivations for studying medicine.

Therefore, this study aims to explore medical students' motivations for studying medicine before and during medical school, and its relationships with altruistic attitudes and expectations/experiences of learning at university. The next chapter describes the methods of the study undertaken to address the research aims.

CHAPTER 3. METHODS

3.1 Introduction

This chapter describes the study setting, the study design, participants and procedures, the design, development and administration of questionnaires, and the approaches to statistical analysis employed in this thesis.

3.2 Study setting

The study was conducted within the University of Adelaide (UoA) undergraduate medical degree program (here after referred to as the medical program). The medical program is a six-year undergraduate bachelor degree program where the majority of applicants are school leavers. Students apply from around Australia and there are also a limited number of places for international students.

The selection process to identify successful applicants to the medical program has three components (The University of Adelaide, 2011): 1) the South Australia Tertiary Admission Centre (SATAC) application, which requires a matriculation score of Australian Tertiary Admission Rank (ATAR) equivalent of 90 or over; 2) the Undergraduate Medicine and Health Sciences Admission Test (UMAT), which assesses logical reasoning, problem solving, interaction skills and non-verbal reasoning; and 3) the Oral Assessment, which assesses a range of non-cognitive qualities (Laurence et al., 2010). Applicants whose UMAT scores qualify them for an oral assessment are invited to participate in a structured interview as part of their application process. An offer of a place is based on a composite score of the UMAT, ATAR, and the oral assessment score. Table 6 presents the application and acceptance data of the medical program from year 2004 to 2007, from which a general trend of application and recruitment can be observed (Laurence et al., 2010).

Table 6 Number of applicants and proportion of previous application stage, 2004–2007

Stage of process	2004	2005	2006	2007
Applicants	1494	1556	1697	1952
Interviews	394 (26.4%)	386 (24.8%)	396 (23.3%)	586 (30.0%)
Offers	255 (64.7%)	213 (55.2%)	159 (40.2%)	350 (59.7%)
Acceptances	93 (36.5%)	75 (35.2%)	65 (40.9%)	105 (30.0%)

Notes: Excludes Aboriginal and Torres Strait Islander applicants, tertiary transfer scheme applicants, deferrers from previous cohorts, and international students applying for fee-paying places.

The medical program aims to provide its graduates with the basic knowledge, skills and competencies required for the practice of medicine as a prevocational or junior hospital doctor. The course consists of three 'streams', each emphasising a core element of medical practice (The University of Adelaide, 2011): 1) the Scientific Basis of Medicine; 2) Clinical Skills; and 3) Medical Personal and Professional Development. In years 1-3 learning is predominantly at the university through an integrated Case-Base Learning program. Years 4-6 are predominantly structured around clinical training within teaching hospitals, general practices, specialist rooms, rural/remote hospitals and health clinics, where students further expand their scientific knowledge, clinical skills, and professionalism (The University of Adelaide, 2010). Therefore, the first year and the fourth year are two critical years of learning transition and professional socialisation in the medical program.

3.3 The study design

The study design is shown in Figure 3. Two groups of medical students were followed in the study, namely the medical applicants and the fourth year medical students. The medical applicants completed an entry baseline questionnaire when applying for 2012 entry; 12 months later in 2013 they completed an entry follow-up questionnaire at the start of their second year. Similarly, the fourth year medical students completed a fourth-year baseline questionnaire at the midpoint of their fourth year in 2012; 12 months later in 2013 they completed a fourth-year follow-up questionnaire at the mid-point of their fifth year. Therefore, altogether four questionnaires were used for this

study. The planned timing of these four questionnaires in the medical program is shown in Figure 4.

Not everyone who completed the entry baseline questionnaire completed the entry follow-up questionnaire, and vice versa. Similarly, not everyone who completed the fourth-year baseline questionnaire completed the fourth-year follow-up questionnaire, and vice versa. A pilot study was conducted to help refine the study procedure and data collection instruments (further reported in Section 3.5.2).

Figure 3 The study design

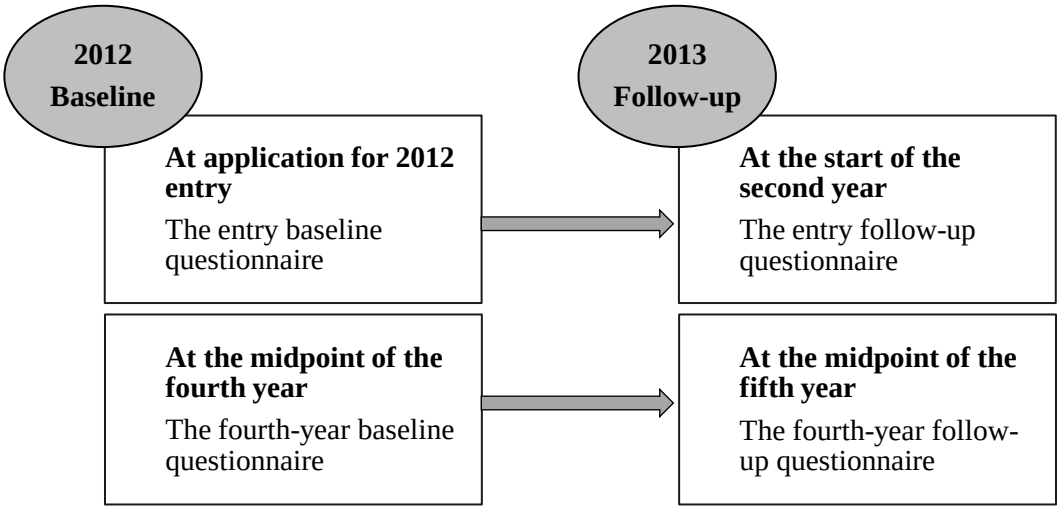
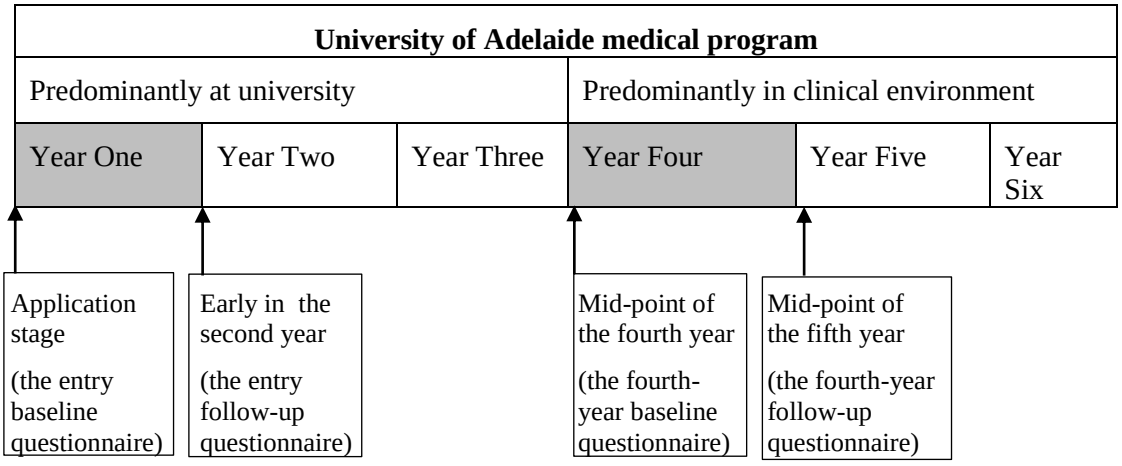


Figure 4 The planned timing of the four questionnaires in the medical program



3.4 Participants and procedure

This section describes the process used for each questionnaire. In order to enable the analysis within participants' paired baseline and follow-up responses while allowing them to stay anonymous, each questionnaire described below included a process of generating a unique identifier – a study ID. This study ID was generated using the same method across all questionnaires, so any individual was expected to generate the identical study ID for every questionnaire he/she had participated. Throughout all stages of data collection, participants were assured that at all times confidentiality and anonymity were maintained. Participants were also assured that although the results would be published, neither their personal information nor their responses would be personally identified. To maximise response rate, participants for all surveys were offered opportunities to enter a draw for a low value voucher. This study was approved by the University of Adelaide Human Research Ethics Committee (Project No. H-204-2011, Appendix 6) and the medical program Curriculum Committee (Appendix 7).

3.4.1 The entry baseline questionnaire

All domestic applicants attending the oral assessment for 2012 entry into the medical program (here after referred to as medical applicants) were invited to complete the entry baseline questionnaire.

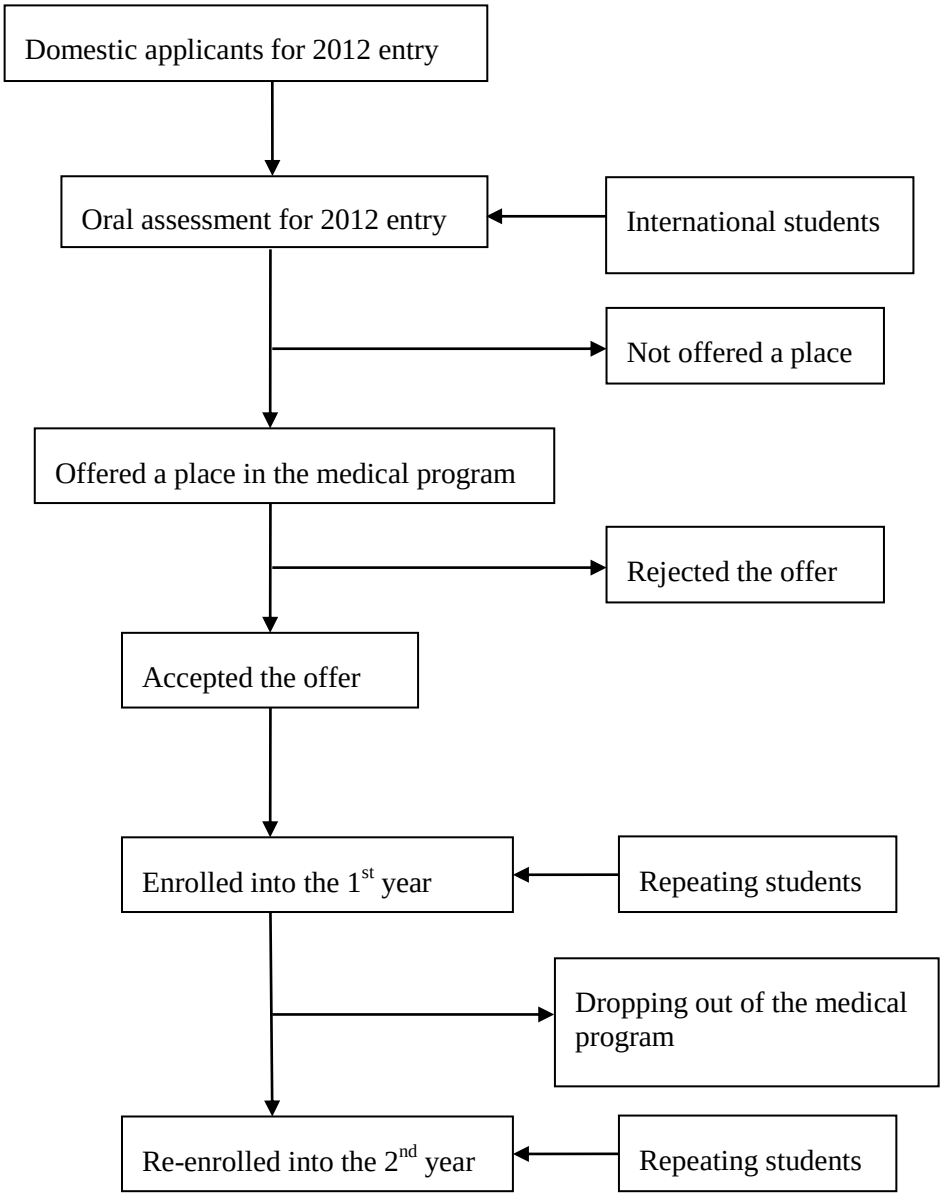
The oral assessment for the 2012 intake was conducted in two sessions (in December 2011 and in January 2012). In both sessions, the applicants were approached by the researcher whilst completing their on-line registration for the oral assessment using the computers located in the registration area. The computers were set up in advance with one tab in Internet Explorer leading to the on-line questionnaire created with SurveyMonkey. After guiding each applicant to complete the computer assisted registration, the researcher introduced the tab and explained the study emphasising that participation in the questionnaire was voluntary, that all responses were anonymous, and that there was sufficient time to complete the questionnaire before their scheduled interview. The researcher then left the applicants alone to decide whether to participate or not.

The on-line questionnaire started with an information page including details about the study and contact information. Applicants who consented to participate could click on the ‘next’ button to proceed. Any applicants who did not wish to participate or wished to withdraw before completion could click on ‘exit the questionnaire’ button. All responses were exported automatically into an Excel spreadsheet.

3.4.2 The entry follow-up questionnaire

One year later in 2013, all medical students early in their second year (here after referred to as second year medical students) were invited to complete the entry follow-up questionnaire. Figure 5 shows how medical students in the University of Adelaide medical program proceed from their application to the second year. As can be seen, not all the second year medical students in 2013 had been the domestic medical applicants attending the oral assessment for 2012 entry.

Figure 5 The procedure of proceeding from application to the second year at the University of Adelaide medical program



Two strategies were used to collect responses from second year medical students: paper-based and online. First, students were approached at the end of their first Medical Curriculum Essentials session in March 2013. This session was selected as it was the first chance after 12 months that students could be approached when all together. Immediately after the lecturer had finished the session, the researcher gave a brief overview of the study including the researcher and supervisors, study background, and its aims. The researcher made it clear that the participation in the questionnaire was voluntary and all responses were anonymous. Following this, paper questionnaires were distributed together with an information sheet describing the study in detail and providing contact details in case students had any questions. Students who consented to participate completed the questionnaire in the lecture room and returned their responses in one marked box at the exit door as they left. Any students who did not wish to participate were free to leave or submit a blank questionnaire if they wished to stay anonymous. All responses from paper-based questionnaire were entered into an Excel spreadsheet.

Students could alternatively complete the entry follow-up questionnaire on-line using SurveyMonkey. On the same day of administrating the paper-based survey, an invitation letter with a link to the questionnaire was posted as a Bulletin Board message for second year students by the Curriculum Planning Officer on behalf of the researcher. The 2013 second year medical students who consented to participate could click to enter the questionnaire which started with an information page including details about the study and contact information. Students could then click on the 'next' button to proceed with the survey or withdraw before completion by clicking on 'exit the questionnaire' button. All responses were exported automatically into an Excel spreadsheet. The possibility of a student completing both the paper-based and on-line version of this questionnaire was minimised by the unique study ID explained earlier. Duplicates of paper-based and online responses could be identified using the study ID and discarded.

3.4.3 The fourth-year baseline questionnaire

In 2012, all fourth year medical students were invited to complete the fourth-year baseline questionnaire at the mid-point of the year. It would have been preferable to approach them at the start of their fourth year, since that was the exact time when they

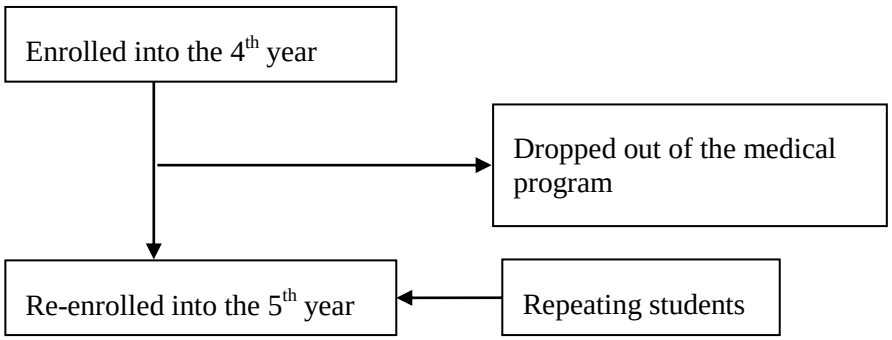
started hospital placements. However, this year involved mainly hospital placements, so the only time they could be approached when altogether was while they were at the School of Medicine Teaching Series (SMTS) sessions, of which the first session was scheduled in the middle of the year.

The fourth year medical students were approached by the researcher at the end of this first SMTS session. The 2012 fourth year medical students were divided into two batches (semester one students and semester two students) and the SMTS was scheduled for each batch with one month between. The fourth-year baseline questionnaire was therefore conducted separately for each batch (in May 2012 and in June 2012). This questionnaire was administered using the same procedure employed for the paper-based entry follow-up questionnaire for 2013 second year medical students.

3.4.4 The fourth-year follow-up questionnaire

One year later in 2013, all fifth year medical students were invited to participate in the fourth-year follow-up questionnaire at the midpoint of the year. Figure 6 shows how medical students in the University of Adelaide medical program proceeded from the fourth year to the fifth year. As can be seen, some fifth year medical students had not participated in the fourth-year baseline questionnaire, such as repeating students.

Figure 6 The procedure of proceeding from the fourth year to the fifth year at the University of Adelaide medical program



In the fifth year of the medical program, semester one students and semester two students have different curricula schedules. Therefore, the semester one students were approached at the end of their orientation day for Paediatrics and Obstetrics/Gynaecology rotations on 17 June, 2013. Semester two students were approached at the end of their School of Medicine Teaching Series (SMTS) on 28 June, 2013. This questionnaire was administered using the same procedure employed for the paper-based entry follow-up questionnaire for 2013 second year medical students.

3.5 Questionnaire

The four questionnaires outlined above were similar, with minor modifications to reflect the different situations for participants at the time of being surveyed. In this section, the development of the basic questionnaire, piloting of this basic questionnaire, and its modifications for the four questionnaires are described.

3.5.1 Questionnaire design

The basic questionnaire was composed of four sections: socio-demographic characteristics, reasons for studying medicine, altruistic attitudes, and expectations/experiences of learning at university. All questions were developed based on literature review or derived from questionnaires used in published studies. Copies of the questionnaires are in Appendix 2 through Appendix 5.

Social-demographic characteristics

As reviewed in Section 2.4.1, a number of socio-demographic characteristics has been associated with medical students' motivations for studying medicine and or/a career in medicine. Based on this, in the study the following variables relevant to the study population were selected for inclusion in the questionnaires: age, sex, cultural background (country of birth, citizenship, language spoken at home), educational background, parents' educational level, and family members working in health-related professions (Table 7).

Table 7 Socio-demographic characteristics included into the questionnaires

Variables	Explanations	Categories
Age		N/A
Sex		Male/female
Cultural background	Country of birth	Australia/others
	Citizenship	Australian/others
	Language spoken at home	English/others
Parents' educational level	Father/mother's highest level of completed education	Bachelor or above/certificate/diploma/secondary or below
Secondary schooling		Government school/private school/other countries
Family members working in health-related	Father/mother's occupation Family members (other than parents) working in health profession	Working in health-related profession/not working in health-related profession

Reasons for studying medicine

This section of the questionnaire included 14 five-point Likert scale items regarding students' reasons for studying medicine. Participants had the opportunity to add their own reasons in one open-ended item. Participants were asked to rate the importance of each item from 'not at all important' (1 point) to 'very important' (5 point). Items in this section (Table 8) were selected and derived from scales in previous studies used for measuring medical students' motivations for studying medicine and/or a medical career, as reviewed in Section 2.4.1.

Table 8 Items regarding reasons for studying medicine

Item No.	Items
1	I have scientific curiosity
2	I have a desire for helping others
3	Professional independence is important to me
4	I have previous experiences with illness (personal or family)
5	I am attracted to the high prestige associated with medicine
6	I have relatives in health care
7	Medicine will provide intellectual satisfaction
8	I have a desire to cure/prevent diseases
9	My parents expect me to study medicine
10	A high income is important to me
11	I enjoy interacting with people
12	Most of my friends are studying medicine
13	Having job security is important to me
14	My teachers expect me to study medicine
15	Other

Altruistic attitudes

This section of the questionnaire included eight five-point Likert scale items comprising statements describing medical profession responsibilities. Participants were asked to rate the strength of agreement to each of the items from 'strongly disagree' (1 point) to 'strongly agree' (5 points). The scale generated an altruistic attitude score based on the sum of the responses to the eight items. The maximum altruistic attitude score is 40, with a higher score meaning more altruistic attitudes. This scale is a validated instrument used in a previous study for measuring medical, law, and business students' altruistic attitudes (Coulter et al., 2007). In the study, some minor modification of wording was made to reflect the Australian setting (Table 9). Generally, 'underserved communities' was replaced by 'disadvantaged communities', 'the needy' was replaced by 'the disadvantaged', 'physicians' was replaced by 'doctors'.

Table 9 Summary of the modifications of items on altruistic attitudes

Item No.	Items and modifications*
1	Working with the poor is important for practice of medicine
2	Helping disadvantaged (underserved) communities' is important for practice of medicine
3	Doctors (Physicians) should be required to provide medical care to the disadvantaged (needy)
4	Doctors (Physicians) should volunteer some of their time to work in a free clinic
5	I feel personally responsible for providing services to the disadvantaged (needy).
6	I would be interested in volunteering on my own time for programs which provide medical care for the disadvantaged (needy) during my medical school experiences
7	All medical students should become involved in community health effort
8	Society is responsible for providing for the health care of all its members

*Notes: * Wording in parenthesis represents the original item content*

Expectations/experiences of learning at university

This section of the questionnaire consisted of nine five-point Likert scale items and one fixed response item that asked participants' about their expectations/experiences of learning at university. Participants were asked to rate their strength of agreement to each of the Likert scale items from 'strongly disagree' (1 point) to 'strongly agree' (5 points). The fixed response item asked participants to choose a time range that they expected to spend/spent on independent/private study. Two sets of wording were used to reflect respectively the expectations (at the application stage) and experiences (based on the previous 12 months' experiences) (Table 10). These items were drawn from an earlier study of first year health sciences students (O'Keefe et al., 2011) and an institution-wide study of first year students' expectations (Crisp et al., 2009).

Table 10 Items regarding expectations/experiences of learning at university

Item No.	Items and modifications*
1	I (expect to be able to) can combine study with paid work
2	Having ready access to my lecturers and tutors outside of face-to-face teaching (will be) is important to my success at university
3	(I anticipate that)My learning (will) involves independent/private study
4	Interactive sessions with other students (will be) are important to my learning
5	It is probably not all that important for me to attend most lectures
6	I have activities other than university that might affect my ability to study
7	I expect to continue studying after I obtain my degree
8	I am interested in considering opportunities for research whilst undertaking university study
9	I am interested in considering a career in research

*Notes: * Contents in parenthesis shows the wording for expectations*

3.5.2 Piloting the basic questionnaire

Before the basic questionnaire was modified and disseminated to the students, it was piloted. The aims of the pilot were to:

- obtain feedback on individual questionnaire items for any clarification;
- test the time needed for completing the questionnaire; and
- assess optimal strategies for questionnaire delivery: on-line or on-paper

The information and data collected in the pilot were used to guide the modification of the questionnaire used in the formal data collection.

In August 2011, ten medical student volunteers at the University of Adelaide from Year 4 (N=5) and Year 5 (N=5) were recruited through convenience sampling. Students were given a pilot package (Appendix 8) which contained an information sheet concerning the study, the questionnaire, a feedback sheet and a return-addressed envelope. Participants were advised to return their completed questionnaire and feedback sheet enclosed in the envelope provided. The information sheet briefly introduced the research study and the significance of the pilot study. The feedback sheet collected information to assist in modifying the questionnaire, including participants' comments on the content and format of the questionnaire, estimated time for completion, preferred way of completing the questionnaire, and their perception about the ease of completion. Space for extra comments was also included on the feedback sheet.

Seven students reported that they understood all the questions in the questionnaire. The other three students reported some difficulties in answering the items about parent occupation, where they were requested to code their parents' occupations into specific categories. Suggestions for modification included providing explanation and explicit examples for each category. After consideration of this feedback, these items were then modified into 'Does your father/mother work in a health care profession?', for which only a 'yes' or 'no' was required.

The mean time reported for completing the questionnaire was seven minutes (range 5-12 minutes). This information was then included in the information sheet for the main study, making it clear that that completion of the questionnaire would take less than 15 minutes.

Six out of the 10 students preferred to complete the questionnaire online and four preferred a paper version. All 10 participants rated the ease of completion as ‘easy’ or ‘very easy’. Since there was no special preference from the students for questionnaire delivery, advice was sought from the medical staff and researchers who had experience in conducting questionnaires with medical students, regarding ways to approach the students, the strategies to maximise the response rate, and the appropriate and convenient timing of data collection. As a result, the ultimate methods for questionnaire delivery varied and these have been described further in Section 3.4.

3.5.3 Modification of questionnaire for each survey

The basic questionnaire was modified slightly to reflect different situations for participants at the time of being surveyed. Table 11 shows the details of the modifications for each questionnaire from the basic questionnaire. All four questionnaires are also attached as appendices (Appendix 2 through Appendix 5)

Table 11 Summary of modifications of four questionnaires based on the basic questionnaire

Questionnaire sections	Modifications			
	Entry baseline questionnaire	**Entry follow-up questionnaire**	**Fourth-year baseline questionnaire**	**Fourth-year follow-up questionnaire**
Demographic	One extra item asking for the application to other schools was added: 'Have you applied to other medical schools? If yes, how many?'	Deleted, because can be retrieved from the responses from entry baseline questionnaire after pairing.	No modification	Deleted, because can be retrieved from the responses from fourth-year baseline questionnaire after pairing.
Reasons for studying medicine	Participants were asked about their reason for 'applying to study' medicine. For example, the item 'most of my friends are studying medicine' was adjusted into 'most of my friends are applying to study medicine'.	Participants were asked about their reasons for 'continuing to study medicine'. For example, instead of 'my parents expect me to study medicine', this item was changed into 'my parents expect me to continue to study medicine.'	Participants were asked about their reasons for 'continuing to study medicine'. For example, instead of 'my parents expect me to study medicine', this item was changed into 'my parents expect me to continue to study medicine.'	Participants were asked about their reasons for 'continuing to study medicine'. For example, instead of 'my parents expect me to study medicine', this item was changed into 'my parents expect me to continue to study medicine.'
Altruistic attitudes	No modification	No modification	No modification	No modification
Expectations/experience of learning at university	The set of wording asking for expectations was used.	The set of wording asking for experiences was used.	The set of wording asking for experiences was used.	The set of wording asking for experiences was used.

3.6 Statistical analysis

The analysis included three stages: analysis of baseline responses, analysis of follow-up responses, and the comparison between baseline and follow-up. These three stages of analysis are described below. This section also presents calculations of power that were based on the predicted number of respondents to each component of the study.

3.6.1 Baseline responses analysis

The analysis of baseline responses (collected in the entry baseline questionnaire and the fourth-year baseline questionnaire) was designed to:

- describe participants' motivations for studying medicine, altruistic attitudes, and expectations/experiences of learning at university; and
- explore the relationships between motivations for studying medicine, altruistic attitudes, and expectations/experiences of learning at university.

Table 12 outlines the steps for the analysis of baseline responses. In the initial stages, frequency distributions were calculated for responses to each of the items. For Likert scale responses, mean, standard deviations, and 95% confidence interval were calculated. Percentages of students who chose 'agree' or 'strongly agree' (or 'slightly important' or 'very important') were aggregated to give percentages of broad agreement/broad importance.

To test the construct validity of the items of reasons for studying medicine and to assist further analysis, exploratory factor analysis was conducted using the procedure recommended by Pett et al. (2003). First, internal consistency of the 14 items of reasons for studying medicine was examined by deriving Pearson's correlation matrix to assess any clustering pattern. Bartlett's test of sphericity was then conducted to determine if the correlation matrix was consistent with an identity matrix. A Kaiser-Meyer-Olkin Test was conducted to measure the sampling adequacy relative to the number of items included in the analysis. A threshold of 0.6 was used as the minimum value indicative of an adequate sample size relative to the number of items. The anti-image correlation matrix was formed to examine the strength of correlations among individual items. A

threshold of 0.5 was used as the minimum value indicative of strong enough correlations among individual items for factor extraction (Hair et al., 2010, p.4). Factor analysis was then carried out using the method of principal component analysis to extract a set of uncorrelated underlying factors explaining the total variance of the responses. Varimax rotation was applied to the extracted factors to maximize the separation of the factors. Factors with eigenvalues equal or higher than 1 were retained. Each retained factor was then labelled after examining the items included in that factor based on the literature. For each factor, both the Cronbach's alpha (Pett et al., 2003) and the mean inter-items correlation (Pallant, 2010) were calculated to indicate the internal consistency. A Cronbach's alpha value of 0.60-0.69 was considered marginal and greater than 0.70 was considered to indicate a reliable set of items (Pett et al., 2003). A mean inter-item correlation value between 0.2 and 0.4 was considered acceptable (Pallant, 2010). For this study the mean inter-item correlation is considered a better indicator of internal consistency reliability, as Pallant (2010) suggests that Cronbach's alpha is not a good indicator of internal consistency reliability for a scale with fewer than 10 items. A score for each factor was also generated based on the mean rating of items loading above 0.4 on each factor. This factor analysis was conducted only for the responses from the entry baseline questionnaire. Based on the factors identified, scores for factors of reasons for studying medicine were calculated for the responses from the fourth-year baseline questionnaire. Summary statistics using means and standard deviations were calculated for the factors identified.

Participants' responses regarding reasons for studying medicine, altruistic attitudes, and expectations/experiences of learning at university were compared by socio-demographic characteristics. Likert-scale responses were compared using Mann Whitney U-tests. Categorical variables were compared using Chi-square tests of association, with Fisher's exact test used when the expected count for any cell was less than 5.

The relationships between scores for factors of reasons for studying medicine and socio-demographic characteristics were examined using both bivariate analysis and multivariable analysis. Bivariate analysis was conducted using Mann Whitney U-tests and Kruskal Wallis tests, as appropriate. Multivariable analysis was conducted using multiple linear regressions. Backwards elimination was used with all socio-demographic variables initially entered as independent variables. The variable which

made the smallest, non-significant contribution to the fit of this initial model (based on likelihood ratio tests) was then eliminated, and the regression was re-fitted with the reduced set of independent variables. Variables continued to be eliminated until all the remaining variables were statistically significant predictors in the model. A similar process was followed for the analysis of the altruistic attitude score.

Finally, the relationships between reasons for studying medicine (both individual items of reasons and scores for factors of reasons for studying medicine), altruistic attitudes, and expectations/experiences of learning at university were explored. Spearman's correlation or Kruskal Wallis tests were used in this step, as appropriate.

Table 12 Summary of baseline responses analysis

Description of analysis	Variables	Analysis methods
Descriptive	Social-demographic variables Reasons for studying medicine Altruistic attitudes Expectations/experiences of learning at university	Frequency distribution Mean, standard deviation, and 95% CI Percentage of combined 'agree' or 'strongly agree' ('slightly important' or 'very important')
Explorative factor analysis (only for response from entry baseline questionnaire)	Reasons for studying medicine	Factor analysis Cronbach's alpha calculation/Mean inter-items correlation calculation
Comparison of responses by demographic characteristics	Reasons for studying medicine/ scores for factors of reasons for studying medicine Altruistic attitudes Expectations/experiences of learning at university	Mann Whitney U-test Kruskal Wallis Chi-square test of association or Fisher's exact test Multiple linear regression
Correlation analysis	Reasons/ scores for factors of reasons for studying medicine and expectations/experiences Reasons/ scores for factors of reasons for studying medicine and altruistic attitudes Expectations/experiences and altruistic attitudes	Spearman's correlation

3.6.2 Follow-up responses analysis

The analysis of follow-up responses (collected in the entry follow-up questionnaire and the fourth-year follow-up questionnaire) was similarly designed to:

- describe participants' motivations for studying medicine, altruistic attitudes, and expectations/experiences of learning at university; and
- explore the relationships between motivations for studying medicine, altruistic attitudes, and expectations/experiences of learning at university.

The analysis of follow-up responses proceeded in a similar fashion to that for baseline responses. However, factor analysis was not conducted for the follow-up responses. The calculation of scores for factors of reasons for studying medicine for follow-up responses was based on the factors identified from the responses from the entry baseline questionnaire. There was no comparison of participants' scores for factors of reasons for studying medicine and altruistic attitude score by socio-demographic characteristics, since socio-demographic characteristics were not collected in follow-up questionnaires. Other steps are the same as the baseline responses analysis (Table 13).

Table 13 Summary of follow-up responses analysis

Description of analysis	Variables	Analysis methods
Descriptive	Reasons for studying medicine	Frequency distribution
	Altruistic attitudes	Mean, standard deviation, and 95% CI
	Expectations/experiences of learning at university	Percentage of combined 'agree' or 'strongly agree' (or 'slightly important' or 'very important')
Correlation analysis	Reasons/ scores for factors of reasons for studying medicine and expectations/experiences	Spearman's correlation
	Reasons/ scores for factors of reasons for studying medicine and altruistic attitudes	
	Expectations/experiences and altruistic attitudes	

3.6.3 Comparison between baseline and follow-up responses

The baseline and the follow-up responses were compared so as to determine if:

- medical students' reasons for studying medicine change after the first/fourth year at the medical program;
- medical students' altruistic attitudes change after the first/fourth year at the medical program;
- medical students' experiences of learning at university change/differ from their expectations after the first year of preclinical training/clinical training; and
- the alignment between medical students' expectations/experiences varies by reasons for studying medicine

Table 14 outlines the analysis in this stage. All responses collected from the entry baseline questionnaire were compared with all responses collected from the entry follow-up questionnaire regarding the reasons for studying medicine, altruistic attitudes, and expectations/experiences of learning at university. Similarly, all responses collected from the fourth-year baseline questionnaire were compared with all responses collected from the fourth-year follow-up questionnaire regarding the reasons for studying medicine, altruistic attitudes, and expectations/experiences of learning at university. The same comparison was then conducted within only the paired baseline and follow-up responses. Likert-scale responses were compared using Mann Whitney U-test (for all responses) and Wilcoxon signed ranks test (for paired responses). Categorical variables, such as the time (expected to) spent on private/independent study, were compared using Chi-square tests of association or Fisher's exact tests, as appropriate.

In addition, participants with paired baseline and follow-up responses were classified into groups based on their reasons for studying medicine at baseline. To do this, hierarchical cluster analysis with Ward's linkage method was conducted. The similarity of participants was measured based on their scores for factors of reasons for studying medicine at baseline time points, using Euclidean distance as the measure of similarity between participants. The number of clusters was decided using a combination of the dendrogram and two stopping rules (Clatworthy et al., 2005, Stata Corporation, 2005): the Calinski/Harabasz pseudo-F index (Caliński et al., 1974) and the Duda–Hart

Je(2)/Je(1) index (Duda et al., 1973). For both rules, larger values indicate more distinct clustering. Pseudo-T-squared values were also presented with the Duda-Hart Je(2)/Je(1) values, of which smaller values indicate more distinct clustering. Each cluster was named after examining their mean scores for factors of reasons for studying medicine. Then within each cluster group of participants (the cluster identified in cluster analysis), paired baseline and follow-up responses were compared regarding their altruistic attitudes and expectations/experiences of learning at university, using Wilcoxon signed-ranks test for Likert-scale responses and Chi-square tests of association or Fisher's exact tests for categorical variables.

Table 14 Summary of comparison between baseline and follow-up responses

Description of analysis	Variables	Analysis methods
Comparison with baseline responses (within all responses and paired responses)	Reasons for studying medicine/ scores for factors of reasons for studying medicine	Mann Whitney U-test
		Wilcoxon signed ranks test
	Altruistic attitudes	Chi-square test of association or Fisher's exact test
	Expectations/experiences of studying at university	
Paired comparison within subgroups	Altruistic attitudes	Hierarchical cluster analysis
	Expectations/experiences of learning at university	Wilcoxon signed ranks test
		Chi-square test of association or Fisher's exact test

Since multiple items were used to measure the same underlying constructs, type I error was likely to increase. Therefore, the researcher set a conservative alpha level for rejecting the null hypothesis when it is true (p value at 0.01). There is no further adjustment for the p value, as recommended by Rothman (1990). Analyses were undertaken using Stata/IC 12 (Stata Corporation, 2011). IBM SPSS Statistics Version 20 was used only for the pre-tests in factor analysis.

3.6.4 Power analysis

A priori sample size calculation was not undertaken. All available responses to each of the four questionnaires in this study were used in the analyses. Assumptions about the number of respondents to each stage were made when planning the study, and power

calculations were carried out to determine the minimum effect sizes that would be detected as statistically significant in different analyses. All power analysis were conducted using G* Power 3 (Faul et al., 2009).

Baseline responses

The number of domestic applicants attending the oral assessment for 2012 entry was prospectively estimated as to be 450. Assuming an 80% response rate (Dillman, 2000), 360 first year baseline responses would be available for analysis. With this sample size, Mann Whitney U-tests could demonstrate small effect sizes of 0.37 as statistically significant (assuming $\alpha = 0.01$, power = 0.80, and equally sized comparison groups). Multiple linear regressions could demonstrate small effect sizes of 0.06 as statistically significant (assuming $\alpha = 0.01$, power = 0.80, and 10 socio-demographic characteristics in the model). A sample size of 360 was also considered adequate for factor analysis as it ensured that there were more than 10 observations for each of the 14 items regarding reasons for studying medicine (Everitt, 1975, Pett et al., 2003).

A response rate of 50% from the fourth year students would result in approximately 100 completed fourth year baseline questionnaires available for analysis. With this size sample, Mann Whitney U-tests could demonstrate medium effect sizes of 0.71 as statistically significant (assuming $\alpha = 0.01$, power = 0.80, and equally sized comparison groups). Multiple linear regressions could demonstrate medium effect sizes of 0.25 as statistically significant (assuming $\alpha = 0.01$, power = 0.80, and 10 socio-demographic characteristics in the model).

Follow-up responses

It was assumed that the size of the second year cohort of medical students was 200, and 50% of students would respond to the follow-up questionnaire. With 100 responses, Mann Whitney U-tests could demonstrate medium effect sizes of 0.71 as statistically significant (assuming $\alpha = 0.01$, power = 0.80, and equally sized comparison groups). Spearman's correlation analysis could demonstrate medium effect sizes of 0.33 as statistically significant (assuming $\alpha = 0.01$, power = 0.80). A similar response and effect sizes were assumed to be demonstrable with the follow-up responses obtained from the fifth year medical students.

Baseline – follow-up comparisons

If 50% of the responses from medical applicants and second year students could be paired, 50 paired observations would be available for analysis. With this sample size, small effect sizes of 0.47 could be detected as statistically significant in Wilcoxon signed-ranks tests (assuming $\alpha = 0.01$, power = 0.80). If 30 paired observations were available, then the detectable effect size would be 0.62 (assumptions as previously).

Thus the predicted number of available responses appeared to be sufficiently large to investigate the aims of the thesis.

3.7 Summary

This chapter has given a full description of the study methods. In the following chapter the results around medical students' reasons for studying medicine are reported.

CHAPTER 4. REASONS FOR STUDYING MEDICINE

4.1 Introduction

This chapter provides a full description of the results around participants' reasons for studying medicine. The results are structured in the following order: results from baseline questionnaires, results from follow-up questionnaires, and results from the comparison between baseline and follow-up questionnaires.

This chapter also provides a description of how medical students with paired baseline and follow-up responses were classified into groups according to their reported reasons for studying medicine at baseline. Subsequent chapters explore results associated with this classification.

4.2 Baseline responses

The presentation of results from baseline responses begins with descriptive information about participants' socio-demographic characteristics and reasons for studying medicine. Results from the factor analysis and the calculation of the scores for factors of reasons for studying medicine are then reported. Finally the associations between scores for factors of reasons for studying medicine and socio-demographic characteristics are reported.

4.2.1 Descriptive information

Medical applicants

Of the 458 medical applicants attending the oral assessment for 2012 entry into the University of Adelaide medical program, 411 completed the entry baseline questionnaire (response rate of 90%). Participants' socio-demographic information is shown in Table 15. Most of the participants were male (n = 239; 58%), born in Australia (n = 292; 71%), held an Australian citizenship (n = 363; 88%), spoke English at home (n = 314; 76%), and completed their last year of secondary schooling at an Australian non-government school (n = 250; 61%). Twelve per cent (n = 49) of the participants had both parents working in a health-related profession and 56% (n = 230) had at least one family member working in a health-related profession. Most of the

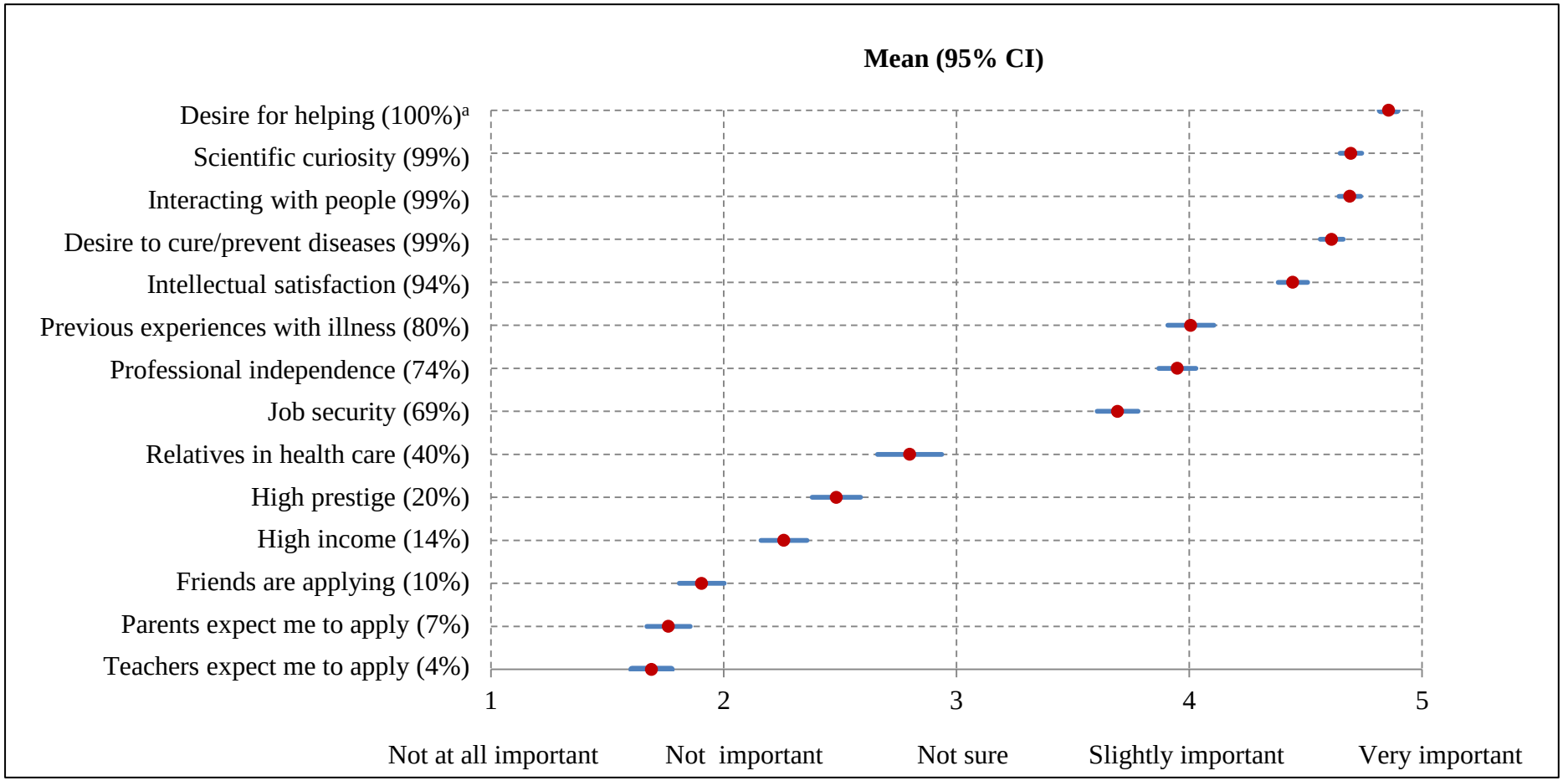
medical applicants' fathers (n = 320; 78%) or mothers (n = 302; 73%) held a bachelor-level degree or higher. In addition, 92% (n = 378) of the participants reported that they had applied to other medical schools aside from the University of Adelaide medical program.

Table 15 Summary of socio-demographic characteristics of medical applicants (n = 411)

Characteristics	Frequency (%)	
Sex		
Male	239 (58)	
Female	172 (42)	
Country of birth		
Australia	292 (71)	
Other countries	119 (29)	
Citizenship		
Australian	363 (88)	
Other	48 (12)	
Language spoken at home		
English	314 (76)	
Other	97 (24)	
Secondary schooling		
Australian government school	137 (33)	
Australian non-government school	250 (61)	
Other country	24 (6)	
Family members working in health-related profession (except parents)		
Yes	163 (40)	
No	248 (60)	
	Father	Mother
Parents' occupation		
Heath-related profession	91 (22)	103 (25)
Other profession	313 (76)	303 (74)
N/A	7 (2)	5 (1)
Parents' highest level of complete educational qualification		
Bachelor or above	320 (78)	302 (73)
Certificate/diploma	35 (8)	47 (11)
Secondary or below	44 (11)	53 (13)
Other education (non-award courses)	5 (1)	3 (1)
N/A	7 (2)	6 (2)

Medical applicants' mean ratings of the importance of the 14 items regarding their reasons for applying to study medicine are shown in Figure 7. The items are ordered from the highest mean rating to the lowest mean rating. The items with the highest mean ratings were 'I have a desire for helping others' (Mean = 4.86, SD = 0.36), 'I have scientific curiosity' (Mean = 4.70, SD = 0.48), and 'I enjoy interacting with people' (Mean = 4.69, SD = 0.48). The items with the lowest mean ratings were 'Most of my friends are applying' (Mean = 1.90, SD = 0.99), 'My parents expect me to study medicine' (Mean = 1.75, SD = 0.95), and 'My teachers expect me to study medicine' (Mean = 1.68, SD = 0.85).

Figure 7 Summary of medical applicants' ratings of the importance of their reasons for applying to study medicine (n = 411)



Notes: [a] *Percentage of combined 'very important/slightly important'.*

Fourth year medical students

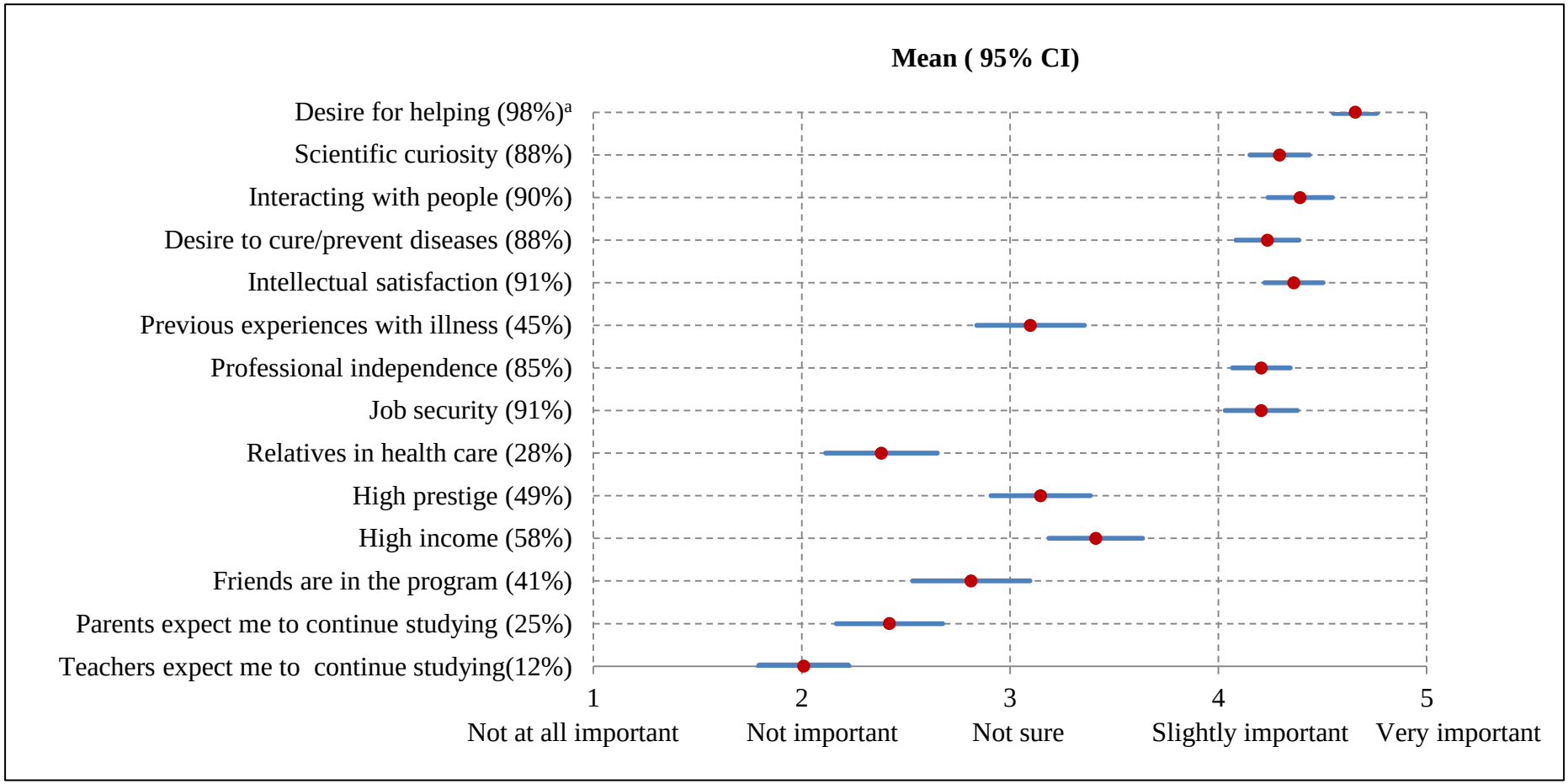
Of the 187 fourth year medical students enrolled in 2012, 102 (response rate of 55%) completed the fourth-year baseline questionnaire. Socio-demographic characteristics of these participants are shown in Table 16. Most of the participants were female (n = 66; 65%), born in Australia (n = 61; 60%), held an Australian citizenship (n = 84; 82%), spoke English at home (n = 84; 82%), and completed their last year of secondary schooling at an Australian non-government school (n = 60; 59%). Twenty per cent of the participants (n = 20) had both parents working in a health-related profession and 65% (n = 66) had at least one family member working in a health-related profession. Most of the students' fathers (n = 77; 75%) or mothers (n = 68; 66%) held a bachelor-level degree or higher.

Table 16 Summary of socio-demographic characteristics of 2012 fourth year medical students (n = 102)

Characteristics	Frequency (%)	
Sex		
Male	36 (35)	
Female	66 (65)	
Country of birth		
Australia	61 (60)	
Other countries	41 (40)	
Citizenship		
Australian	84 (82)	
Other	18 (18)	
Language spoken at home		
English	84 (82)	
Other	18 (18)	
Secondary schooling		
Australian government school	24 (23)	
Australian non-government school	60 (59)	
Other country	18 (18)	
Family members working in health-related profession (except parents)		
Yes	49 (48)	
No	53 (52)	
	Father	Mother
Parents' occupation		
Heath-related profession	32 (31)	32 (31)
Other profession	70 (69)	70 (69)
Parents' highest level of complete educational qualification		
Bachelor or above	77 (75)	68 (66)
Certificate/diploma	9 (9)	13 (13)
Secondary or below	14 (14)	20 (20)
Other education (non-award courses)	1 (1)	0 (0)
N/A	1 (1)	1 (1)

Fourth year medical students' mean ratings of the importance of the 14 items regarding their reasons for studying medicine are shown in Figure 8. The items are presented in the same order as for the medical applicants (Figure 7) so as to enable comparison. The items with the highest mean ratings were 'I have a desire for helping others' (Mean = 4.66, SD = 0.52), 'I enjoy interacting with people' (Mean = 4.39, SD = 0.79), and 'Medicine will provide intellectual satisfaction' (Mean = 4.36, SD = 0.71). The items with the lowest mean ratings were 'I have relatives in health care' (Mean = 2.38, SD = 1.36), 'My parents expect me to continue studying medicine' (Mean = 2.42, SD = 1.31), and 'My teachers expect me to continue studying medicine' (Mean = 2.01, SD = 1.08).

Figure 8 Summary of fourth year medical students' ratings of the importance of their reasons for studying medicine (n = 102)



Notes: The items were presented in the same order as the medical applicants; [a] percentage of combined 'very important/slightly important'.

4.2.2 Factors of reasons for studying medicine and scores for each factor

As described in Section 3.6.1, factor analysis of the 14 reason items was conducted for the responses from the entry baseline questionnaire (by medical applicants).

Preliminary analysis suggested that factor analysis of the 14 Likert scale items regarding reasons for studying medicine was feasible. First, the correlation matrix indicated that there were significant correlations between items, which might eventually combine in some fashion to form factors. Second, Bartlett's test of sphericity was significant ($\chi 2$ (91) = 1040.66, $p < .001$), which indicated that the pair wise correlation matrix for the 14 items was not an identity matrix, so that a factor analysis was appropriate. Third, the Kaiser-Meyer-Olkin assessment of sampling adequacy was 0.74, above the commonly recommended minimum value of 0.6 (Kaiser, 1974), which suggested that the sample size relative to the number of items was sufficient. Furthermore, the diagonals of the anti-image correlation matrix were all over 0.5, indicating that the correlation among individual items was strong enough to justify the conduct of factor analysis (Pett et al., 2003)

Four factors were extracted using the method of principal component analysis. The four initial eigenvalues above 1 explained 22%, 15%, 9%, and 8% of the total variance respectively. Table 17 shows the loadings of each item on the four factors after varimax rotation. The item 'I have relatives in health care' did not load above 0.4 on any factor. Its highest loading was 0.3471 on Factor One, while its second highest loading was 0.3239 on Factor Four. As a result, this item was not included in generating the score for any factor.

Table 17 Factor analysis of the 14 items regarding reasons for studying medicine

	Factor One	Factor Two	Factor Three	Factor Four
Items				
I have scientific curiosity	0.8091	-	-	-
I have a desire for helping others	-	0.5931	-	-
Professional independence is important to me	-	-	0.4795	-
I have previous experiences with illness (personal or family)	-	0.6217	-	-
I am attracted to the high prestige associated with medicine	-	-	0.7773	-
I have relatives in health care	-	-	-	-
Medicine will provide intellectual satisfaction	0.6888	-	-	-
I have a desire to cure/prevent diseases	-	0.5777	-	-
My parents expect me to apply	-	-	-	0.7865
A high income is important to me	-	-	0.7421	-
I enjoy interacting with people	-	0.6246	-	-
Most of my friends are applying	-	-	-	0.7495
Having job security is important to me	-	-	0.6465	-
My teachers expect me to apply	-	-	-	0.7978
Internal consistency reliability				
Cronbach's alpha	0.40	0.41	0.68	0.73
Mean inter-item correlations	0.26	0.21	0.33	0.48

Notes: ' - ' represents factor loading < 0.4.

Table 17 also shows the internal consistency reliability of each factor. The Cronbach's alpha values for Factor Three and Factor Four were reasonable at 0.68 and 0.73 respectively, given that of 0.60-0.69 was considered marginal and greater than 0.70 was considered to indicate a reliable set of items (Pett et al., 2003). Factor One and Factor Two had low Cronbach's alpha values at 0.40 and 0.41 respectively. Nevertheless, the mean inter-item correlations of the four factors ranged from 0.21 to 0.48, which were satisfactory, given the criteria that mean inter-item correlations between 0.2 and 0.4 were considered acceptable (Pallant, 2010). The four factors were then labelled as below with reference to previous literature (Wierenga et al., 2003, Price et al., 1994a, Vaglum et al., 1999a, Crossley et al., 2002, McManus et al., 2006, Puljak et al., 2007b, Molnar et al., 2008, Molnar et al., 2006, Vahid Dastjerdi et al., 2012, Morley et al., 2013):

- Factor one: labelled as science-orientation. Items included in this factor are related to the scientific aspects of medicine which attract students to study medicine, such as the scientific curiosity and intellectual satisfaction.
- Factor Two: labelled as people-orientation. Items included in this factor are related to the humanistic aspect of medicine, such as helping people, curing/preventing disease and communicating with others.
- Factor three: labelled as job status/security. Items included in this factor are related to the advantages of medicine as a job, such as the high income, high status, and good job security.
- Factor Four: labelled as external pressure. Items included in this factor are related to the influences from others on the decision for studying medicine, such as peer pressure, expectations from parents and teachers.

The medical applicants had a mean score of 4.57 (SD = 0.45) for science orientated items, 4.54 (SD = 0.39) for people-oriented items, 3.10 (SD = 0.69) for items of job status/security, and 1.78 (SD = 0.75) for items of external pressure. Fourth year medical students' mean scores for the four factors of reasons for studying medicine were also calculated based on the factor solution derived using medical applicants' responses. Fourth year medical students had a mean score of 4.33 (SD = 0.59) for science

orientated reasons, 4.10 (SD = 0.0.56) for people-oriented items, 3.74 (SD = 0.67) for items of job status/security, and 2.42 (SD = 1.01) for items of external pressure.

4.2.3 Associations between scores for factors of reasons for studying medicine and socio-demographic characteristics

Medical applicants

As shown in Table 18, results from Mann Whitney U-tests indicated that the medical applicants whose mothers were working in health-related profession had significantly higher scores for science-orientation (Median = 5; Interquartile range = 4.5-5) than those whose mothers were not working in health-related profession (Median = 4.5; Interquartile range = 4.5-5; $z = 2.74$, $p = 0.006$). Those medical applicants who spoke a language other than English at home had significantly higher scores for external pressure (Median = 2; Interquartile range = 1.33-2.67) than those who spoke English at home (Median = 1.67; Interquartile range = 1-2; $z = -3.82$, $p < 0.001$).

Results from Kruskal Wallis tests showed that there were significant differences by secondary schooling regarding medical applicants' scores for science orientation ($\chi^2 = 9.28$, $p = 0.010$) and score for external pressure ($\chi^2 = 12.68$, $p = 0.002$). Those students who completed secondary schooling in another country scored higher, on average, for science orientation and external pressure than students who completed secondary schooling at an Australian school (either government or non-government).

There were no other significant differences in medical applicants' scores of factors of reasons for studying medicine by socio-demographic characteristics found in bivariate analysis.

Table 18 Bivariate analysis of the associations between medical applicants' scores for the four factors of reasons for studying medicine and socio-demographic characteristics (n=411)

Characteristics	Science orientation						People orientation					
	Mean	SD	Median	Interquartile range	z [a] / K-W χ^{2} [b]	p*	Mean	SD	Median	Interquartile range	z / K-W χ^{2}	p
Sex					-0.37	0.712					-0.57	0.570
Male	4.57	0.45	4.5	4.5-5			4.54	0.38	4.5	4.25-4.75		
Female	4.58	0.47	4.5	4.5-5			4.55	0.40	4.75	4.25-4.75		
Country of birth					-1.03	0.304					0.16	0.870
Australia	4.56	0.45	4.5	4.5-5			4.54	0.39	4.63	4.25-4.75		
Other countries	4.60	0.46	4.5	4.5-5			4.54	0.39	4.75	4.25-4.75		
Citizenship					-1.45	0.146					-0.37	0.710
Australian	4.56	0.45	4.5	4.5-5			4.54	0.39	4.5	4.25-4.75		
Other	4.65	0.46	5	4.5-5			4.58	0.33	4.75	4.25-4.75		
Language spoken at home					0.79	0.431					-1.67	0.095
English	4.58	0.45	4.5	4.5-5			4.53	0.38	4.5	4.25-4.75		
Other	4.54	0.47	4.5	4.5-5			4.59	0.41	4.75	4.25-5		
Family members working in health-related profession (except parents)					1.22	0.222					2.22	0.026
Yes	4.60	0.44	4.5	4.5-5			4.60	0.36	4.75	4.25-5		
No	4.55	0.46	4.5	4.5-5			4.51	0.40	4.5	4.25-4.75		
Father's occupation					2.40	0.016					-2.09	0.036
Heath-related profession	4.67	0.40	5	4.5-5			4.48	0.36	4.5	4.25-4.75		
Other profession	4.54	0.47	4.5	4.25-5			4.56	0.40	4.75	4.25-4.75		

Table 18 (Continued) bivariate analysis of the associations between medical applicants' scores for the four factors of reasons for studying medicine and socio-demographic characteristics (n=411)

Characteristics	Science orientation						People orientation					
	Mean	SD	Median	Interquartile range	z [a] / K-W χ^{2} [b]	p*	Mean	SD	Median	Interquartile range	z / K-W χ^{2}	p
Mother's occupation					2.74	0.006					0.29	0.769
Heath-related profession	4.65	0.49	5	4.5-5			4.55	0.38	4.5	4.25-4.75		
Other profession	4.54	0.44	4.5	4.5-5			4.53	0.39	4.5	4.25-4.75		
Father's highest level of complete educational qualification					1.42	0.156					0.04	0.965
Bachelor or above	4.58	0.45	4.5	4.5-5			4.54	0.39	4.75	4.25-4.75		
Below bachelor	4.51	0.46	4.5	4-5			4.54	0.39	4.5	4.25-4.75		
Mother's highest level of complete educational qualification					2.15	0.031					0.18	0.860
Bachelor or above	4.59	0.45	4.5	4.5-5			4.54	0.40	4.75	4.25-4.75		
Below bachelor	4.49	0.46	4.5	4-5			4.54	0.37	4.5	4.25-4.75		
Secondary schooling					9.28	0.010					3.53	0.171
Aust government school	4.64	0.44	5	4.5-5			4.58	0.40	4.75	4.5-5		
Aust non-government school	4.52	0.45	4.5	4.5-5			4.53	0.38	4.5	4.25-4.75		
Other country	4.71	0.49	5	4.5-5			4.48	0.34	4.5	4.25-4.75		

Table 18 (Continued) bivariate analysis of the associations between medical applicants' scores for the four factors of reasons for studying medicine and socio-demographic characteristics (n=411)

Characteristics	Job status/security						External pressure					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Sex					-0.26	0.798					2.13	0.033
Male	3.08	0.69	3.25	2.5-3.5			1.85	0.79	1.67	1.33-2.33		
Female	3.10	0.69	3	2.63-3.5			1.68	0.69	1.67	1-2		
Country of birth					-0.89	0.376					-2.14	0.033
Australia	3.07	0.68	3	2.5-3.5			1.72	0.72	1.67	1-2		
Other countries	3.13	0.70	3.25	2.75-3.5			1.91	0.81	1.67	1.33-2.33		
Citizenship					-2.09	0.037					-2.17	0.030
Australian	3.07	0.69	3	2.5-3.5			1.75	0.74	1.67	1-2		
Other	3.27	0.67	3.25	3-3.75			1.99	0.80	1.83	1.33-2.33		
Language spoken at home					-1.09	0.276					-3.82	< 0.001
English	3.07	0.69	3	2.5-3.5			1.69	0.70	1.67	1-2		
Other	3.16	0.67	3	2.75-3.5			2.04	0.85	2	1.33-2.67		
Family members working in health-related profession (except parents)					0.11	0.909					-0.10	0.922
Yes	3.10	0.71	3	2.5-3.5			1.79	0.78	1.67	1-2.33		
No	3.09	0.67	3	2.5-3.5			1.77	0.74	1.67	1-2.17		
Father's occupation					0.86	0.392					-0.81	0.419
Heath-related profession	3.15	0.61	3.25	2.75-3.5			1.71	0.71	1.67	1-2		
Other profession	3.08	0.71	3	2.5-3.5			1.80	0.77	1.67	1-2.33		

Table 18 (Continued) bivariate analysis of the associations between medical applicants' scores for the four factors of reasons for studying medicine and socio-demographic characteristics (n=411)

Characteristics	Job status/security						External pressure					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Mother's occupation												
Heath-related profession	3.12	0.68	3.25	2.5-3.75			1.73	0.75	1.67	1-2.33		
Other profession	3.08	0.69	3	2.5-3.5			1.80	0.76	1.67	1-2.33		
Father's highest level of complete educational qualification					0.35	0.724					0.15	0.878
Bachelor or above	3.10	0.70	3	2.5-3.5			1.79	0.77	1.67	1-2.33		
Below bachelor	3.08	0.67	3	2.5-3.5			1.75	0.71	1.67	1-2.33		
Mother's highest level of complete educational qualification					-0.58	0.563					-0.01	0.990
Bachelor or above	3.08	0.67	3	2.5-3.5			1.78	0.76	1.67	1-2.33		
Below bachelor	3.14	0.75	3.25	2.5-3.75			1.77	0.75	1.67	1.17-2		
Secondary schooling					6.07	0.048					12.68	0.002
Aust government school	3.16	0.75	3	2.5-3.75			1.94	0.83	2	1.33-2.33		
Aust non-government school	3.03	0.63	3	2.5-3.5			1.66	0.67	1.67	1-2		
Other country	3.35	0.77	3.25	3-3.75			2.04	0.88	1.83	1.33-2.33		

*Notes: * Mann Whitney U-test or Kruskal Wallis test as appropriate;*
[a] z score for Wilcoxon Mann Whitney test;
[b] K-W χ2 for Kruskal Wallis test, only for the comparison by secondary schooling.

Table 19 presents the results from multiple linear regressions of scores for factors of reasons on socio-demographic characteristics among medical applicants. Based on the final model, medical applicants who had their last year in Australian non-government schools had a predicted 0.15 point lower score for science orientation compared with those who had the last year in Australian government schools (95% CI = -0.25, -0.06; p = 0.002). Also, participants whose fathers were working in non-health-related professions had a predicted 0.16 point lower score for science orientation compared with those whose fathers were working in health-related professions (95% CI = -0.27, -0.05; p = 0.004).

Medical applicants who spoke a language other than English at home had a predicted 0.30 point higher score for external pressure than those who spoke English at home (95% CI = 0.13, 0.47; p = 0.001). Medical applicants who had their last year in Australian non-government schools had a predicted 0.23 point lower score external pressure compared with those who had the last year in Australian Government schools (95% CI = -0.39, -0.07; p = 0.005).

No socio-demographic characteristic were found to be significant predictors of the scores for people-orientation and job status/security.

Table 19 Multivariable analysis of the association between medical applicants' scores for the four factors of reasons for studying medicine and socio-demographic characteristics (n = 403[a])

Factors	Socio-demographic characteristics	β (95% CI)	p*
Science orientation [b]			
	Secondary schooling		
	Australian government school	-	-
	Australian non-government school	-0.15 (-0.25, -0.06)	0.002
	Other countries	0.02 (-0.18, 0.22)	0.823
	Father's occupation		
	Health-related profession	-	-
	Other profession	-0.16 (-0.27, -0.05)	0.004
External pressure [c]			
	Language spoken at home		
	English	-	-
	Other	0.30 (0.13, 0.47)	0.001
	Secondary schooling		
	Australian government school	-	-
	Australian non-government school	-0.23 (-0.39, -0.07)	0.005
	Other countries	0.14 (-0.18, 0.46)	0.383

*Notes: *Multiple regression analysis with backward selection of predictors;*
[a] 8 observations with missing data were excluded from the model;
[b] prob(F) < 0.001;
[c] prob(F) < 0.001.

Fourth year medical students

As shown in Table 20, results from Mann Whitney U-tests indicated that male fourth year medical students had a significantly lower score (Median = 4; Interquartile range = 3.5-4.25) for people-orientation than female fourth year medical students (Median = 4.25; Interquartile range = 4-4.5; z = -2.74, p = 0.006). There were no other significant differences in fourth year medical students' scores for factors of reasons for studying medicine by socio-demographic characteristics found in bivariate analysis.

Table 20 Bivariate analysis of the associations between fourth year medical students' scores for the four factors of reasons for studying medicine and demographic characteristics (n=102)

Characteristics	Science-orientation						People-orientation					
	Mean	SD	Median	Interquartile range	z[a] / K-W χ^{2} [b]	p*	Mean	SD	Median	Interquartile range	z/ K-W χ^{2}	p
Sex					0.26	0.792					-2.74	0.006
Male	4.33	0.64	4.25	4-5			3.88	0.59	4	3.5-4.25		
Female	4.33	0.56	4.5	4-5			4.22	0.51	4.25	4-4.5		
Country of birth					1.32	0.186					-0.47	0.641
Australia	4.39	0.61	4.5	4-5			4.06	0.60	4	3.75-4.5		
Other countries	4.24	0.56	4	4-4.5			4.15	0.50	4.25	3.75-4.5		
Citizenship					1.67	0.095					0.54	0.591
Australian	4.37	0.59	4.5	4-5			4.10	0.58	4.13	3.75-4.5		
Other	4.14	0.56	4	3.5-4.5			4.08	0.49	4	3.75-4.5		
Language spoken at home					-0.30	0.762					0.27	0.786
English	4.32	0.59	4.25	4-5			4.10	0.57	4	3.75-4.5		
Other	4.36	0.59	4.5	4-5			4.08	0.56	4.13	3.75-4.5		
Family members working in health-related profession (except parents)					0.86	0.388					2.49	0.013
Yes	4.38	0.60	4.5	4-5			4.21	0.61	4.5	4-4.75		
No	4.28	0.58	4	4-5			3.99	0.50	4	3.75-4.5		
Father's occupation					0.40	0.693					1.99	0.047
Heath-related profession	4.36	0.65	4.5	4-5			4.23	0.60	4.38	4-4.75		
Other profession	4.31	0.57	4.25	4-5			4.03	0.54	4	3.75-4.5		

Table 20 (Continued) bivariate analysis of the associations between fourth year medical students' scores for the four factors of reasons for studying medicine and demographic characteristics (n=102)

Characteristics	Science-orientation						People-orientation					
	Mean	SD	Median	Interquartile range	z[a] / K-W χ^{2} [b]	p*	Mean	SD	Media n	Interquartile range	z/ K-W χ^{2}	p
Mother's occupation					0.58	0.559					2.34	0.020
Heath-related profession	4.38	0.64	4.5	4-5			4.27	0.52	4.5	4-4.5		
Other profession	4.31	0.57	4	4-5			4.01	0.57	4	3.5-4.5		
Father's highest level of complete educational qualification					0.38	0.703					0.96	0.339
Bachelor or above	4.34	0.59	4.5	4-5			4.12	0.58	4.25	3.75-4.5		
Below bachelor	4.28	0.60	4	4-5			4.02	0.50	4	3.75-4.5		
Mother's highest level of complete educational qualification					0.98	0.330					1.03	0.303
Bachelor or above	4.38	0.57	4.5	4-5			4.14	0.53	4.25	3.75-4.5		
Below bachelor	4.24	0.63	4	4-5			4.01	0.62	4	3.5-4.5		
Secondary schooling					3.94	0.139					1.30	0.522
Aust government school	4.31	0.57	4.25	4-5			4.20	0.54	4.25	4-4.5		
Aust non-government school	4.41	0.58	4.5	4-5			4.05	0.59	4	3.85-4.5		
Other country	4.08	0.62	4	3.5-4.5			4.10	0.52	4.13	3.75-4.5		

Table 20 (Continued) bivariate analysis of the associations between fourth year medical students' scores for the four factors of reasons for studying medicine and demographic characteristics (n=102)

Characteristics	Job status/security						External pressure					
	Mean	SD	Median	Interquartile range	z/ K-W χ^2	p	Mean	SD	Median	Interquartile range	z/ K-W χ^2	p
Sex					0.55	0.584					0.29	0.775
Male	3.76	0.79	3.75	3.25-4.25			2.44	0.96	2.33	1.83-3.33		
Female	3.73	0.59	3.75	3.25-4			2.40	1.04	2.33	1.33-3.33		
Country of birth					1.32	0.188					0.91	0.365
Australia	3.80	0.67	3.75	3.5-4.25			2.50	1.06	2.33	1.67-3.33		
Other countries	3.66	0.66	3.75	3.25-4			2.29	0.93	2.33	1.67-2.67		
Citizenship					0.14	0.887					0.21	0.832
Australian	3.74	0.66	3.75	3.38-4.13			2.43	1.03	2.33	1.67-3.33		
Other	3.75	0.73	3.75	3-4.5			2.35	0.95	2.33	1.67-3		
Language spoken at home					1.51	0.131					0.37	0.711
English	3.78	0.68	3.75	3.5-4.25			2.43	1.02	2.33	1.67-3.33		
Other	3.56	0.56	3.75	3-3.75			2.33	0.99	2.17	1.67-3		
Family members working in health-related profession (except parents)					1.22	0.222					1.37	0.172
Yes	3.84	0.60	3.75	3.5-4.25			2.56	1.04	2.33	2-3.33		
No	3.66	0.72	3.75	3-4			2.28	0.97	2.33	1.33-2.67		
Father's occupation					1.72	0.085					1.96	0.050
Heath-related profession	3.94	0.61	4	3.5-4.5			2.73	1.13	2.67	2-3.67		
Other profession	3.65	0.68	3.75	3-4			2.27	0.92	2.17	1.67-2.67		

Table 20 (Continued) bivariate analysis of the associations between fourth year medical students' scores for the four factors of reasons for studying medicine and demographic characteristics (n=102)

Characteristics	Job status/security						External pressure					
	Mean	SD	Median	Interquartile range	z/ K-W χ^2	p	Mean	SD	Median	Interquartile range	z/ K-W χ^2	p
Mother's occupation					0.73	0.469					-1.56	0.118
Heath-related profession	3.82	0.65	3.75	3.5-4.25			2.19	1.05	2	1.17-2.83		
Other profession	3.71	0.68	3.75	3.25-4			2.52	0.98	2.33	2-3.33		
Father's highest level of complete educational qualification					1.75	0.080					1.58	0.115
Bachelor or above	3.81	0.62	3.75	3.5-4.25			2.51	1.03	2.33	2-3.33		
Below bachelor	3.52	0.75	3.75	3-4			2.13	0.89	2	1.33-2.67		
Mother's highest level of complete educational qualification					1.63	0.104					0.46	0.648
Bachelor or above	3.84	0.56	3.75	3.5-4.25			2.46	1.04	2.33	1.67-3.33		
Below bachelor	3.55	0.82	3.75	3-4.25			2.33	0.95	2.33	1.33-3		
Secondary schooling					1.76	0.414					2.02	0.364
Aust government school	3.72	0.70	3.75	3.13-4.13			2.58	0.99	2.67	1.83-3.5		
Aust non-government school	3.81	0.59	3.75	3.5-4.25			2.43	1.02	2.33	1.67-3.33		
Other country	3.56	0.84	3.63	2.75-4.25			2.15	0.98	2.17	1.37-2.67		

*Notes: * Mann Whitney U-test or Kruskal Wallis test as appropriate;*
[a] z score for Wilcoxon Mann Whitney test;
[b] K-W χ^2 for Kruskal Wallis test, only for the comparison by secondary schooling.

Table 21 shows the results from multiple linear regressions of scores for factors of reasons on socio-demographic characteristics among fourth year medical students. Among the fourth year medical students, females had a predicted score for people orientation that was 0.34 higher than males (95% CI = 0.12, 0.56; p = 0.003).

Those fourth year medical students whose fathers were working in non-health-related professions had a predicted 0.77 point lower score for external pressure compared with those whose fathers were working in health-related professions (95% CI = -1.22, -0.31; p = 0.001). The fourth year medical students whose mothers were working in non-health-related professions had 0.67 point higher score for external pressure compared with those whose mothers were working in health-related professions (95% CI = 0.23, 1.13; p = 0.004).

No socio-demographic characteristic were found to be significant predictors of the score for science-orientation and job status/security.

Table 21 Multivariable analysis of the associations between fourth year medical students' scores for the four factors of reasons for studying medicine and socio-demographic characteristics (n = 102)

Factors	Demographic characteristics	Coefficient (95% CI)	p*
People-orientation [a]			
	Sex		
	Male	-	-
	Female	0.34 (0.12, 0.56)	0.003
External pressure [b]			
	Father's occupation		
	Health-related profession	-	-
	Other profession	-0.77 (-1.22, -0.31)	0.001
	Mother's occupation		
	Health-related occupation	-	-
	Other occupation	0.67 (0.23, 1.13)	0.004

*Notes: *Multiple regression analysis with backward selection of predictors*
[a] prob(F) = 0.003;
[b] prob(F) = 0.002.

4.3 Follow-up responses

Results from follow-up responses include descriptive information about participants' socio-demographic characteristics and reasons for studying medicine, as well as scores for the factors of reasons for studying medicine calculated based on the four factors derived from medical applicants' responses.

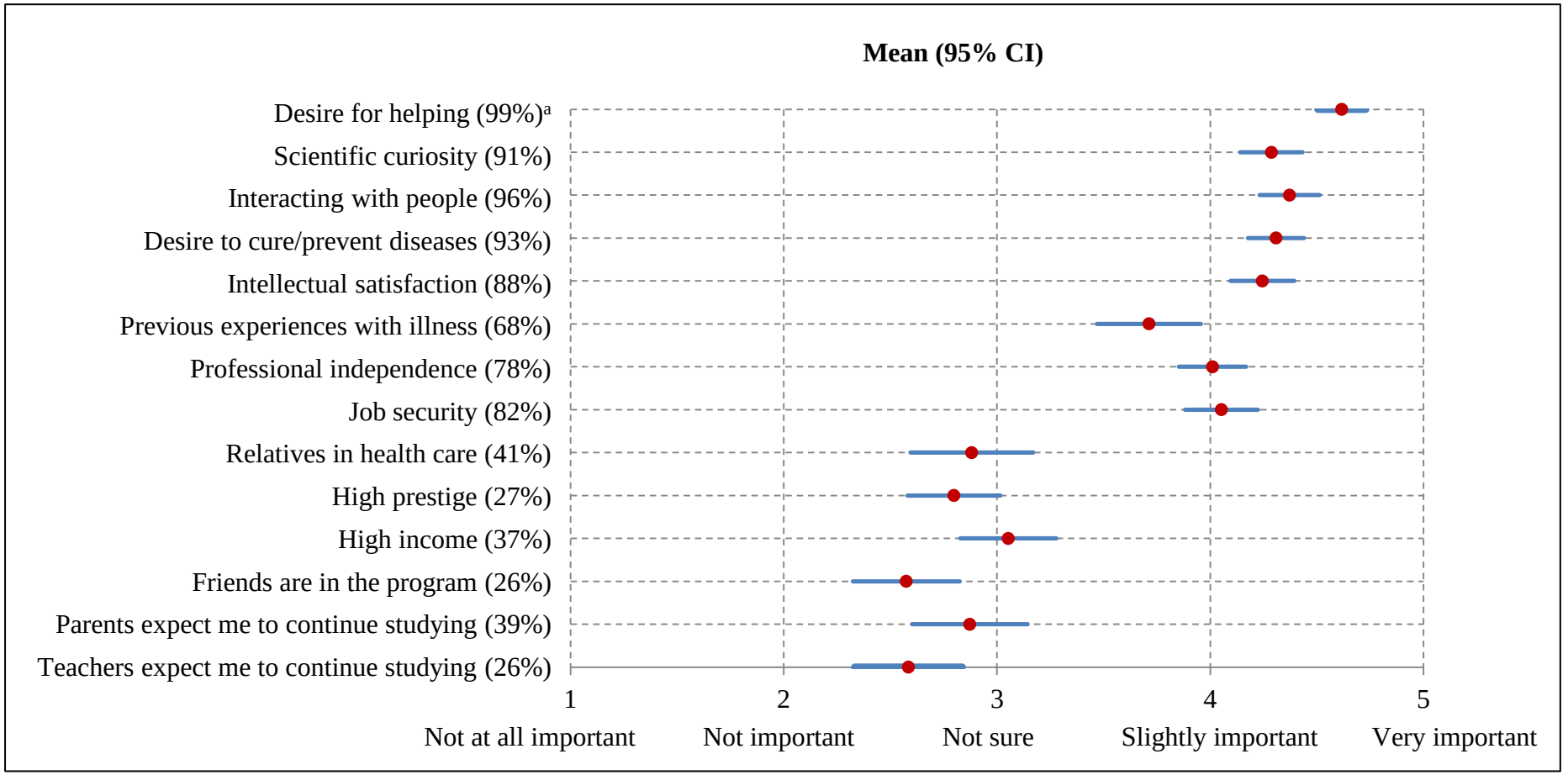
4.3.1 Descriptive information

Second year medical students

Of the 190 second year medical students enrolled in 2013, 94 (response rate of 49%) completed the entry follow-up questionnaire.

Second year medical students' mean ratings of the importance of the 14 items regarding their reasons for studying medicine are shown in Figure 9. The items were presented in the same order as the medical applicants (Figure 7). The items with the highest mean ratings were 'I have a desire for helping others' (Mean = 4.62, SD = 0.55), 'I enjoy interacting with people' (Mean = 4.37, SD = 0.69), and 'I have the desire to cure/prevent disease' (Mean = 4.31, SD = 0.63). The items with the lowest mean ratings were: 'I am attracted to the high prestige associated with medicine' (Mean = 2.80, SD = 1.06), 'Most of my friends are studying medicine' (Mean = 2.57, SD = 1.22), and 'My teachers expect me to study medicine' (Mean = 2.59, SD = 1.23).

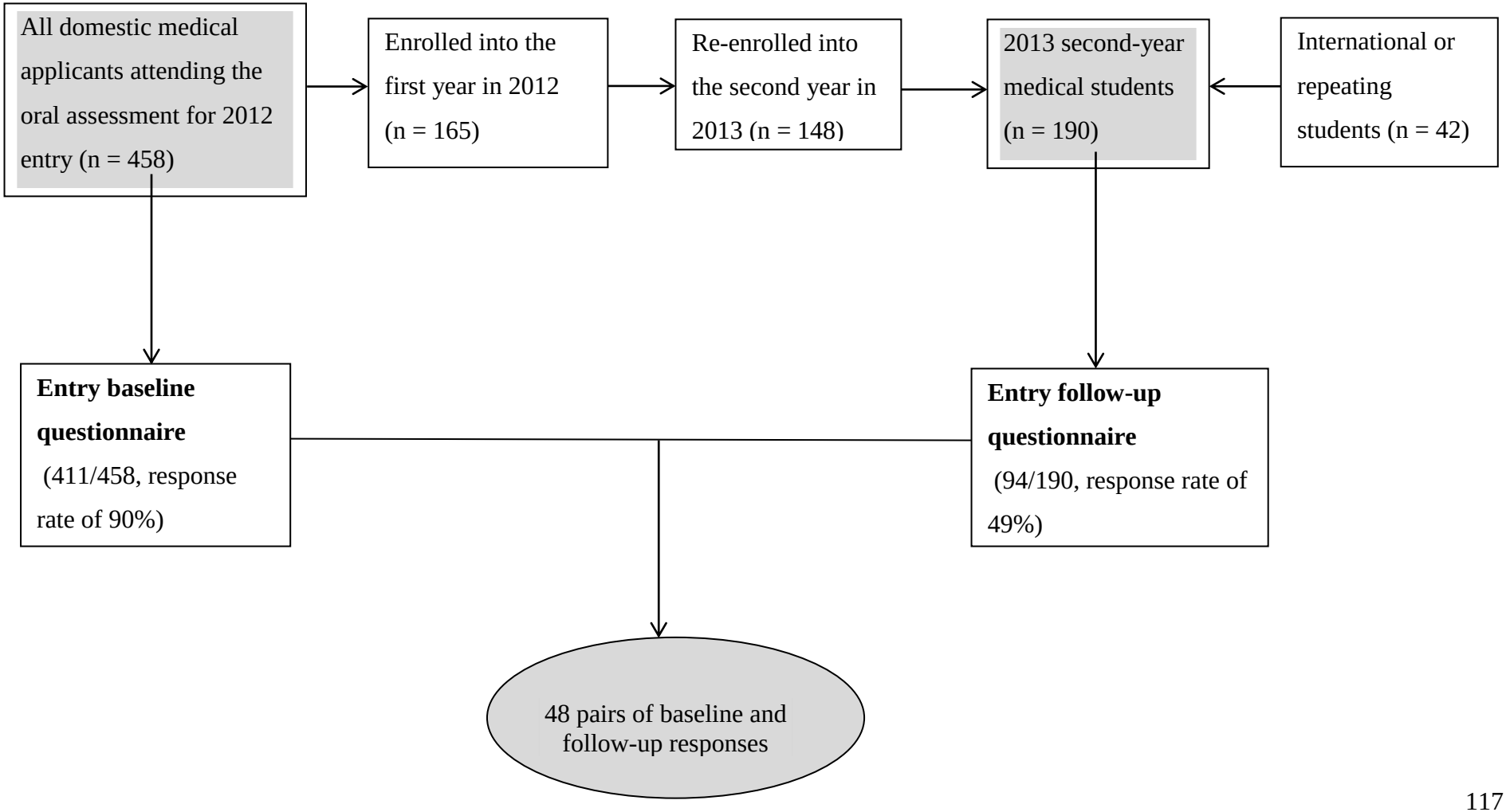
Figure 9 Summary of second year medical students' ratings of the importance of their reasons for studying medicine (n = 94)



Notes: The items were presented in the same order as the medical applicants; [a] percentage of combined 'very important/slightly important'.

Figure 10 demonstrates the pairing between responses from the entry baseline questionnaire and the responses from the entry follow-up questionnaire. As can be seen, between the 411 responses collected from medical applicants and the 94 responses collected from second year medical students, 48 paired baseline and follow-up responses were identified.

Figure 10 Demonstration of the pairing between responses from entry baseline and entry follow-up questionnaire



The demographic characteristics of the 48 medical students whose baseline and follow-up responses could be paired are shown in Table 22. Among medical applicants' responses, these 48 paired students differed from the other 363 unpaired medical applicants only by sex: 38% (18/48) of the paired applicants were male while 61% (221/363) of the unpaired applicants were male (p = 0.002).

Table 22 Summary of socio-demographic characteristics of second year medical students whose responses can be paired with a baseline response from the entry baseline questionnaire (n = 48)

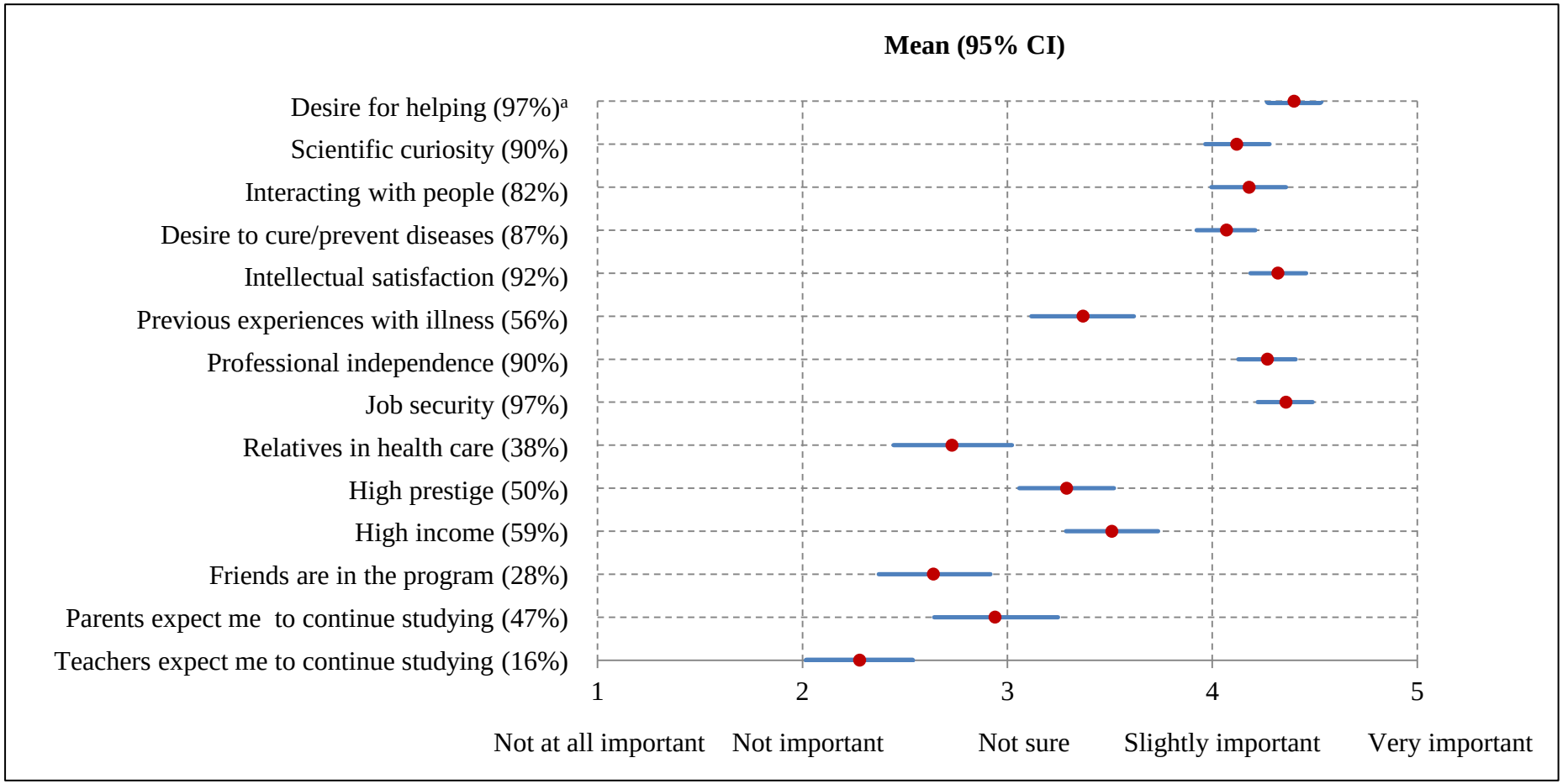
Characteristics	Frequency (%)	
Sex		
Male	18 (38)	
Female	30 (62)	
Country of birth		
Australia	37 (77)	
Other countries	11 (23)	
Citizenship		
Australian	43 (90)	
Other	5 (10)	
Language spoken at home		
English	35 (73)	
Other	13 (27)	
Secondary schooling		
Australian government school	12 (25)	
Australian non-government school	32 (67)	
Other country	4 (8)	
Family members working in health-related profession (except parents)		
Yes	12 (25)	
No	36 (75)	
	Father	Mother
Parents' occupation		
Heath-related profession	7 (15)	13 (27)
Other profession	41 (85)	35 (73)
Parents' highest level of complete educational qualification		
Bachelor or above	34 (71)	35 (74)
Certificate and diploma	5 (10)	6 (12)
Secondary or below	8 (17)	6 (12)
Other education (non-award courses)	0 (0)	0 (0)
N/A	1 (2)	1 (2)

Fifth year medical students

Of the 199 fifth year medical students enrolled in 2013, 90 (response rate of 45%) completed the fourth-year follow-up questionnaire.

The fifth year medical students' mean ratings of the importance of the 14 items regarding their reasons for studying medicine are shown in Figure 11. The items are presented in the same order as the medical applicants for 2012 entry (Figure 7). The items with the highest mean ratings were 'I have a desire for helping others' (Mean = 4.40, SD = 0.60), 'Medicine will provide intellectual satisfaction' (Mean = 4.32, SD = 0.65), and 'Having job security is important to me' (Mean = 4.36, SD = 0.64). The items with the lowest mean ratings were: 'I have relatives in health care' (Mean = 2.73, SD = 1.38), 'Most of my friends' are studying medicine' (Mean = 2.64, SD = 1.30), and 'My teachers expect me to study medicine' (Mean = 2.28, SD = 1.24).

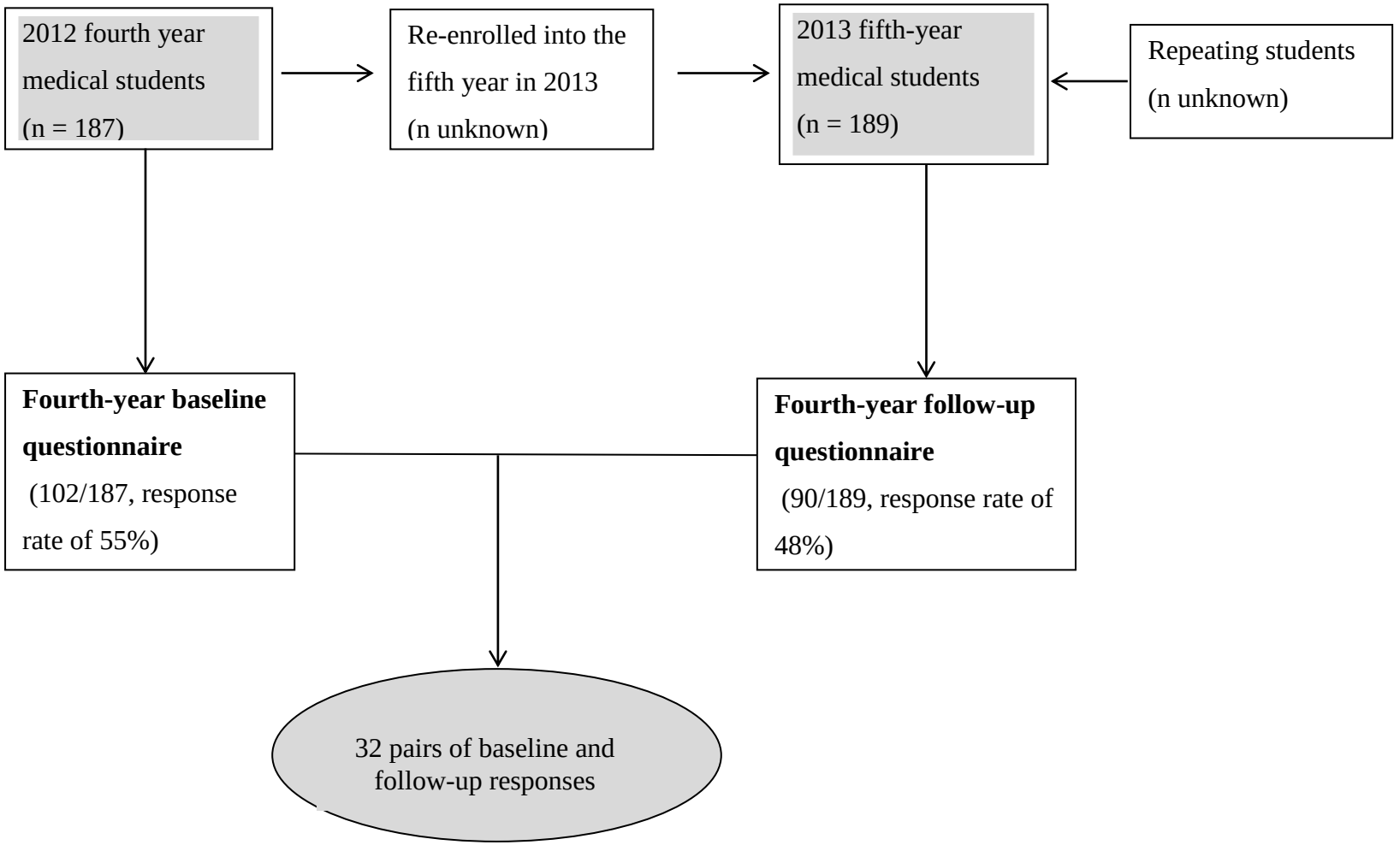
Figure 11 Summary of fifth year medical students' ratings of the importance of their reasons for studying medicine (n = 90)



Notes: The items were presented in the same order as the medical applicants; [a] Percentage of combined 'very important/slightly important'.

Figure 12 demonstrates the pairing between responses from the fourth-year baseline questionnaire and the responses from the fourth-year follow-up questionnaire. As has been seen, between the 102 responses collected from the fourth year medical students and the 90 responses collected from fifth year medical students, 32 paired baseline and follow-up responses were identified.

Figure 12 Demonstration of the pairing between responses from fourth-year baseline and fourth-year follow-up responses



The demographic characteristics of the 32 fifth year medical students whose responses could be paired are shown in Table 23. The paired and unpaired medical students did not differ on any socio-demographic characteristics at the fourth-year baseline

Table 23 Summary of socio-demographic characteristics of fifth year medical students whose responses can be paired with a baseline response from the fourth-year baseline questionnaire (n = 32)

Characteristics	Frequency (%)	
Sex		
Male	8 (25)	
Female	24 (75)	
Country of birth		
Australia	15 (47)	
Other countries	17 (53)	
Citizenship		
Australian	24 (75)	
Other	8 (25)	
Language spoken at home		
English	24 (75)	
Other	8 (25)	
Secondary schooling		
Australian government school	8 (25)	
Australian non-government school	17 (53)	
Other country	7 (22)	
Family members working in health-related profession (except parents)		
Yes	13 (41)	
No	19 (59)	
	Father	Mother
Parents' occupation		
Heath related profession	11 (34)	8 (25)
Other profession	21 (66)	24 (75)
Parents' highest level of complete educational qualification		
Bachelor or above	26 (81)	18 (56)
Certificate and diploma	3 (10)	7 (22)
Secondary or below	2 (6)	6 (19)
Other education (non-award courses)	0 (0)	0 (0)
N/A	1 (3)	1 (3)

4.3.2 Scores for the four factors of reasons for studying

Second year medical students' and fifth year medical students' scores for the factors of reasons for studying were also calculated based on the four factor solution derived using medical applicants' responses.

Second year medical students had a mean score of 4.27 (SD = 0.57) for science orientated items, 4.25 (SD = 0.52) for people-orientated items, 3.48 (SD = 0.63) for items of job status/security, and 2.68 (SD = 1.00) for items of external pressure.

Fifth year medical students had a mean score of 4.22 (SD = 0.59) for science-orientated items, 4.00 (SD = 0.53) for people-orientated items, 3.86 (SD = 0.63) for items of job status/security, and 2.62 (SD = 1.02) for items of external pressure.

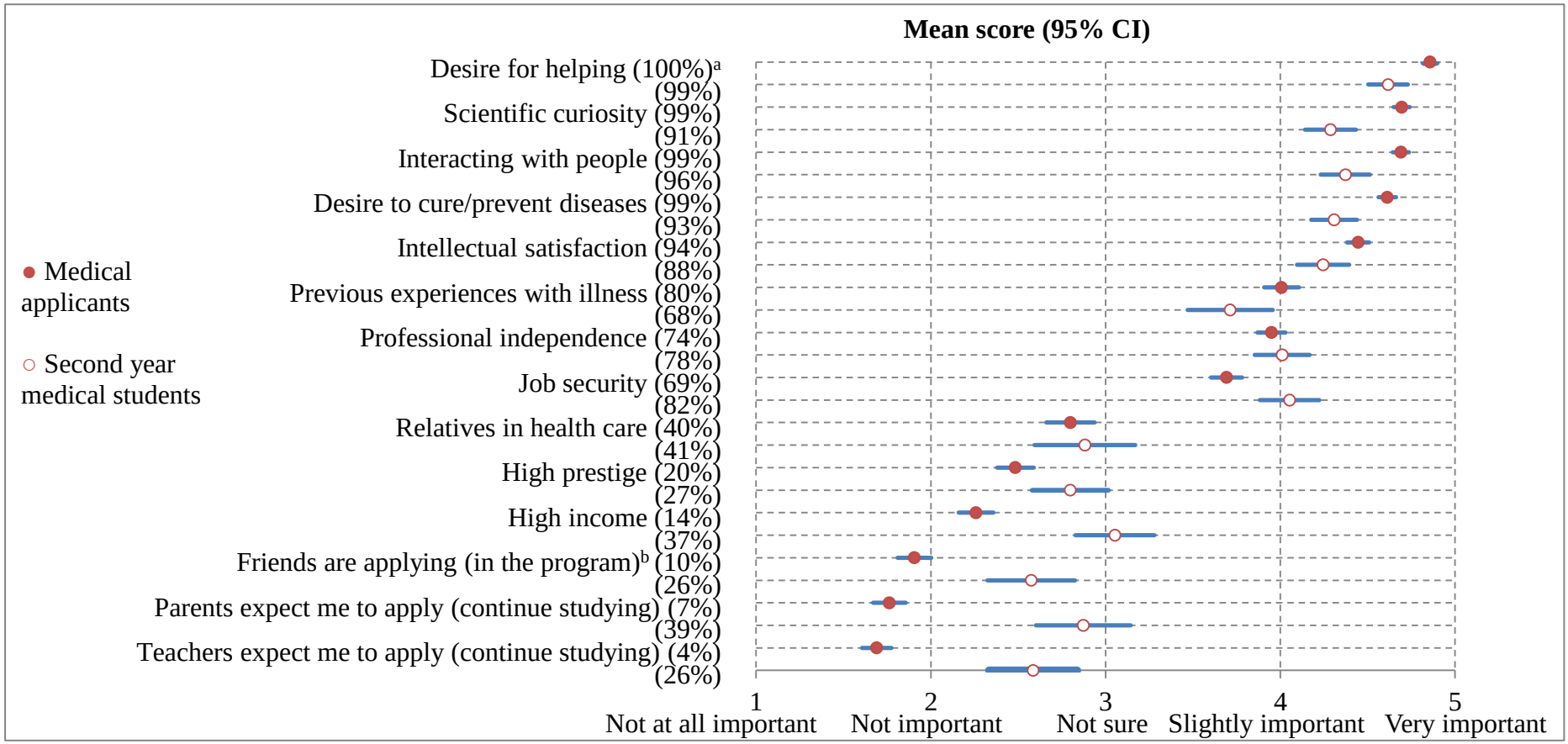
4.4 Comparison between baseline and follow-up responses

4.4.1 Change in reasons for studying medicine after the first year at medical school

As can be seen in Figure 13, a majority of both medical applicants and second year medical students rated the following items as ‘slightly important’ or ‘very important’ as reasons for (applying to) studying medicine: ‘I have a desire for helping others’, ‘I have scientific curiosity’, ‘I enjoy interacting with people’, ‘I have a desire to cure/prevent disease’, and ‘Medicine will provide intellectual satisfaction’. A small proportion of both medical applicants and second year medical students rated the influences of friends, parents and teachers as ‘not important’ or ‘not at all important’ as reasons for studying medicine. These items with the lowest mean ratings by both groups were rated much higher by second year medical students than by medical applicants.

Generally, second year medical students’ ratings for the 14 items were less extreme than that of the medical applicants, and second year medical students’ ratings were more variable with wider confidence intervals.

Figure 13 Comparison of medical applicants' (n = 411) and second year medical students' (n = 94) reasons for studying medicine



Notes: a percentage of combined 'very important/slightly important';
b words in parenthesis indicate the terminology used to describe reasons for continuing to study medicine.

As shown in Table 24, the comparison between all baseline and follow-up responses using Mann Whitney U-tests indicated that second year medical students' ratings for the 14 items differed significantly from the ratings by the medical applicants on all except three items: 'I have relatives in health care', 'Professional independence is important to me', and 'I have previous experiences with illness (personal or family)'. The major differences were: the second year medical students' ratings (Median = 3; Interquartile range = 2-4) for 'My parents expect me to apply (continue studying medicine)' was significantly higher than that of medical applicants (Median = 1; Interquartile range = 1-2; $z = -7.74$, $p < 0.001$); the second year medical students' ratings (Median = 3; Interquartile range = 2-4) for 'A high income is important to me' was significantly higher than that of medical applicants (Median = 2; Interquartile range = 1-3; $z = -6.26$, $p < 0.001$); and the second year medical students' ratings (Median = 3; Interquartile range = 2-4) for 'My teachers expect me to apply (continue studying medicine)' was significantly higher than that of medical applicants (Median = 1; Interquartile range = 1-2; $z = -6.93$, $p < 0.001$). For other items with significant differences, the median differences were small.

Table 24 Comparison of medical applicants' and second year medical students' reasons for studying medicine

Reasons for studying medicine [a]	Medical applicant for 2012 entry (n = 411)				2013 second year medical students (n = 94)				Mann-Whitney	
	Mean	SD	Median	Interquartile range	Mean	SD	Median	Interquartile range	z	p*
I have scientific curiosity	4.70	0.48	5	4-5	4.29	0.71	4	4-5	5.84	< 0.001
I have a desire for helping others	4.86	0.36	5	5-5	4.62	0.55	5	4-5	5.08	< 0.001
Professional independence is important to me	3.95	0.82	4	3-5	4.01	0.77	4	4-5	-0.56	0.574
I have previous experiences with illness (personal or family)	4.01	1.02	4	4-5	3.71	1.19	4	3-5	2.20	0.028
I am attracted to the high prestige associated with medicine	2.48	1.08	2	2-3	2.80	1.06	3	2-4	-2.70	0.007
I have relatives in health care	2.79	1.43	2	2-4	2.88	1.40	3	2-4	-0.60	0.548
Medicine will provide intellectual satisfaction	4.45	0.65	5	4-5	4.24	0.73	4	4-5	2.63	0.008
I have a desire to cure/prevent diseases	4.61	0.52	5	4-5	4.31	0.64	4	4-5	4.45	< 0.001
My parents expect me to apply (continue studying medicine)a	1.75	0.95	1	1-2	2.87	1.32	3	2-4	-7.74	< 0.001
A high income is important to me	2.25	1.02	2	1-3	3.05	1.10	3	2-4	-6.26	< 0.001
I enjoy interacting with people	4.69	0.48	5	4-5	4.37	0.69	4	4-5	4.78	< 0.001

Table 24 (Continued) comparison of medical applicants' and second year medical students' reasons for studying medicine

Reasons for studying medicine [a]	Medical applicant for 2012 entry (n = 411)				2013 second year medical students (n = 94)				Mann-Whitney	
	Mean	SD	Median	Interquartile range	Mean	SD	Median	Interquartile range	z	p*
Most of my friends are applying (studying medicine)a	1.90	0.99	2	1-2	2.57	1.22	2	2-4	-5.24	< 0.001
Having job security is important to me	3.69	0.91	4	3-4	4.05	0.83	4	4-5	-3.74	0.0002
My teachers expect me to apply (continue studying medicine)a	1.68	0.85	1	1-2	2.59	1.23	3	2-4	-6.93	< 0.001

*Notes: * Mann Whitney U-test*

[a] *words in parenthesis indicate the terminology used to describe reasons for continuing to study medicine*

These differences were confirmed by the results from comparisons between paired baseline and follow-up responses using Wilcoxon signed ranks tests (Table 25). However in this paired comparison, the difference in the rating for ‘Medicine will provide intellectual satisfaction’ was no longer significant. This may be due to reduced power because of the smaller number of observations included in the analysis. There may also be some systematic difference between those students who completed both baseline and follow-up questionnaires and those who completed only one of them. This will be further discussed in the final chapter of the thesis.

Table 25 Paired comparison of reasons for studying medicine before and after the first year at medical school (n = 48, paired)

Reasons for studying medicine [a]	Mean	SD	Median	Interquartile range	p*
I have scientific curiosity					
At application	4.71	0.46	5	4-5	< 0.001
At the start of second year	4.21	0.74	4	4-5	
I have a desire for helping others					
At application	4.92	0.28	5	5-5	0.001
At the start of second year	4.67	0.48	5	4-5	
Professional independence is important to me					
At application	3.75	0.76	4	3-4	0.012
At the start of second year	4.04	0.68	4	4-4	
I have previous experiences with illness (personal or family)					
At application	4.04	1.07	4	4-5	0.018
At the start of second year	3.73	1.16	4	3-5	
I am attracted to the high prestige associated with medicine					
At application	2.15	0.90	2	2-3	< 0.001
At the start of second year	3.02	1.08	3	2-4	
I have relatives in health care					
At application	2.70	1.49	2	1-4	0.960
At the start of second year	2.81	1.45	2	2-4	
Medicine will provide intellectual satisfaction					
At application	4.33	0.66	4	4-5	0.256
At the start of second year	4.19	0.82	4	4-5	

Table 25 (Continued) paired comparison of reasons for studying medicine before and after the first year at medical school (n = 48, paired)

Reasons for studying medicine [a]	Mean	SD	Median	Interquartile range	p*
I have a desire to cure/prevent diseases					
At application	4.75	0.44	5	4.5-5	< 0.001
At the start of second year	4.35	0.60	4	4-5	
My parents expect me to study (continue studying) medicine					
At application	1.75	0.93	1	1-2	< 0.001
At the start of second year	2.96	1.32	3	2-4	
A high income is important to me					
At application	2.15	0.97	2	1-3	< 0.001
At the start of second year	3.13	1.10	3	2-4	
I enjoy interacting with people					
At application	4.71	0.46	5	4-5	0.004
At the start of second year	4.42	0.65	4	4-5	
Most of my friends are applying (studying medicine)					
At application	1.88	0.87	2	1-2	< 0.001
At the start of second year	2.75	1.31	2	2-4	
Having job security is important to me					
At application	3.58	0.94	4	3-4	0.002
At the start of second year	4.40	0.87	4	4-5	
My teachers expect me to study (continue studying) medicine					
At application	1.67	0.75	2	1-2	< 0.001
At the start of second year	2.60	1.32	2	1.5-4	

*Notes: * Wilcoxon sign ranks test*
[a] words in parenthesis indicate the terminology used to describe reasons for continuing to study medicine

Results from paired comparison of medical applicants' scores for the four factors of reasons for studying medicine before and after the first year at medical school are shown in Table 26. The score for science-orientation declined from application (Median = 4.5; Interquartile range = 4-5) to the start of the second year (Median = 4.25; Interquartile range = 4-4.5) ($p< 0.001$). The score for people-orientation declined from application (Median = 4.75; Interquartile range = 4.25-5) to the start of the second year (Median = 4.25; Interquartile range = 4-4.63) ($p< 0.001$). In contrast, the score for job status/security increased from application (Median = 3; Interquartile range = 2.5-3.25) to the start of the second year (Median = 3.75; Interquartile range = 3.13-4) ($p< 0.001$). The score for external pressure increased from application (Median = 1.67; Interquartile range = 1-2.33) to the start of the second year (Median = 2.67; Interquartile range = 2-3.33) ($p< 0.001$).

Table 26 Comparison of medical applicants' scores for the four factors of reasons for studying medicine before and after the first year at medical school (n = 48, paired)

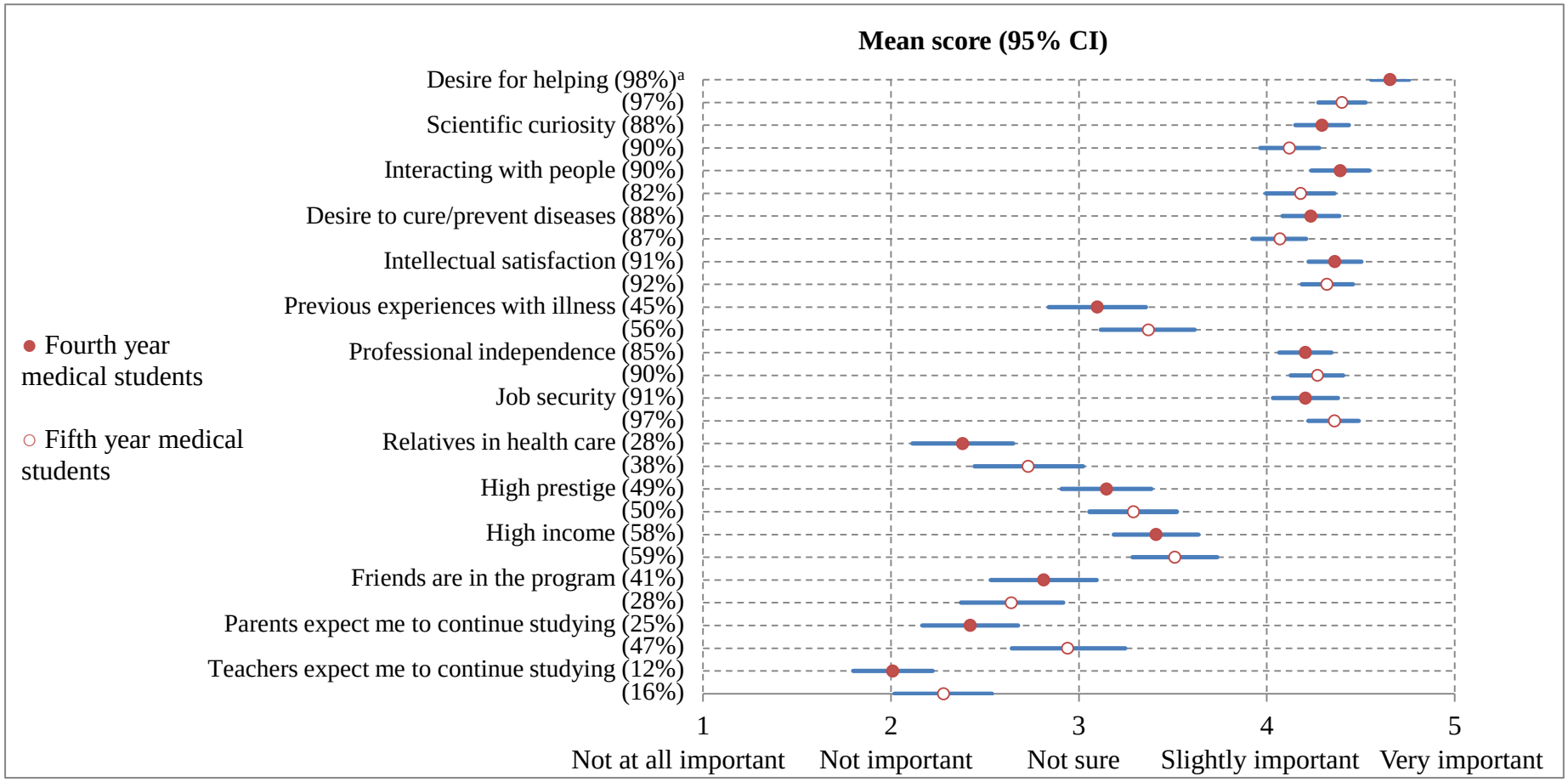
Factors of reasons for studying medicine	Mean	SD	Median	Inter-quartile range	p*
Science orientation					
At application	4.52	0.44	4.50	4-5	< 0.001
At the start of second year	4.20	0.60	4.25	4-4.5	
People orientation					
At application	4.60	0.36	4.75	4.25-5	< 0.001
At the start of second year	4.29	0.49	4.25	4-4.63	
Job status/security					
At application	2.91	0.59	3.00	2.5-3.25	< 0.001
At the start of second year	3.56	0.63	3.75	3.13-4	
External pressure					
At application	1.76	0.66	1.67	1-2.33	< 0.001
At the start of second year	2.77	1.05	2.67	2-3.33	

Notes: Wilcoxon sign ranks test*

4.4.2 Change in reasons for studying medicine after the fourth year at medical school

As can be seen in Figure 14, the majority of both fourth and fifth year medical students rated the following items as ‘slightly important’ or ‘very important’ as reasons for studying medicine: ‘I have a desire for helping others’, ‘I have scientific curiosity’, ‘I enjoy interacting with people’, ‘I have a desire to cure/prevent disease’, and ‘Medicine will provide intellectual satisfaction’. A small proportion of both fourth and fifth year medical students rated the influences from friends, parents and teachers as ‘not important’ or ‘not at all important’ as reasons for studying medicine. The fifth year medical students’ ratings for the importance of the 14 items were generally similar to those of the fourth year medical students, except for the item ‘My parents expect me to continue studying medicine’, which was rated higher by fifth year medical students than by fourth year medical students.

Figure 14 Comparison of fourth year medical student' (n = 102) and fifth year medical students' (n = 90) reasons for studying medicine



Notes: a percentage of combined 'very important/slightly important

As shown in Table 27, the comparison between all baseline and follow-up responses using Mann Whitney U-tests indicated that fifth year medical students' ratings (Median = 4; Interquartile range = 4-5) for 'I have a desire for helping others' was significantly lower than that of fourth year medical students (Median = 5; Interquartile range = 4-5; $z = 3.20$, $p = 0.001$). In contrast, fifth year medical students' ratings (Median = 3; Interquartile range = 2-4) for 'My parents expect me to continue studying medicine' was significantly higher than that of fourth year medical students (Median = 2; Interquartile range = 1-4; $z = 3.20$, $p = 0.001$). Still, the median differences were small. Except for these items, there were no other significant differences between fifth year medical students' and fourth year medical students' ratings for the items regarding reasons for studying medicine.

Table 27 Comparison of fourth year medical students' and fifth year medical students' reasons for studying medicine

Reasons for studying medicine [a]	2012 fourth year medical students (n = 102)				2013 fifth year medical students (n = 90)				Mann-Whitney	
	Mean	SD	Median	Interquartile range	Mean	SD	Median	Interquartile range	z	p*
I have scientific curiosity	4.29	0.73	4	4-5	4.12	0.75	4	4-5	1.18	0.086
I have a desire for helping others	4.66	0.52	5	4-5	4.40	0.60	4	4-5	3.20	0.001
Professional independence is important to me	4.21	0.71	4	4-5	4.27	0.67	4	4-5	-0.56	0.578
I have previous experiences with illness (personal or family)	3.10	1.32	3	2-4	3.37	1.19	4	2-4	-1.40	0.162
I am attracted to the high prestige associated with medicine	3.15	1.21	3	2-4	3.29	1.10	3.5	2-4	-0.63	0.528
I have relatives in health care	2.38	1.36	2	1-4	2.73	1.38	2	2-4	-1.83	0.067
Medicine will provide intellectual satisfaction	4.36	0.71	4	4-5	4.32	0.65	4	4-5	0.65	0.516
I have a desire to cure/prevent diseases	4.24	0.77	4	4-5	4.07	0.68	4	4-4	2.00	0.045
My parents expect me to continue studying medicine	2.42	1.30	2	1-4	2.94	1.44	3	2-4	-2.58	0.001
A high income is important to me	3.41	1.15	4	3-4	3.51	1.07	4	3-4	-0.47	0.641
I enjoy interacting with people	4.39	0.79	5	4-5	4.18	0.87	4	4-5	1.88	0.061

Table 27 (Continued) comparison of fourth year medical students' and fifth year medical students' reasons for studying medicine

Reasons for studying medicine [a]	2012 fourth year medical students (n = 102)				2013 fifth year medical students (n = 90)				Mann-Whitney	
	Mean	SD	Median	Interquartile range	Mean	SD	Median	Interquartile range	z	p*
Most of my friends are studying medicine	2.81	1.43	3	1-4	2.64	1.30	2	2-4	0.69	0.492
Having job security is important to me	4.21	0.88	4	4-5	4.36	0.64	4	4-5	-0.82	0.412
My teachers expect me to continue studying medicine	2.01	1.08	2	1-3	2.28	1.24	2	1-3	-1.40	0.162

*Notes: * Mann Whitney U-test*

Comparison between paired baseline and follow-up responses using Wilcoxon sign ranks tests (Table 28) demonstrated no significant differences in the ratings for the 14 items before and after the fourth year at medical school. This may partly be due to reduced power because of the smaller number of observations included in the analysis. There may also be some systematic difference between those students who completed both baseline and follow-up questionnaires and those who completed a questionnaire on only one occasion. A further analysis within the responses from fourth year medical students found that paired medical students' ratings (Median = 3; Interquartile range = 2-4) for 'My parents expect me to continue studying medicine' were significantly higher than those of unpaired medical students (Median = 2; Interquartile range = 1-3) ($z = 3.09$, $p = 0.002$). These will be further discussed in the final chapter.

Table 28 Paired comparison of reasons for studying medicine before and after the fourth year at medical school (n = 32, paired)

Reasons for studying medicine	Mean	SD	Median	Interquartile range	p*
I have scientific curiosity					
At the midpoint of fourth year	4.09	0.89	4	4-5	0.255
At the midpoint of fifth year	3.88	0.79	4	4-4	
I have a desire for helping others					
At the midpoint of fourth year	4.69	0.47	5	4-5	0.132
At the midpoint of fifth year	4.53	0.51	5	4-5	
Professional independence is important to me					
At the midpoint of fourth year	4.38	0.75	4.5	4-5	0.772
At the midpoint of fifth year	4.34	0.75	4	4-5	
I have previous experiences with illness (personal or family)					
At the midpoint of fourth year	3.00	1.32	3	2-4	0.072
At the midpoint of fifth year	3.31	1.26	4	2-4	
I am attracted to the high prestige associated with medicine					
At the midpoint of fourth year	3.09	1.20	3	2.5-4	0.809
At the midpoint of fifth year	3.09	0.12	3.5	2-4	
I have relatives in health care					
At the midpoint of fourth year	2.44	1.41	2	1-3	0.945
At the midpoint of fifth year	2.47	1.27	2	1.5-4	
Medicine will provide intellectual satisfaction					
At the midpoint of fourth year	4.28	0.58	4	4-5	0.564
At the midpoint of fifth year	4.22	0.75	4	4-5	

Table 28 (Continued) paired comparison of reasons for studying medicine before and after the fourth year at medical school (n = 32, paired)

Reasons for studying medicine	Mean	SD	Median	Interquartile range	p*
I have a desire to cure/prevent diseases					
At the midpoint of fourth year	4.25	0.62	4	4-5	0.025
At the midpoint of fifth year	3.88	0.71	4	4-4	
My parents expect me to continue studying medicine					
At the midpoint of fourth year	3.00	1.24	3	2-4	0.415
At the midpoint of fifth year	3.13	1.41	4	2-4	
A high income is important to me					
At the midpoint of fourth year	3.63	1.26	4	3-5	0.424
At the midpoint of fifth year	3.41	1.01	3.5	3-4	
I enjoy interacting with people					
At the midpoint of fourth year	4.44	0.72	5	4-5	0.248
At the midpoint of fifth year	4.31	0.69	4	4-5	
Most of my friends are studying medicine					
At the midpoint of fourth year	2.91	1.51	3	1.5-4	0.227
At the midpoint of fifth year	2.63	1.31	2	2-3.5	
Having job security is important to me					
At the midpoint of fourth year	4.53	0.51	5	4-5	0.083
At the midpoint of fifth year	4.34	0.48	4	4-5	
My teachers expect me to continue studying medicine					
At the midpoint of fourth year	2.34	1.26	2	1-3	0.278
At the midpoint of fifth year	2.50	1.24	2	1.5-3	

*Notes: * Wilcoxon sign ranks test*

Results from paired comparison of fourth year medical students' scores for the four factors of reasons for studying medicine before and after the fourth year are shown in Table 29. No significant changes in the scores for the four factors of reasons for studying medicine were found from the start of the fourth year to the start of the fifth year at medical school.

Table 29 Comparison of fourth year medical students' scores for the four factors of reasons for studying medicine before and after the fourth year at medical school (n = 32, paired)

Factors of reasons for studying medicine	Mean	SD	Median	Inter-quartile range	p*
Science orientation					
At the midpoint of fourth year	4.19	0.61	4	4-4.75	0.240
At the midpoint of fifth year	4.05	0.63	4	4-4.5	
People-orientation					
At the midpoint of fourth year	4.09	0.57	4	3.75-4.5	0.507
At the midpoint of fifth year	4.01	0.49	4	3.75-4.38	
Status-security					
At the midpoint of fourth year	3.91	0.63	3.75	3.5-4.25	0.383
At the midpoint of fifth year	3.80	0.60	3.75	3.25-4.25	
External pressure					
At the midpoint of fourth year	2.75	1.00	2.67	2-3.5	0.903
At the midpoint of fifth year	2.75	1.04	2.67	2-3.67	

Notes: * Wilcoxon Sign Ranks test*

4.5 Classification of participants with paired baseline and follow-up responses

As described in Section 3.6.3, there will be further comparison between paired baseline and follow-up responses within groups of participants determined by their scores for factors of reasons for studying medicine. This section describes the classification of participants into different groups using cluster analysis.

4.5.1 Medical applicants

Figure 15 shows the dendrogram for the hierarchical cluster analysis (using Ward's linkage method) of the 48 medical applicants with paired baseline and follow-up responses. As can be seen, inconsistent increases in the dissimilarity measure started to show when four clusters were merged into fewer clusters; this indicated that the clusters merged at this stage were quite distinct and the clustering process should be stopped at one step prior (Clatworthy et al., 2005).

Figure 15 Dendrogram for hierarchical cluster analysis of the applicants with paired baseline and follow-up responses (n = 48, paired)

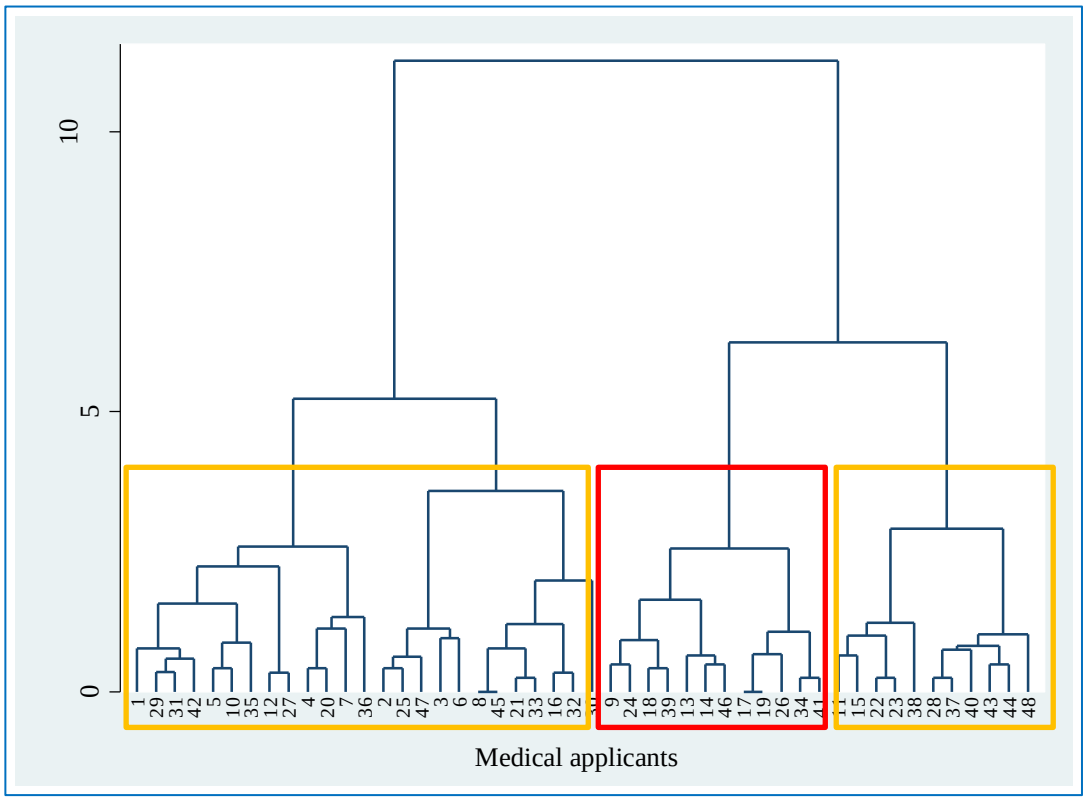


Table 30 shows the Calinski and Harabasz pseudo-F index from the second to the tenth level of the hierarchy in the hierarchical cluster analysis. As can be seen, the two-cluster solution had the largest Calinski and Harabasz pseudo-F value (19.5), followed by the four-cluster solution (17.63) and the three-cluster solution (17.13). This indicated that these solutions were the most distinct solutions compared with the other solutions (Stata Corporation, 2005).

Table 30 also shows the Duda–Hart Je(2)/Je(1) values and corresponding Pseudo T-squared values from the second to the tenth level of the hierarchy in the hierarchical cluster analysis. As can be seen, the three-cluster solution had the largest Duda–Hart Je(2)/Je(1) value of 0.71. Though the smallest pseudo T-squared value was 5.03 for the six-cluster solution, the three-cluster solution also had a relatively small pseudo T-squared of 9.49, next to which the pseudo T-squared value for the two-cluster solution was much larger at 15.78. This indicated a distinct solution at the three-cluster level (Stata Corporation, 2005).

Table 30 Calinski and Harabasz pseudo-F index ((n = 48, paired))

Number of clusters	Calinski and Harabasz pseudo-F	Duda/Hart	
		Je(2)/Je(1)	Pseudo T-squared
2	19.50	0.57	15.78
3	17.13	0.71	9.49
4	17.63	0.54	8.52
5	16.46	0.50	8.94
6	15.89	0.69	5.03
7	15.95	0.60	6.75
8	15.65	0.55	5.82
9	15.85	0.33	9.95
10	16.28	0.48	5.38

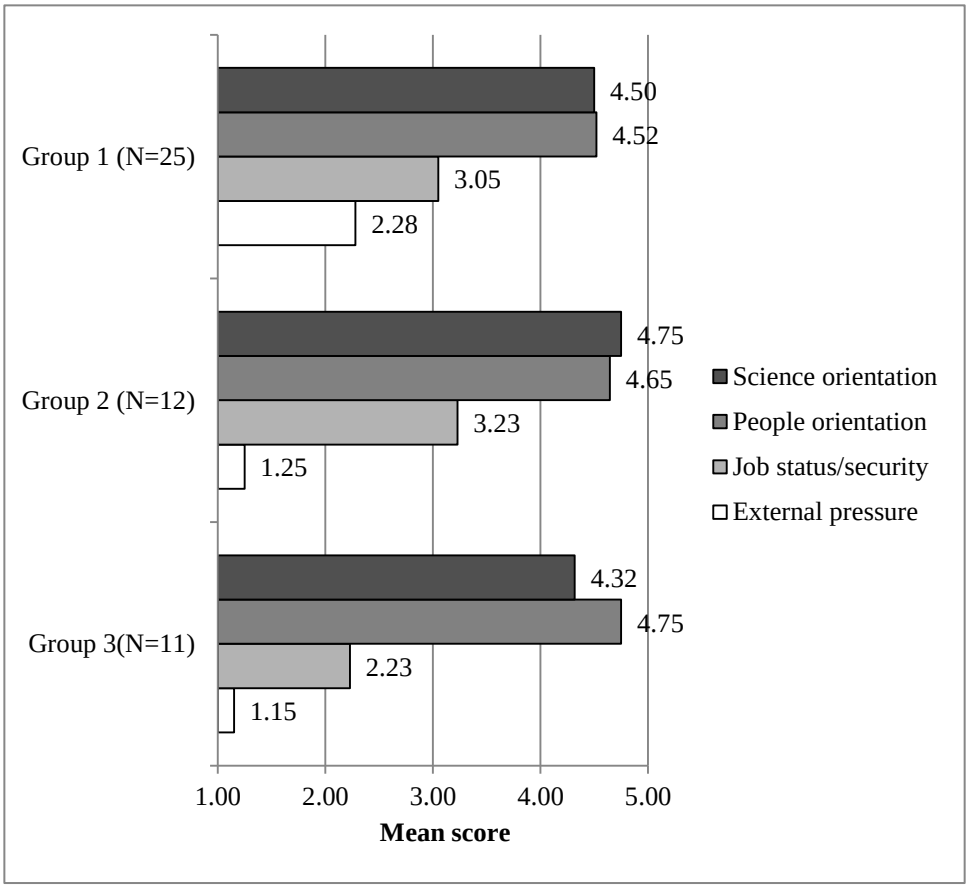
Considering the dendrogram and the two cluster stopping rules, the researcher decided that the three-cluster solution was the most appropriate for these data (as shown in Figure 15). Figure 16 shows the mean scores for the four factors of reasons for studying medicine for each group (cluster) of medical applicants. As can be seen, all three groups had high mean scores for science orientation, high mean scores for people orientation, and low mean scores for external pressure. Group 1 (mean = 2.28) had a relatively

higher mean score for external pressure than Group 2 (mean = 1.25) and Group 3 (1.15). The mean score for job status/security was medium for Group 1 (3.05) and Group 2 (3.23), while low for Group 3 (2.23). According to these characteristics of each group, they are named as following:

- Group 1: High science-orientation, high people-orientation, low external pressure group (LE group);
- Group 2: High science-orientation, high people-orientation, very low external pressure group (vLE group);
- Group 3: High science-orientation, high people-orientation, low job status/security, and very low external pressure group (LJvLE group).

Fisher's exact test found no significant differences between these groups of medical participants regarding their socio-demographic characteristics.

Figure 16 Medical applicants' mean scores for the factors of reasons for studying medicine (n = 48, paired)



4.5.2 Fourth year medical students

Figure 17 shows the dendrogram for the hierarchical cluster analysis (using Ward's linkage method) of the 32 fourth year medical students with paired baseline and follow-up responses. As can be seen, inconsistent increases in the dissimilarity measure showed when four clusters were merged into fewer clusters, where the first five participants seemed to stand out as one distinct cluster.

Figure 17 Dendrogram for hierarchical cluster analysis of the fourth-year medical students with paired baseline and follow-up responses (n = 32, paired)

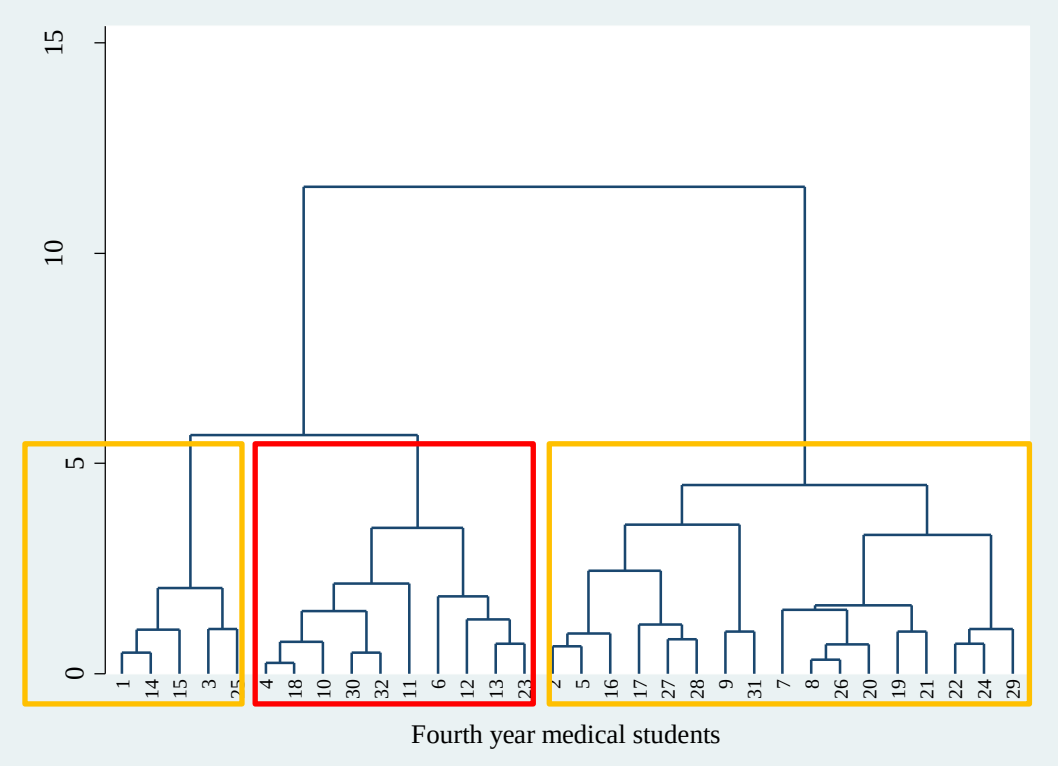


Table 31 shows the Calinski and Harabasz (1974) pseudo-F index from the second to the tenth level of the hierarchy in the hierarchical cluster analysis. As can be seen, the two-cluster solution had the largest Calinski and Harabasz pseudo-F value (14.48), followed by the three-cluster solution (12.25) and the four-cluster solution (11.44). This indicated that these solutions were the most distinct solutions compared with the other solutions (Stata Corporation, 2005).

Table 31 also shows the Duda–Hart (2001, sec. 10.10) Je(2)/Je(1) values and corresponding Pseudo T-squared values from the second to the tenth level of the hierarchy in the hierarchical cluster analysis. As can be seen, the three-cluster solution

had the largest Duda–Hart Je(2)/Je(1) value of 0.73, Though the smallest pseudo T-squared value was 2.92 for the ten-cluster solution, the three-cluster solution also had a relatively low pseudo T-squared of 5.61. These indicated a distinct solution at the three-cluster level (Stata Corporation, 2005).

Table 31 Calinski and Harabasz pseudo-F index (n = 32, paired)

Number of clusters	Calinski and Harabasz pseudo-F	Duda/Hart	
		Je(2)/Je(1)	Pseudo T-squared
2	14.48	0.60	8.55
3	12.25	0.73	5.61
4	11.44	0.50	5.93
5	10.91	0.58	5.90
6	11.26	0.51	6.75
7	11.84	0.43	5.27
8	11.74	0.39	6.17
9	11.75	0.41	4.36
10	11.93	0.41	2.92

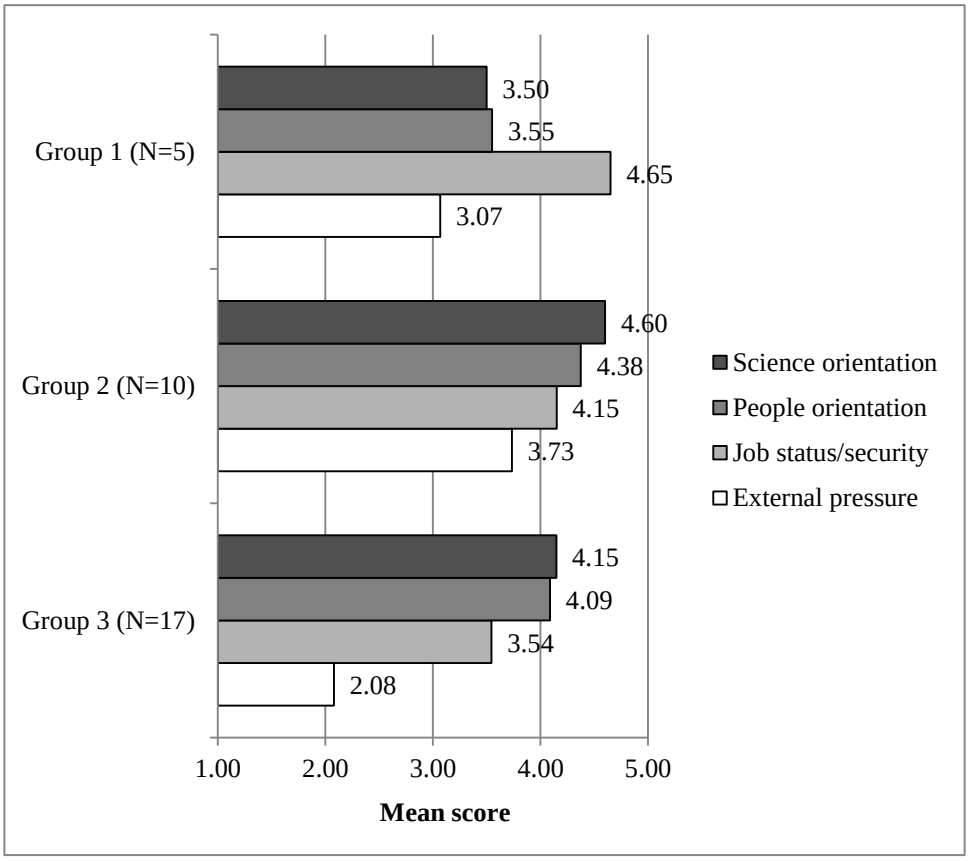
Considering the dendrogram and the two cluster stopping rules, the researcher decided that the three-cluster solution was the most appropriate for these data (as shown in Figure 17).

Figure 18 shows the mean scores for the four factors of reasons for studying medicine for each group (cluster) of students. As can be seen, Group 1 was characterised by its mean score for job status/security (mean = 4.65) being the highest among the four factors of reasons for studying medicine. Group 2 had high mean sores for all the four factors of reasons for studying medicine. Group 3 differed from the other two groups in that it had a low mean score for external pressure (mean = 2.08). According to these characteristics of each group, they are named as the following:

- Group 1: lower science orientation, lower people orientation, high job status/security group (HJ group)
- Group 2: overall highly motivated group (oH group);
- Group 3: high science orientation, high people orientation, lower job status/security, and low external pressure group (LE group).

Fisher's exact test indicated no significant differences between these groups of medical participants regarding their socio-demographic characteristics.

Figure 18 Fourth year medical students' mean scores for the factors of reasons for studying medicine (n = 32, paired)



4.6 Summary

Across the four questionnaires in this study, the following items were rated by a majority of the participants as 'slightly important' or 'very important' for studying medicine: 'I have scientific curiosity', 'I have a desire for helping others', 'Medicine will provide intellectual satisfaction', 'I have a desire to cure/prevent disease', and 'I enjoy interacting with people'. The mean rating score for the item 'I have the desire for helping others' was always the highest among all items across the four questionnaires. In the factor analysis, these reasons loaded on the two factors labelled as science-orientation and people-orientation. In contrast, friends' influence and teachers' expectations were rated by only a small proportion of participants as 'slightly important' or 'very important' for studying medicine. In the factor analysis, these reasons loaded on the factor that was labelled as external pressure.

Changes were found in medical students' rating for the importance of the reasons for studying medicine after the first year at medical school. Generally, second year medical students' ratings for the 14 items were less extreme than those of the medical applicants. Paired comparisons showed that the ratings for the science-oriented and people-oriented reasons for studying medicine were lower after the first year at medical school compared with those at application. In contrast, the ratings for the reasons concerning job security and external pressure were higher after the first year at medical school compared with those at application. There were few changes in medical students' ratings for the importance of reasons for studying medicine after the fourth year at medicine school.

Using cluster analysis, the medical applicants with paired entry baseline and entry follow-up responses were divided into three distinct groups based on their reasons for studying medicine: LE group; vLE group; LJvLE group. Similarly, the fourth year medical students with paired entry baseline and entry follow-up responses were divided into three distinct groups: HJ group; oH group; LE group. The analysis within these groups will be reported in the next two chapters.

In the next chapter, findings around participants' altruistic attitudes and their relationship with reasons for studying medicine will be reported.

CHAPTER 5. ALTRUISTIC ATTITUDES

5.1 Introduction

This chapter provides a full description of participants' altruistic attitudes, and their relationships to reasons for studying medicine. The results are structured in the same order as the previous chapter: results from baseline questionnaires, results from follow-up questionnaires, and results from the comparison between baseline and follow-up questionnaires.

5.2 Baseline responses

5.2.1 Descriptive information

As described in Section 3.5.1, an altruistic attitude score was generated for each participant based on the total rating of the eight items, with a higher score out of 40 indicating more altruistic attitudes. The medical applicants had a mean altruistic attitude score of 34.62 (SD = 3.97) and a median altruistic attitude score of 35 (interquartile range = 32-38). The fourth year medical students had a slightly lower mean altruistic attitude score of 31.23 (SD = 4.86) and a median altruistic attitude score of 32 (interquartile range = 28-34).

5.2.2 Associations between altruistic attitude score and socio-demographic characteristics

Medical applicants

As shown in Table 32, results from Mann Whitney U-tests and Kruskal Wallis tests show that among the medical applicants, there were no statistically significant differences in the altruistic attitude score by socio-demographic characteristics. Of note, the sex difference was close to statistically significant; females had higher mean and median altruistic attitude score than males.

In multiple linear regression analysis with backwards elimination of predictors, no socio-demographic characteristics were retained in the model as significant predictors for altruistic attitude score.

Table 32 Bivariate analysis of the associations between medical applicants' altruistic attitude score and socio-demographic characteristics (n=411)

Characteristics	Altruistic attitude score					
	Mean	SD	Median	Inter-quartile range	z [a] / K-W χ^{2} [b]	p*
Sex					-2.47	0.013
Male	34.18	4.12	35	31-37		
Female	35.23	3.68	36	32-38		
Country of birth					-1.33	0.183
Australia	34.42	4.10	35	32-38		
Other countries	35.10	3.61	36	32-38		
Citizenship					-0.13	0.897
Australian	34.61	3.96	35	32-38		
Other	34.67	4.08	35	32-38		
Language spoken at home					-0.61	0.545
English	34.52	4.06	35	32-38		
Other	34.95	3.64	35	32-38		
Family members working in health-related profession (except parents)					0.36	0.721
Yes	34.71	3.90	35	32-38		
No	34.56	4.02	35	32-38		
Father's occupation					-1.64	0.102
Heath-related profession	33.89	4.37	34	31-37		
Other profession	34.80	3.84	35	32-38		
Mother's occupation					-0.03	0.976
Heath-related profession	34.57	3.93	35	32-38		
Other profession	34.60	4.00	35	32-38		
Father's highest level of complete educational qualification					0.33	0.742
Bachelor or above	34.59	4.14	35	32-38		
Below bachelor	34.62	3.37	35	32-37		
Mother's highest level of complete educational qualification					0.89	0.373
Bachelor or above	34.65	4.13	35	32-38		
Below bachelor	34.43	3.56	35	32-37		
Secondary schooling					0.57	0.753
Aust government school	34.74	3.74	35	32-38		
Aust non-government school	34.63	4.02	35	32-38		
Other country	33.83	4.72	34.5	31-38		

*Notes: * Mann Whitney U-test or Kruskal Wallis test as appropriate;*
[a] z score for Wilcoxon Mann Whitney test;
[b] K-W $\chi 2$ for Kruskal Wallis test, only for the comparison by secondary schooling.

Fourth year medical students

As shown in Table 33, results from Mann Whitney U-tests indicated that male fourth year medical students had a significantly lower altruistic attitude score (Median = 29; Interquartile range = 25.5-32) than female fourth year medical students (Median = 32; Interquartile range = 30-36; z = -3.03, p = 0.002). Also, the fourth year medical students who were born in Australia had a significantly lower altruistic attitude score (Median = 30; Interquartile range = 26-33) than those who were born in other countries (Median = 32; Interquartile range = 31-37; z = -3.39, p = <0.001). Results from the Kruskal Wallis test showed that there were significant differences by secondary schooling regarding fourth year medical students' altruistic attitude score (χ^2 = 11.99, p = 0.003) – those who had their last year of secondary schooling at an Australian non-government school had a lower altruistic attitude score than those who had their last year of secondary schooling at an Australian government school or in another country. With these exceptions, there were no other significant differences in fourth year medical students' altruistic attitude score by socio-demographic characteristics found in bivariate analysis. The difference by father's occupation was close to statistically significant; those students whose fathers were working in health-related profession had a lower mean and median altruistic attitude score than the students whose father were working in other professions.

In multiple linear regression analysis, sex was the only socio-demographic variable retained.

Table 33 Bivariate analysis of the associations between fourth year medical students' altruistic attitude score and socio-demographic characteristics (n=102)

Characteristics	Altruistic attitude score					
	Mean	SD	Median	Inter-quartile range	z [a] / K-W χ^{2} [b]	p*
Sex					-3.03	0.002
Male	29.28	4.69	29	25.5-32		
Female	32.29	4.65	32	30-36		
Country of birth					-3.39	<0.001
Australia	29.84	4.74	30	26-33		
Other countries	33.29	4.33	32	31-37		
Citizenship					-1.75	0.080
Australian	30.82	4.67	31	28-34		
Other	33.11	5.42	33	30-38		
Language spoken at home					-0.81	0.415
English	31.03	4.85	31	28-34		
Other	32.11	4.99	32	30-37		
Family members working in health-related profession (except parents)					-1.27	0.205
Yes	30.61	5.10	31	26-33		
No	31.79	4.61	32	29-35		
Father's occupation						
Heath-related profession	29.66	5.28	30	25-32	-2.44	0.015
Other profession	31.94	4.52	32	29-35		
Mother's occupation					-0.17	0.865
Heath-related profession	31.19	5.34	31	27-35		
Other profession	31.24	4.67	32	28-34		
Father's highest level of complete educational qualification					-0.91	0.361
Bachelor or above	31.04	4.96	31	28-34		
Below bachelor	31.08	4.59	32	30-34		
Mother's highest level of complete educational qualification					-0.56	0.574
Bachelor or above	31.06	4.87	31	28-34		
Below bachelor	31.56	4.91	32	29-34		
Secondary schooling					11.99	0.003
Aust government school	32.58	4.31	32	31-35		
Aust non-government school	29.88	4.63	30	27.5-33		
Other country	33.89	4.85	34.5	31-38		

*Notes: * Mann Whitney U-test or Kruskal Wallis test as appropriate;*
[a] z score for Wilcoxon Mann Whitney test;
[b] K-W χ^{2} for Kruskal Wallis test, only for the comparison by secondary schooling.

5.2.3 Relationships between altruistic attitude score and scores for factors of reasons for studying medicine

As can be seen in Table 34, Spearman's correlation coefficients were calculated for medical applicants and fourth year medical students. Medical applicants' altruistic attitude score was positively correlated with score for science-orientation ($r_s = 0.19$, $p<0.001$) and score for people-orientation ($r_s = 0.38$, $p<0.001$), while negatively correlated with score for job status/security ($r_s = -0.15$, $p = 0.002$). Similarly, fourth year medical students' altruistic attitude score was positively correlated with the science-orientation factor score ($r_s = 0.34$, $p<0.001$) and the score for people-orientation ($r_s = 0.44$, $p<0.001$). However, the correlation between altruistic attitude score and job status/security was no longer significant in fourth year medical students. Among both groups, there was not much evidence of correlation between the altruistic attitude score and external pressure.

It must be recognized that although statistically significant, small correlations may not indicate very strong relationships.

Table 34 Correlations between medical applicants' and fourth year medical students' altruistic attitude score and scores for the four factors of reasons for studying medicine

Factors of reasons for studying medicine	**Altruistic attitude score**			
	Medical applicants (n = 411)		**Fourth year medical students (n=102)**	
	Spearman r_s	p	Spearman r_s	p
Science orientation	0.19	< 0.001	0.34	< 0.001
People-orientation	0.38	< 0.001	0.44	< 0.001
Job status/security	-0.15	0.002	-0.14	0.155
External pressure	-0.08	0.103	-0.17	0.090

Notes: For values of r_s below 0.20, correlations were considered too low to be meaningful even statistically significant.

5.3 Follow-up responses

5.3.1 Descriptive information

The second year medical students had a mean altruistic attitude score of 32.60 (SD = 4.80) and a median altruistic attitude score of 32 (Interquartile range = 30-37). The fifth year medical students had a mean altruistic attitude score of 30.38 (SD = 5.47) and a median altruistic attitude score of 31 (Interquartile range = 27-34).

5.3.2 Relationships between altruistic attitude score and scores for factors of reasons for studying medicine

As can be seen in Table 35, Spearman's correlation coefficients were calculated for second and fifth year medical students. Second year medical students' altruistic attitude score was positively correlated with the people-orientation factor score ($r_s = 0.36$, $p<0.001$). Also, fifth year medical students' altruistic attitude score was positively correlated with the score for people-orientation ($r_s = 0.41$, $p<0.001$). Quite differently to that observed with the baseline responses, the correlations between altruistic attitude score and science-orientation or job status/security were no longer significant in the follow-up responses.

Table 35 Correlations between second year medical students' altruistic attitude score and scores for the four factors of reasons for studying medicine

Factors of reasons for studying medicine	**Altruistic attitude score**			
	Second year medical students (n=94)		**Fifth year medical students (n=90)**	
	Spearman r_s	p	Spearman r_s	p
Science orientation	0.08	0.418	0.10	0.344
People-orientation	0.36	<0.001	0.41	<0.001
Job status/security	-0.07	0.493	-0.13	0.205
External pressure	-0.03	0.788	-0.10	0.368

Notes: For values of r_s below 0.20, correlations were considered too low to be meaningful even statistically significant.

5.4 Comparison between baseline and follow-up responses

Table 36 provides a summary of participants' altruistic attitude scores for the four questionnaires. This section further describes the comparison of altruistic attitude scores using all baseline and follow-up responses and using only paired baseline and follow-up responses.

Table 36 Summary of participants' altruistic attitude scores in the four questionnaires

Participants	Altruistic attitude score			
	Mean	SD	Median	Interquartile range
Medical applicants (n = 411)	34.62	3.97	35	32-38
Second year medical students (n = 94)	32.60	4.81	32	30-37
Fourth year medical student (n = 102)	31.23	4.86	32	28-34
Fifth year medical students (n = 90)	30.38	5.47	31	27-34

5.4.1 Change in altruistic attitudes after the first year at medical school

The comparison between all baseline and follow-up responses using Mann Whitney U-tests indicated that medical applicants' altruistic attitude score (Median = 35; Interquartile range = 32-38) was significantly higher than that of second year medical students (Median = 32; Interquartile range = 30-37; $z = 3.87$, $p < 0.001$).

Similarly, the comparison between paired baseline and follow-up responses using Wilcoxon signed ranks tests indicated that altruistic attitude score declined from application (Median = 35.5; Interquartile range = 32-39) to the start of the second year (Median = 32; Interquartile range = 29.5-37; $p = 0.008$).

As described in Section 4.5.1, the 48 medical applicants with paired baseline and follow-up responses were classified into one of the following three groups based on their reasons for studying medicine at entry baseline:

- Group 1: High science-orientation, high people-orientation, low external pressure group (LE group);

- Group 2: High science-orientation, high people-orientation, very low external pressure group (vLE group);
- Group 3: High science-orientation, high people-orientation, low job status/security, and very low external pressure group (LJvLE group).

The changes in altruistic attitudes within each group are summarised in Table 37. Results from Wilcoxon signed ranks tests indicated no statistically significant changes in altruistic attitudes from application to the start of the second year within any group. This may be due to reduced power because of the smaller number of observations included in the analysis. Generally it can be observed that the mean and median of the altruistic attitude score of each group were higher at application than at the start of the second year.

Table 37 Paired comparison of altruistic attitudes before and after the first year at medical school within groups of medical applicants

Groups of medical applicants	Mean	SD	Median	Interquartile range	p*
LE group (n = 25)					
At application	34.24	5.52	36	31-39	0.597
At the start of second year	33.96	4.00	34	30-37	
vLE group (n = 12)					
At application	34.42	4.34	34	32-38.5	0.023
At the start of second year	31.58	4.42	31	28.5-32.5	
LJvLE group(n = 11)					
At application	35.55	3.11	36	32-39	0.045
At the start of second year	32.00	4.49	31	29-37	

*Notes: * Wilcoxon signed ranks test*

5.4.2 Change in altruistic attitudes after the fourth year at medical school

The comparison between all baseline and follow-up responses using Mann Whitney U-tests indicated that fourth year medical students' altruistic attitude score (Median = 32; Interquartile range = 28-34) was not significantly different from that of fifth year medical students (Median = 31; Interquartile range = 27-34; z = -0.79, p = 0.430).

Similarly, the comparison between paired baseline and follow-up responses using Wilcoxon signed ranks tests indicated that the altruistic attitude score did not change from the start of the fourth year (Median = 31.5; Interquartile range = 27.5-35) to the start of the fifth year (Median = 32; Interquartile range = 27.5-35; p =0. 715).

As described in Section 4.5.2, the 32 fourth year medical students with paired baseline and follow-up responses were classified into one of the following three groups based on their reasons for studying medicine at fourth-year baseline:

- Group 1: lower science orientation, lower people orientation, high job status/security group (HJ group)
- Group 2: overall highly motivated group (oH group);
- Group 3: high science orientation, high people orientation, lower job status/security, and low external pressure group (LE group).

The change in altruistic attitudes within each group is summarised in Table 38. As can be seen, results from Wilcoxon signed ranks tests indicated no statistically significant changes in altruistic attitudes from the start of fourth year to the start of fifth year within any group. This may be due to reduced power because of the smaller number of observations included in the analysis. It can be observed that within the HJ group, who scored high for job status/security, the mean and median of the altruistic attitude score were higher during the fifth year than during the fourth year. This was quite different from the other two groups.

Table 38 Paired comparison of altruistic attitudes before and after the fourth year at medical school within groups of medical applicants

Groups of fourth year medical students	Mean	SD	Median	Inter-quartile range	p*
HJ group (n = 5)					
At the midpoint of fourth year	25.00	2.55	25	23-27	0.416
At the midpoint of fifth year	27.40	6.66	29	26-30	
oH group (n = 10)					
At the midpoint of fourth year	32.70	4.37	31.5	29-37	0.082
At the midpoint of fifth year	30.40	4.40	29	27-34	
LE group(n = 17)					
At the midpoint of fourth year	32.24	4.56	32	30-36	0.757
At the midpoint of fifth year	32.00	6.10	33	31-36	

5.5 Summary

Across four questionnaires, participants' altruistic attitude scores were high, with an average in excess of 30 out of 40. However, after the first year at medical school, participants' altruistic attitude scores declined. Paired comparisons within groups of medical applicants (determined by reasons for studying medicine) found no statistically significant changes in the altruistic attitude score after the first year at medical school. This may be due to reduced power because of the smaller number of observations included in the analysis. The three groups were quite homogeneous in the direction of changes in altruistic attitude score mean and median.

Regarding the relationships between participants' altruistic attitudes and reasons for studying medicine, correlations were found between the altruistic attitude score and the score for people orientation across the four questionnaires.

After the first year at medical school, participants' altruistic attitude scores declined. Paired comparison within groups of medical applicants (determined by reasons for studying medicine) found no statistically significant changes in the altruistic attitude score after the first year at medical school. This may be due to reduced power because of the smaller number of observations included in the analysis. The three groups were quite homogeneous in the direction of changes in the altruistic attitude score mean and median.

There was no statistically significant change in the participants' altruistic attitude score after the fourth year at medical school, either within all paired responses or within groups of fourth year medical students (determined by reasons for studying medicine). Again, this may be due to reduced power because of smaller number of observations included in the analysis. The groups with a high score for job status/security had a higher mean and median altruistic attitude score after the fourth year at medical school, while the other two groups had lower mean and median altruistic attitude scores after the fourth year at medical school.

In the next chapter, findings around participants' expectations/experiences of learning at university, and its relationships with reasons for studying medicine will be reported.

CHAPTER 6. EXPECTATIONS AND EXPERIENCES OF LEARNING AT UNIVERSITY

6.1 Introduction

This chapter describes participants' expectations and experiences of learning at university, and their relationships with reasons for studying medicine. The results are structured in the same order as the previous two chapters: results from baseline questionnaires, results from follow-up questionnaires, and results from the comparison between responses from baseline and follow-up questionnaires.

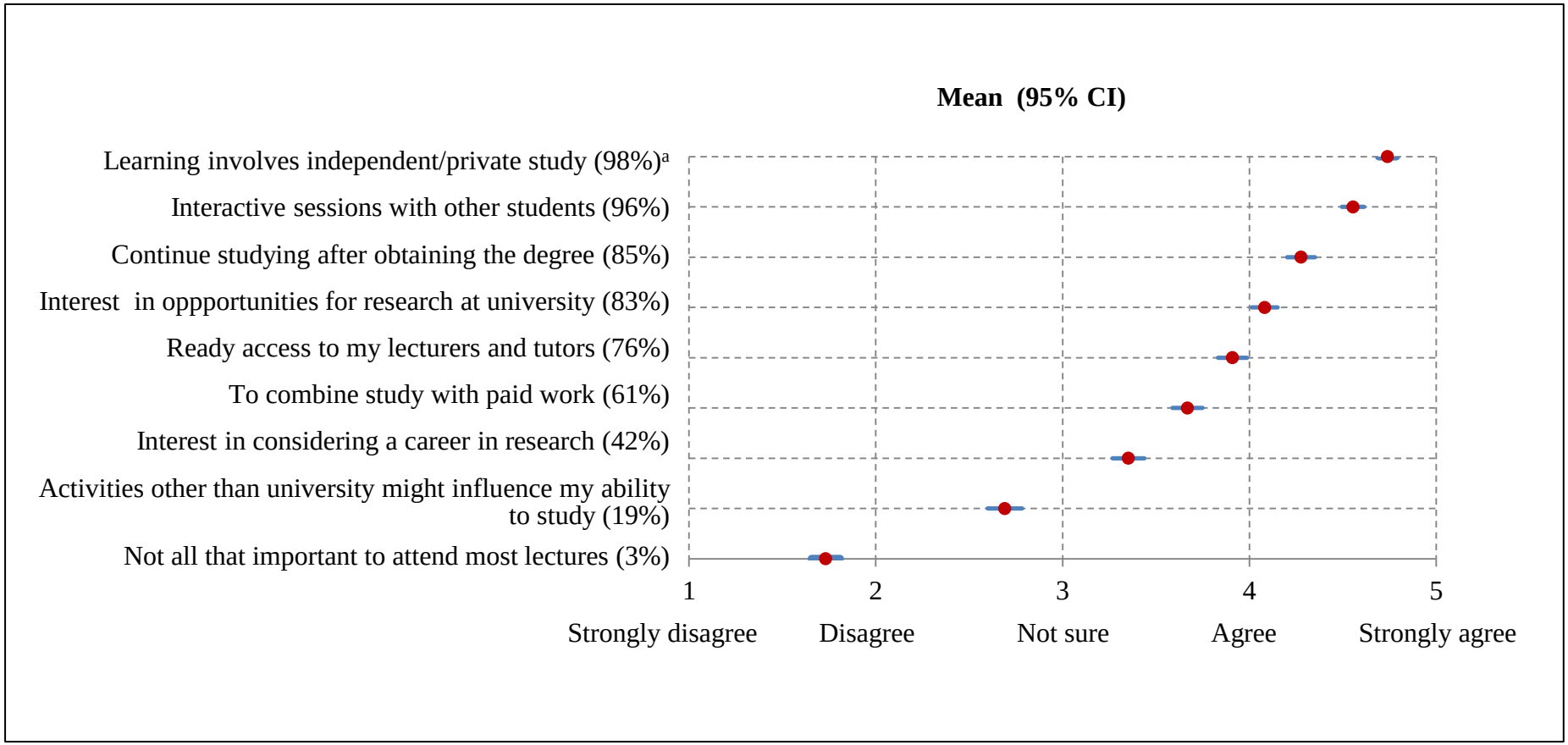
6.2 Baseline responses

6.2.1 Descriptive information

Medical applicants

Medical applicants' mean agreement ratings with the items regarding their expectations of learning at university are shown in Figure 19. The items were ordered from the highest mean rating to the lowest mean rating. The items with the highest mean ratings were 'My learning will involve independent/private study' (Mean = 4.74, SD = 0.48), 'Interactive sessions with other students will be important to my learning' (Mean = 4.55, SD = 0.61), and 'I expect to continue studying after I obtain my degree' (Mean = 4.28, SD = 0.77). The items with the lowest ratings were 'Activities other than university might influence my ability to study' (Mean = 2.69, SD = 0.95) and 'It is probably not all that important for me to attend lectures' (Mean = 1.73, SD = 0.79).

Figure 19 Summary of medical applicants' ratings for their agreement with the items regarding their expectations of learning at university (n = 411)

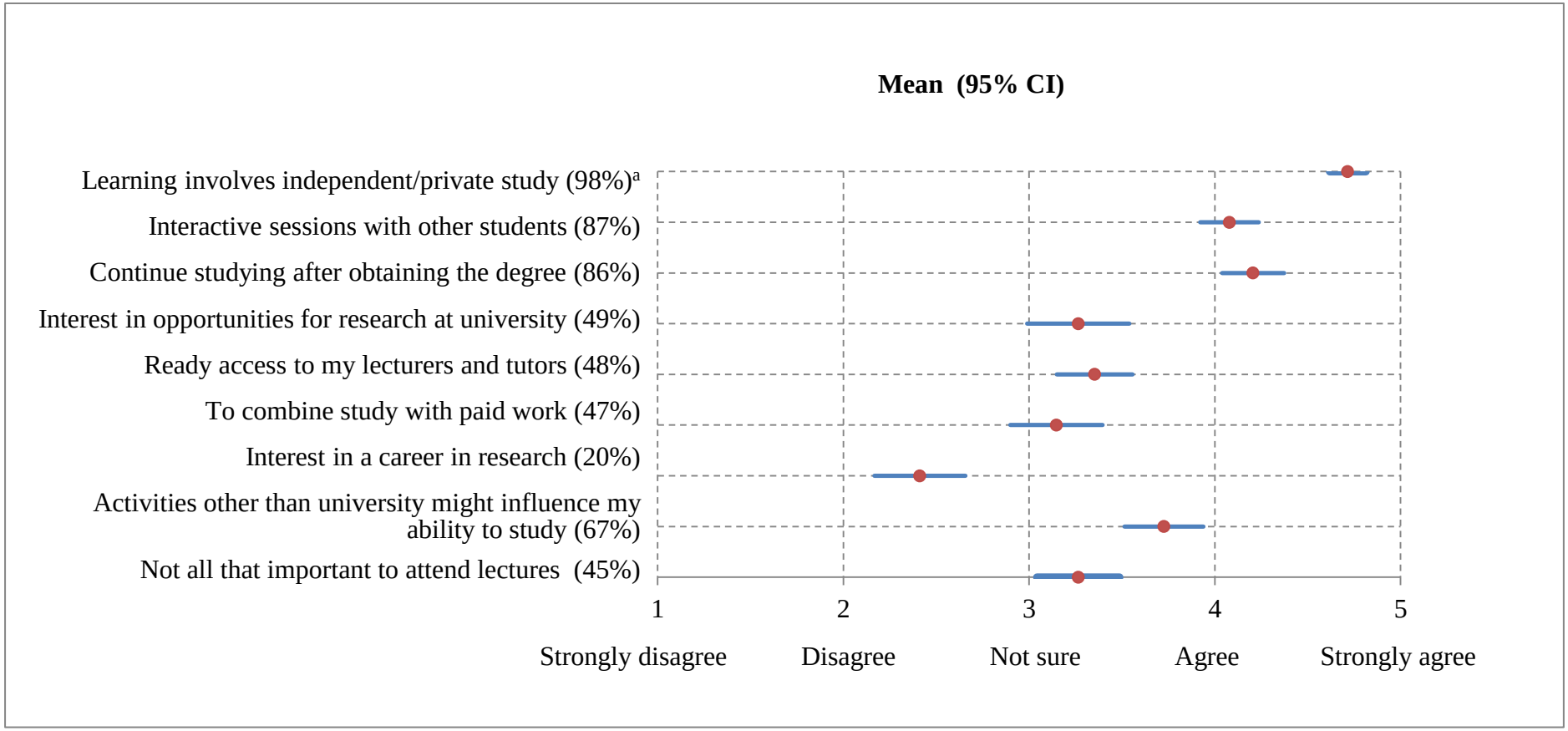


Notes: [a]Percentage of combined 'agree/strongly agree'.

Fourth year medical students

Fourth year medical students' mean agreement ratings for the items regarding their experiences of learning at university are shown in Figure 20. The items are presented in the same order as for the medical applicants (Figure 19). The items with the highest mean ratings were 'My learning involves independent/private study' (Mean = 4.72, SD = 0.50), 'Interactive sessions with other students are important to my learning' (Mean = 4.08, SD = 0.80), and 'I expect to continue studying after I obtain my degree' (Mean = 4.21, SD = 0.85). The items with the lowest ratings were 'I can combine study with paid work' (Mean = 3.15, SD = 1.26), 'I am interested in considering a career in research' (Mean = 2.41, SD = 1.25) and 'It is probably not all that important for me to attend lectures' (Mean = 3.15, SD = 1.13).

Figure 20 Summary of fourth year medical students' ratings for their agreement with the items regarding their experiences of learning at university (n = 102)



Notes: The items were presented in the same order as the medical applicants; [a]Percentage of combined 'agree/strongly agree'.

6.2.2 Associations between expectations/experiences of learning at university and socio-demographic characteristics

Medical applicants

The full results from bivariate analysis of the associations between medical applicants' expectations of learning at university and socio-demographic characteristics are shown in Appendix 9.

Table 39 summarises the significant differences in medical applicants' expectations of learning at university by socio-demographic characteristics.

Results from Mann Whitney U-tests indicated that medical applicants with a father working in a health-related profession had a significantly lower rating (Mean = 4.08; Median = 4; Interquartile range = 4-5) for 'I expected to continue studying after I obtain my degrees' than those whose fathers were working in other professions (Mean = 4.33; Median = 4; Interquartile range = 4-5; z = -2.77, p = 0.005). Those medical applicants whose mother had at least a bachelor degree had a significantly higher rating (Mean =4.34; Median = 4; Interquartile range = 4-5) for this item than those whose mother did not (Mean = 4.09; Median = 4; Interquartile range = 4-5; z = 2.85, p = 0.004). Apart from this, there were no other significant differences in medical applicants' expectations of learning at university by social-demographic characteristics.

Table 39 Summary of differences in medical applicants' expectations of learning at university by socio-demographic characteristics (n = 411)

Characteristics	I expect to continue studying after I obtain my degrees					
	Mean	**SD**	**Median**	**Interquartile range**	**z [a]**	**p***
Father's occupation					-2.77	0.005
Health-related profession	4.08	0.81	4	4-5		
Other profession	4.33	0.76	4	4-5		
Mother's educational level					2.85	0.004
Bachelor or above	4.34	0.74	4	4-5		
Below bachelor	4.09	0.83	4	4-5		

*Notes: * Mann Whitney U-test. Only significant results (p < 0.01) are summarised in this table.*

Fourth year medical students

The full results from bivariate analysis of the associations between fourth year medical students' experiences of learning at university and socio-demographic characteristics are shown in Appendix 10. Table 40 summarises the significant differences in fourth year medical students' experiences of learning at university by socio-demographic characteristics.

Results from Mann Whitney U-tests indicated that medical students born in Australia had significantly higher ratings for 'I can combine study with paid work' (born in Australia: Median = 4, Interquartile range = 2-4; born in other countries: Median = 2, Interquartile range = 2-4; z = 2.58, p = 0.010). They also had significantly higher ratings for 'I have activities other than university that might affect my ability to study' (born in Australia: Median = 4, Interquartile range = 4-5; born in other countries: Median = 3, Interquartile range = 3-4; z = 2.70, p = 0.007). In contrast, students born in Australia had significantly lower ratings for 'Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university' (born in Australia: Median = 3, Interquartile range = 2-4; born in other countries: Median = 4, Interquartile range = 3-4; z = -2.07, p = 0.007).

Results from Mann Whitney U-tests also indicated that the ratings for 'I am interested in considering a career in research' were lower among those medical students who were born in Australia (born in Australia: Median = 2, Interquartile range = 1-3; born in other countries: Median = 3, Interquartile range = 2-4; z = -3.12, p = 0.002), who had Australian citizenship (Australian: Median = 2, Interquartile range = 1-3; other: Median = 3, Interquartile range = 3-4; z = -3.05, p = 0.002), and who spoke English at home (English: Median = 2, Interquartile range = 1-3; other: Median = 3, Interquartile range = 2-4; z = -2.67, p = 0.008).

Those students with a father who held at least a bachelor level qualification had a significantly higher rating for 'Having ready access to my lecturers and tutors outside' than those whose fathers did not hold such a qualification (Bachelor or above: Median = 4, Interquartile range = 3-4; below bachelor: Median = 3, Interquartile range = 2-3; z = 3.06, p = 0.002).

Male students had a significantly higher level of agreement with the statement 'It is probably not all that important for me to attend most lectures' than female students (Male: Median = 4, Interquartile range = 3-4.5; female: Median = 3, Interquartile range = 2-4; z = 2.73, p = 0.006).

Results from Kruskal Wallis tests showed that fourth year medical students' differed significantly in their ratings for 'I can combine study with paid work' ($\chi^2 = 15.74$, $p < 0.001$) and 'I am interested in considering a career in research' ($\chi^2 = 9.71$, $p = 0.008$) by their secondary schooling. Those students who completed secondary schooling in an Australian non-government school indicated higher agreement (Median = 4), on average, with the statement 'I can combine study with paid work' than students who completed secondary schooling at an Australian government school (Median = 2) or in another country (Median = 2)). Those students who completed secondary schooling in another country indicated higher agreement (Median = 3), on average, with the statement 'I am interested in considering a career in research' than students who completed secondary schooling at an Australian government school (Median = 2) or Australian non-government school (Median = 2).

There were no other significant differences in fourth year medical students' experiences of learning at university by socio-demographic characteristics.

Table 40 Summary of differences in fourth year medical students' experiences of learning at university by socio-demographic characteristics (n = 102)

Characteristics	I can combine study with paid work					
	Mean	**SD**	**Median**	**Inter-quartile range**	**z [a] / K-W χ^{2} [b]**	**p***
Country of birth					2.58	0.010
Australia	3.41	1.22	4	2-4		
Other countries	2.76	1.24	2	2-4		
Secondary schooling					15.74	< 0.001
Aust government school	2.71	1.33	2	2-4		
Aust non-government school	3.57	1.09	4	3-4		
Other country	2.33	1.14	2	2-3		
Characteristics	**Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university**					
	Mean	**SD**	**Median**	**Inter-quartile range**	**z [a] / K-W χ^{2} [b]**	**p***
Country of birth					-2.70	0.007
Australia	3.13	1.02	3	2-4		
Other countries	3.68	0.99	4	3-4		
Father's educational level					3.06	0.002
Bachelor or above	3.52	1.03	4	3-4		
Below bachelor	2.84	0.90	3	2-3		
Characteristics	**It is probably not all that important for me to attend most lectures**					
	Mean	**SD**	**Median**	**Inter-quartile range**	**z [a] / K-W χ^{2} [b]**	**p***
Sex					2.73	0.006
Male	3.69	1.01	4	3-4.5		
Female	3.03	1.14	3	2-4		
Characteristics	**I have activities other than university that might affect my ability to study**					
	Mean	**SD**	**Median**	**Inter-quartile range**	**z [a] / K-W χ^{2} [b]**	**p***
Country of birth					2.70	0.007
Australia	3.95	1.01	4	4-5		
Other countries	3.39	1.11	3	3-4		

Table 40 (Continued) summary of differences in fourth year medical students' experiences of learning at university by socio-demographic characteristics (n = 102)

Characteristics	I am interested in considering a career in research					
	Mean	**SD**	**Median**	**Inter-quartile range**	**z [a] / K-W χ^{2} [b]**	**p***
Country of birth					-3.12	0.002
Australia	2.11	1.21	2	1-3		
Other countries	2.85	1.17	3	2-4		
Citizenship					-3.05	0.002
Australian	2.25	1.23	2	1-3		
Other	3.17	1.04	3	3-4		
Language spoken at home					-2.67	0.008
English	2.26	1.21	2	1-3		
Other	3.11	1.18	3	2-4		
Secondary schooling					9.71	0.008
Aust government school	2.29	1.40	2	1-3		
Aust non-government school	2.22	1.15	2	1-3		
Other country	3.22	1.06	3	3-4		

*Notes: * Mann Whitney U-test or Kruskal Wallis test as appropriate. Only significant results (p < 0.01) are summarised in this table.*

[a] z score for Mann Whitney U-test;

[b] K-W χ^{2} for Kruskal Wallis test, only for the comparison by secondary schooling.

6.2.3 Relationships between expectations/experiences of learning at university and scores for factors of reasons for studying medicine

Medical applicants

Table 41 shows the Spearman's correlation coefficients between medical applicants' expectations of studying at university and the factors of reasons for studying medicine. Medical applicants' score for science orientation was positively correlated with their ratings for 'I anticipate that my learning will involve independent/private study' (r_s = 0.21, $p < 0.001$) and 'I expect to continue studying after I obtain my degree' ($r_s = 0.22$, $p < 0.001$). The score for people orientation was positively correlated with their ratings for 'Having ready access to my lecturers and tutors outside of face-to-face teaching will be important to my success at university' ($r_s = 0.22$, $p < 0.001$), 'I anticipate that my learning will involve independent/private study' ($r_s = 0.23$, $p < 0.001$), and 'Interactive sessions with other students will be important to my learning' ($r_s = 0.23$, $p < 0.001$). Medical applicants score for job status/security was positively correlated with 'I have activities other than university that might affect my ability to study' ($r_s = 0.20$, $p < 0.001$). Medical applicants score for external pressure was negatively correlated with their rating for 'I anticipate that my learning will involve independent/private study' ($r_s = -0.20$, $p < 0.001$), while positively correlated with their rating for 'It is probably not all that important for me to attend most lectures' ($r_s = 0.33$, $p < 0.001$). Regarding the time spent on individual/private study, there was no significant correlation between factors of reasons for studying medicine and expected time.

Table 41 Summary of correlations between expectations of studying at university and the factors of reasons for studying medicine among medical applicants (n = 411)

Expectation of learning at university	Factors of reasons for studying medicine			
	Science orientation	**People orientation**	**Job status/security**	**External pressure**
I expect to be able to combine study with paid work	0.07	0.06	0.11	0.04
Having ready access to my lecturers and tutors outside of face-to-face teaching will be important to my success at university	0.10	0.22*	0.16	0.06
I anticipate that my learning will involve independent/private study	0.21*	0.23*	-0.10	-0.20*
Interactive sessions with other students will be important to my learning	0.15	0.23*	-0.07	-0.10
It is probably not all that important for me to attend most lectures	-0.13	-0.11	0.18	0.33*
I have activities other than university that might affect my ability to study	-0.01	-0.09	0.20*	0.19
I expect to continue studying after I obtain my degree	0.22*	0.16	-0.11	-0.09
I am interested in considering opportunities for research whilst undertaking university studies	0.16	0.19	-0.09	-0.05
I am interested in considering a career in research	0.08	0.14	-0.06	0.05

*Notes: *Spearman's correlation coefficients, $p < 0.001$. For values of r_s below 0.20, correlations were considered too low to be meaningful even statistically significant.*

Fourth year medical students

Table 42 shows the Spearman's correlation coefficients between fourth year medical students' experiences of studying at university and the factors of reasons for studying medicine. Fourth year medical students' score for science orientation was positively correlated with their ratings for 'I expect to continue studying after I obtain my degree' ($r_s = 0.33$, $p < 0.001$) and 'I am interested in considering opportunities for research whilst undertaking university studies' ($r_s = 0.40$, $p < 0.001$). The score for people orientation was positively correlated with their rating for 'I expect to continue studying after I obtain my degree' ($r_s = 0.31$, $p = 0.002$).

Table 42 Summary of correlations between experiences of studying at university and the factors of reasons for studying medicine among fourth year medical students (n = 102)

Experiences of learning at university	Factors of reasons for studying medicine			
	Science orientation	**People orientation**	**Job status/security**	**External pressure**
I can combine study with paid work	0.23	0.06	0.02	-0.03
Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university	0.13	0.18	0.03	0.03
My learning involves independent/private study	-0.04	0.06	0.07	-0.03
Interactive sessions with other students are important to my learning	-0.01	0.24	-0.19	0.14
It is probably not all that important for me to attend most lectures	0.12	-0.05	0.20	0.01
I have activities other than university that might affect my ability to study	0.13	0.04	0.00	0.08
I expect to continue studying after I obtain my degree	0.33*	0.31*	-0.05	0.04
I am interested in considering opportunities for research whilst undertaking university studies	0.40*	0.24	-0.17	-0.11
I am interested in considering a career in research	0.12	0.03	-0.20	-0.20

*Notes: *Spearman's correlation coefficients, $p < 0.001$. For values of r_s below 0.20, correlations were considered too low to be meaningful even statistically significant.*

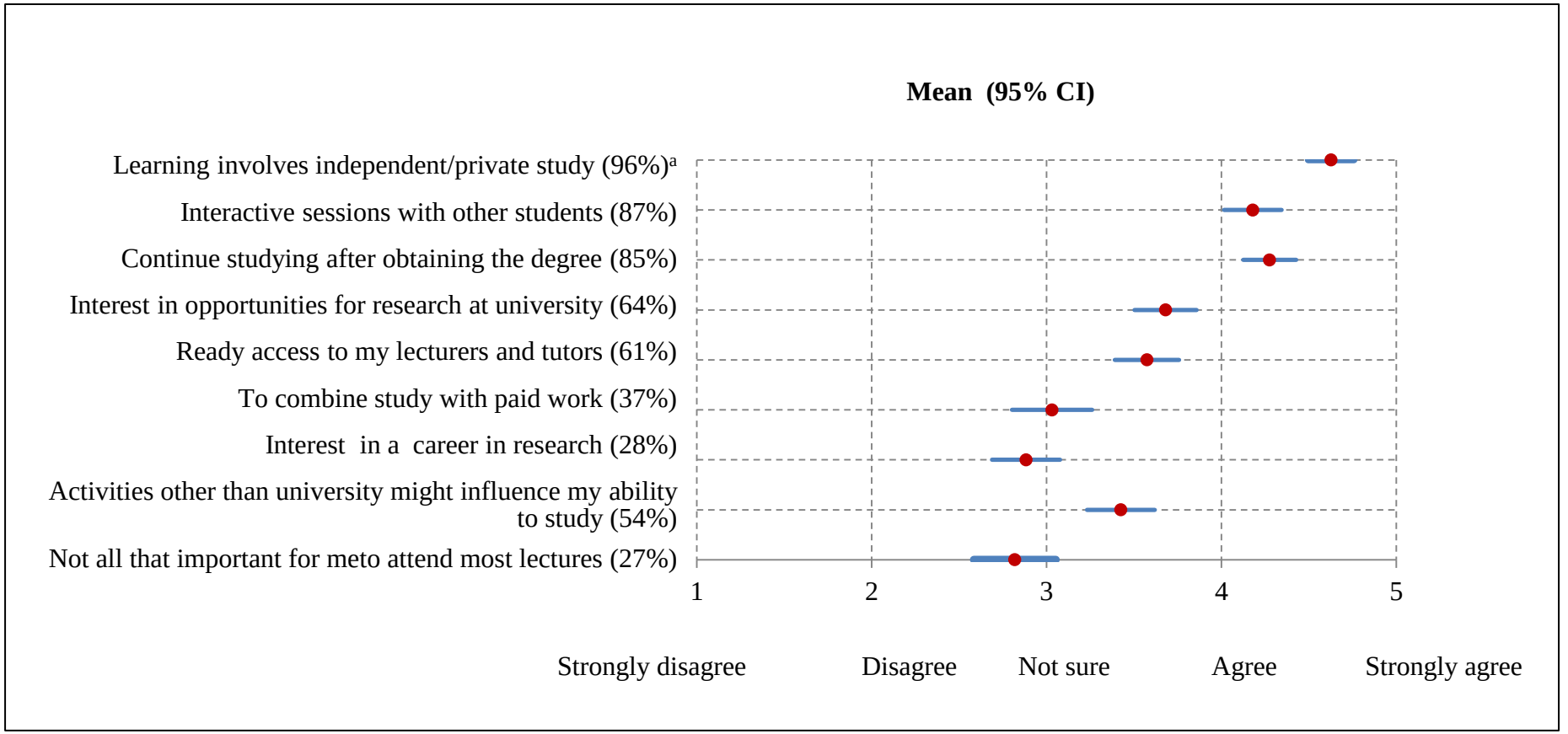
6.3 Follow-up responses

6.3.1 Descriptive information

Second year medical students

Second year medical students' mean agreement ratings for the items regarding their experiences of learning at university are shown in Figure 21. The items are presented in the same order as for the medical applicants (Figure 19). The items with the highest mean ratings were 'My learning involves independent/private study' (Mean = 4.63, SD = 0.64), 'Interactive sessions with other students are important to my learning' (Mean = 4.18, SD = 0.80), and 'I expect to continue studying after I obtain my degree' (Mean = 4.28, SD = 0.74). The items with the lowest ratings were 'I can combine study with paid work' (Mean = 3.03, SD = 1.12), 'I am interested in considering a career in research' (Mean = 2.88, SD = 0.95), and 'It is probably not all that important for me to attend lectures' (Mean = 2.82, SD = 1.15).

Figure 21 Summary of second year medical students' ratings for their agreement with the items regarding their experiences of learning at university (n = 94)

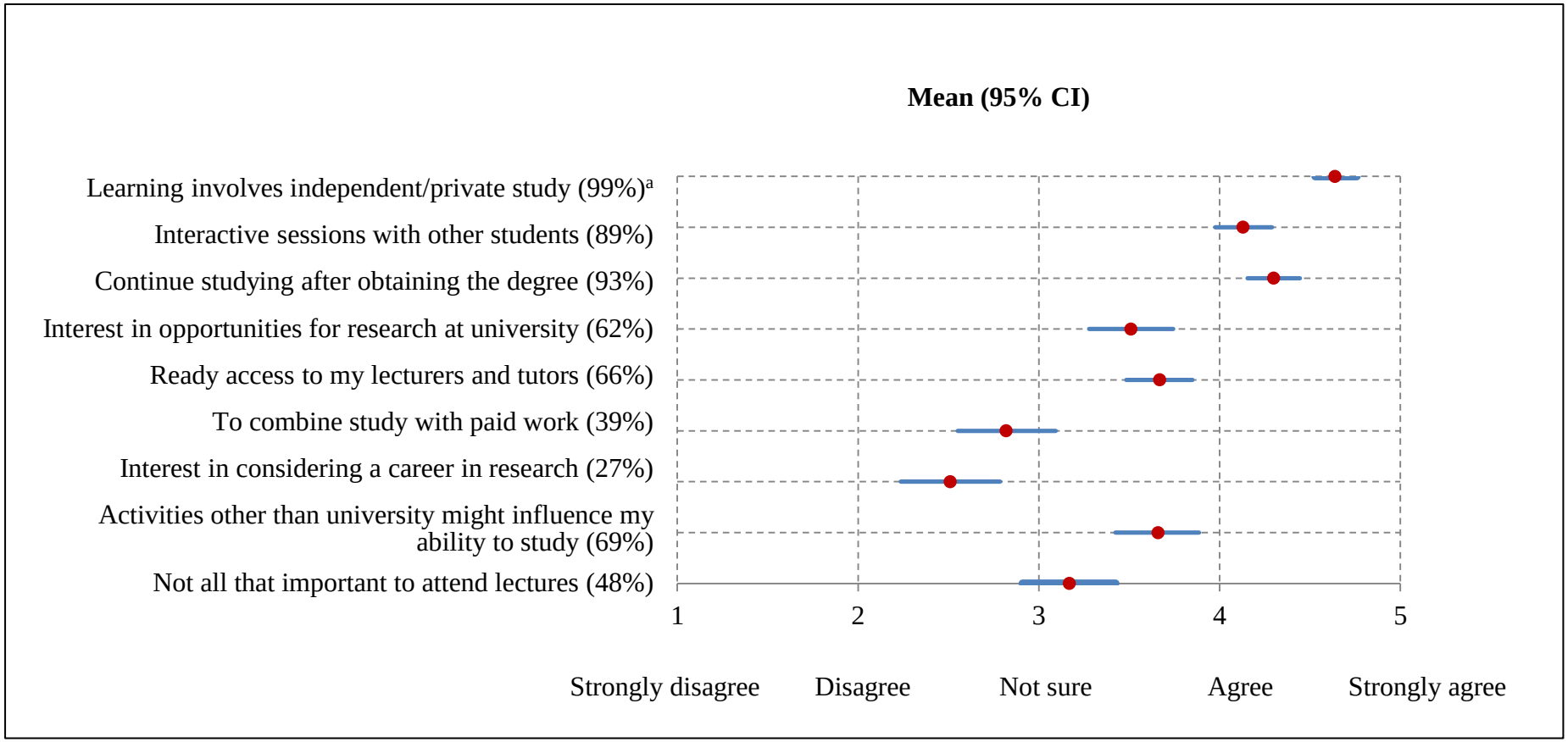


Notes: The items were presented in the same order as the medical applicants; [a] Percentage of combined 'agree/strongly agree'.

Fifth year medical students

Fifth year medical students' mean agreement ratings for the items regarding their experiences of learning at university are shown in Figure 22. The items are presented in the same order as for the medical applicants (i.e. as in Figure 19). The items with the highest mean ratings were 'My learning involves independent/private study' (Mean = 4.64, SD = 0.55), 'I expect to continue studying after I obtain my degree' (Mean = 4.3, SD = 0.69), and 'Interactive sessions with other students are important to my learning' (Mean = 4.13, SD = 0.75). The items with the lowest ratings were 'It is probably not all that important for me to attend lectures' (Mean = 3.17, SD = 1.23), 'I can combine study with paid work' (Mean = 2.82, SD = 1.29), and 'I am interested in considering a career in research' (Mean = 2.51, SD = 1.31).

Figure 22 Summary of fifth year medical students' ratings for their agreement with the items regarding their experiences of learning at university (n = 90)



Notes: The items were presented in the same order as the medical applicants; [a] Percentage of combined 'agree/strongly agree'.

6.3.2 Relationships between experiences of learning at university and scores for factors of reasons for studying medicine

Second year medical students

Table 43 shows the Spearman's correlation coefficients between second year medical students' experiences of learning at university and the factors of reasons for studying medicine. Second year medical students' score for science orientation was positively correlated with their ratings for 'My learning involves independent/private study' (r_s = 0.35, $p < 0.001$) and 'I expect to continue studying after I obtain my degree' (r_s = 0.28, p = 0.006). The score for people-orientation was positively correlated with their rating for 'My learning involves independent/private study' (r_s = 0.36, $p < 0.001$).

Table 43 Summary of correlations between experiences of studying at university and the factors of reasons for studying medicine among second year medical students (n = 94)

Expectation for studying at university	Factors of reasons for studying medicine			
	Science orientation	**People orientation**	**Job status/security**	**External pressure**
I can combine study with paid work	0.06	0.16	-0.01	-0.08
Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university	-0.03	0.21	-0.03	0.09
My learning involves independent/private study	0.35*	0.36*	0.05	-0.22
Interactive sessions with other students are important to my learning	0.05	0.21	0.02	-0.09
It is probably not all that important for me to attend most lectures	-0.01	-0.17	0.26	0.22
I have activities other than university that might affect my ability to study	-0.03	0.08	0.14	0.09
I expect to continue studying after I obtain my degree	0.28*	0.25	0.17	-0.03
I am interested in considering opportunities for research whilst undertaking university studies	0.16	0.10	0.16	0.00
I am interested in considering a career in research	0.10	0.11	0.12	0.09

*Notes: *Spearman's correlation coefficients, $p < 0.001$. For values of r_s below 0.20, correlations were considered too low to be meaningful even statistically significant.*

Fifth year medical students

Table 44 shows the Spearman's correlation coefficients between fifth year medical students' experiences of learning at university and the factors of reasons for studying medicine. Fifth year medical students' score for science orientation was positively correlated with their ratings for 'I expect to continue studying after I obtain my degree' ($r_s = 0.30$, $p = 0.004$) and 'I am interested in considering opportunities for research whilst undertaking university studies' ($r_s = 0.27$, $p = 0.010$). The score for people orientation was positively correlated with their ratings for 'Having ready access to my lecturers and tutors outside of face-to-face teaching will be important to my success at university' ($r_s = 0.26$, $p = 0.010$), 'Interactive sessions with other students are important to my learning' ($r_s = 0.28$, $p = 0.009$), and 'I expect to continue studying after I obtain my degree' ($r_s = 0.28$, $p = 0.008$).

Table 44 Summary of correlations between experiences of studying at university and the factors of reasons for studying medicine among fifth year medical students (n = 90)

Experiences for studying at university	Factors of reasons for studying medicine			
	Science-orientation	**People-orientation**	**Job status/security**	**External pressure**
I can combine study with paid work	0.21	0.09	-0.03	-0.06
Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university	0.21	0.26*	0.14	0.03
My learning involves independent/private study	0.16	0.04	0.04	-0.02
Interactive sessions with other students are important to my learning	0.15	0.28*	-0.04	-0.00
It is probably not all that important for me to attend most lectures	-0.12	-0.20	0.16	0.02
I have activities other than university that might affect my ability to study	0.12	0.10	-0.10	0.06
I expect to continue studying after I obtain my degree	0.30*	0.28*	-0.07	0.02
I am interested in considering opportunities for research whilst undertaking university studies	0.27*	0.24	0.10	-0.13
I am interested in considering a career in research	0.08	0.24	0.01	0.00

*Notes: *Spearman's correlation coefficients, $p < 0.001$. For values of r_s below 0.20, correlations were considered too low to be meaningful even statistically significant.*

6.4 Comparison between baseline and follow-up responses

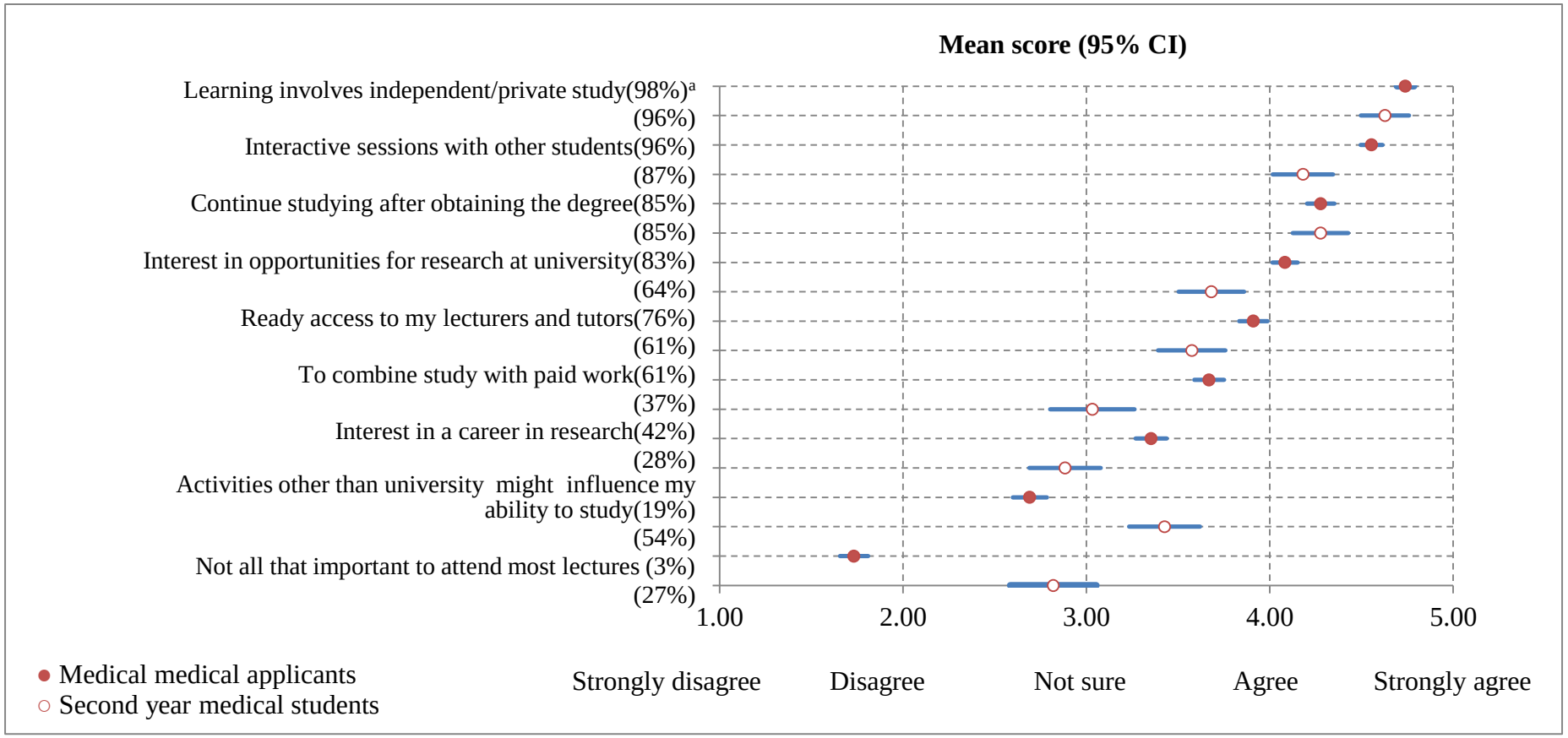
This section further describes the comparison of expectations/experiences of learning at university using all baseline and follow-up responses and using only paired baseline and follow-up responses.

6.4.1 Differences between expectations and experiences of learning at university after the first year at medical school

As can be seen in Figure 23, a majority of both medical applicants and second year medical students chose ‘agree’ or ‘strongly agree’ for ‘(I anticipated that) My learning (will involve) involves independent/private study’, ‘Interactive sessions with other students (will be) are important for my study’, and ‘I expect to continue studying after I obtain my degree’ (contents in parenthesis shows the wording for expectations). A small proportion of medical applicants chose ‘agree’ or ‘strongly agree’ for ‘I have activities other than university that might affect my ability to study’ and ‘It is probably not all that important for me to attend most lectures’. A small proportion of second year medical applicants chose ‘agree’ or ‘strongly agree’ for ‘I can combine study with paid work’, ‘I am interested in considering a career in research’, and ‘It is probably not all that important for me to attend most lectures’.

The major differences were that the second year medical students had a higher mean rating for ‘I have activities other than university that might affect my ability to study’ and ‘It is probably not all that important for me to attend most lectures’, and a lower mean rating for ‘I can combine study with paid work’ and ‘I am interested in considering a career in research’.

Figure 23 Comparison of medical applicants' (n = 411) expectations and second year medical students' (n = 94) experiences of learning at university



Notes: [a] *Percentage of combined 'agree/strongly agree'.*

As shown in Table 45, the comparison between all baseline and follow-up responses using Mann Whitney U-tests indicated that second year medical students' ratings for the nine items differed significantly from the ratings by medical applicants on most of the items, except for 'I (anticipate) that my learning (will) involves independent/private study' and 'I expect to continue studying after I obtain my degree'. Second year medical students' ratings (Median = 2; Interquartile range = 1-2) for 'It is probably not all that important for me to attend most lectures' was significantly higher than that of medical applicants (Median = 3; Interquartile range = 2-4; $z = -8.96$, $p < 0.001$). Second year medical students' ratings (Median = 4; Interquartile range = 3-4) for 'I have activities other than university that might affect my ability to study' was significantly higher than that of medical applicants (Median = 3; Interquartile range = 2-3; $z = -6.39$, $p < 0.001$). For other items with significant differences, the second year medical students' ratings were lower than those of medical applicants. Of note, the median differences were generally small.

Table 45 Comparison of medical applicants' and second year medical students' expectations and experiences of learning at university

Expectations/experiences of learning at university [a]	Medical applicant for 2012 entry (n = 411)				2013 second year medical students (n = 94)				Mann-Whitney	
	Mean	SD	Median	Interquartile range	Mean	SD	Median	Interquartile range	z	p*
I (expect to) can combine study with paid work	3.67	0.83	4	3-4	3.03	1.12	3	2-4	5.20	< 0.001
Having ready access to my lecturers and tutors outside of face-to-face teaching (will be) is important to my success at university	3.91	0.80	4	4-4	3.57	0.90	4	3-4	3.38	< 0.001
(I anticipate that) my learning (will) involves independent/private study	4.74	0.48	5	5-5	4.63	0.64	5	4-5	1.45	0.148
Interactive sessions with other students (will be) are important to my learning	4.55	0.61	5	4-5	4.18	0.80	4	4-5	4.65	< 0.001
It is probably not all that important for me to attend most lectures	1.73	0.79	2	1-2	2.82	1.15	3	2-4	-8.96	< 0.001
I have activities other than university that might affect my ability to study	2.69	0.95	3	2-3	3.43	0.94	4	3-4	-6.39	< 0.001
I expect to continue studying after I obtain my degree	4.28	0.77	4	4-5	4.28	0.74	4	4-5	1.16	0.876
I am interested in considering opportunities for research whilst undertaking university study	4.08	0.71	4	4-5	3.68	0.87	4	3-4	4.16	< 0.001
I am interested in considering a career in research	3.35	0.87	3	3-4	2.88	0.95	3	2-4	4.15	< 0.001

*Notes: * Mann Whitney U-test*

[a] words in parenthesis indicate the wording for expectations.

The differences between medical applicants and second year medical students were confirmed by the results from comparison between paired baseline and follow-up responses using Wilcoxon signed ranks tests (Table 46). However, in this paired comparison, the difference in the rating for 'I (expect to) can combine study with paid work' was no longer significant. This is possibly due to reduced power because of the smaller number of observations included in the paired analysis. There may also be some systematic difference between those students who completed both baseline and follow-up questionnaires and those who completed only one of them. This will be further discussed in the final chapter of the thesis.

Table 46 Paired comparison of expectations and experiences of learning at university before and after the first year at medical school (n = 48, paired)

Expectations/experiences of learning at university [a]	Mean	SD	Median	Interquartile range	p*
I (expect to) can combine study with paid work					
At application	3.39	0.79	3	3-4	0.105
At the start of second year	3.06	1.14	3	2-4	
Having ready access to my lecturers and tutors outside of face-to-face teaching (will be) is important to my success at university					
At application	4.06	0.78	4	4-5	< 0.001
At the start of second year	3.58	0.92	4	3-4	
(I anticipate that) my learning (will involve) involves independent/private study					
At application	4.62	0.53	5	4-5	0.763
At the start of second year	4.67	0.48	5	4-5	
Interactive sessions with other students (will be) are important to my learning					
At application	4.58	0.65	5	4-5	0.003
At the start of second year	4.17	0.69	4	4-5	

Table 46 (Continued) paired comparison of expectations and experiences of learning at university before and after the first year at medical school (n = 48, paired)

Expectations/experiences of learning at university [a]	Mean	SD	Median	Interquartile range	p*
It is probably not all that important for me to attend most lectures					
At application	1.77	0.90	2	1-2	< 0.001
At the start of second year	2.78	1.21	3	2-3.5	
I have activities other than university that might affect my ability to study					
At application	2.54	0.90	2.5	2-3	< 0.001
At the start of second year	3.44	0.99	3.5	3-4	
I expect to continue studying after I obtain my degree					
At application	4.25	0.86	4	4-5	0.834
At the start of second year	4.33	0.78	4.5	4-5	
I am interested in considering opportunities for research whilst undertaking university study					
At application	4.10	0.66	4	4-4.5	0.003
At the start of second year	3.63	0.91	4	3-4	
I am interested in considering a career in research					
At application	3.44	0.82	3	3-4	< 0.001
At the start of second year	2.83	0.95	3	2-3	

*Notes: * Wilcoxon signed ranks tests*
[a] words in parenthesis indicate the wording for expectations.

Regarding the time spent on independent/private study, comparison between all baseline and follow-up responses indicated that medical applicants' expected time for independent/private study differed significantly from the time reported by second year's students (Fisher's exact test p= 0.003). As can be seen in Table 47, a majority of the medical applicants (66%, 270/411) expected to spend 11-20 hours per week on independent/private study and 25% (105/411) expected to spend over 20 hours, while less than 10% (36/411) expected to spend less than 10 hours. The proportion of second year medical students reporting spending less than 10 hours was about two times that of medical applicants(17%, 16/94) and the proportion of spending over 20 hours per week was also much higher (37%, 35/94). In addition, no significant correlations were found between expected/reported time spent on individual/private study and reasons for studying medicine among either medical applicants or second year medical students.

Table 47 Summary of medical applicants and second year medical students' expected/reported time spent on independent/private study

Expected/reported time (hour/week)	N (%)	
	Medical applicants	Second year medical students
0 to 5	7 (2)	1 (1)
6 to 10	29 (7)	15 (16)
11 to 15	115 (28)	21 (22)
16 to 20	155 (38)	22 (24)
Over 20	105 (25)	35 (37)
Total	411 (100)	94 (100)

As described in Section 4.5.1, the 48 medical applicants with paired baseline and follow-up responses were classified into one of the following three groups based on their reasons for studying medicine at baseline time:

- Group 1: High science-orientation, high people-orientation, low external pressure group (LE group);
- Group 2: High science-orientation, high people-orientation, very low external pressure group (vLE group);
- Group 3: High science-orientation, high people-orientation, low job status/security, and very low external pressure group (LJvLE group).

Differences between expectations and experiences of learning at university within each group are summarised in Table 48 through Table 50. Results from Wilcoxon signed ranks tests indicated that after the first year at medical school, the LE group had lower ratings for 'Having ready access to my lecturers and tutors outside of face-to-face teaching (will be) is important to my success at university' (at application: Median = 4, Interquartile range = 4-5; at start of second year: Median = 4, Interquartile range = 3-4; $p = 0.007$). A decrease in the rating for this item was also found among the vLE group (at application: Median = 4, Interquartile range = 4-5; at start of second year: Median = 3, Interquartile range = 3-4; $p = 0.009$). However, the LJvLE group's rating for this item did not change significantly after the first year at medical school.

After the first year at medical school, the vLE group had a lower rating for 'Interactive sessions with other students (will be) are important to my learning' (at application: Median = 5, Interquartile range = 4.5-5; at start of second year: Median = 4, Interquartile range = 4-4;$p = 0.005$). However, the other two groups' rating for this item did not change significantly after the first year at medical school.

Only the LE group had significant changes in the ratings for 'It is probably not all that important for me to attend most lectures' (at application: Median = 2, Interquartile range = 1-2; at start of second year: Median = 3, Interquartile range = 2-4;$p < 0.001$) and 'I have activities other than university that might affect my ability to study' (at application: Median = 3, Interquartile range = 2-3; at start of second year: Median = 4, Interquartile range = 3-4;$p = 0.002$). However, the vLE group also had a higher rating for 'It is probably not all that important for me to attend most lectures' (at application:

Median = 1, Interquartile range = 1-2; at start of second year: Median = 3, Interquartile range = 2-3.5), though this difference was only close to the significance level ($p = 0.016$).

Except for these responses, the three groups did not differ much in the extent to which their experiences aligned with/differed from expectations of learning at university. However, these results need to be interpreted with caution because of the small number of observations in the analysis, which may reduce the power for detecting significant differences.

Table 48 Paired comparison of expectations and experiences of learning at university before and after the first year at medical school within the LE group (n = 25, paired)

Expectations/experiences of learning at university [a]	Mean	SD	Median	Interquartile range	p*
I (expect to) can combine study with paid work					
At application	3.56	0.71	4	3-4	0.109
At the start of second year	3.04	1.24	3	2-4	
Having ready access to my lecturers and tutors outside of face-to-face teaching (will be) is important to my success at university					
At application	4.12	0.73	4	4-5	0.007
At the start of second year	3.64	0.99	4	3-4	
(I anticipate that) my learning (will involve) involves independent/private study					
At application	4.44	0.51	4	4-5	0.317
At the start of second year	4.56	0.51	5	4-5	
Interactive sessions with other students (will be) are important to my learning					
At application	4.64	0.49	5	4-5	0.041
At the start of second year	4.24	0.72	4	4-5	
It is probably not all that important for me to attend most lectures					
At application	1.76	0.66	2	1-2	< 0.001
At the start of second year	2.92	0.22	3	2-4	
I have activities other than university that might affect my ability to study					
At application	2.68	0.80	3	2-3	0.002
At the start of second year	3.52	1.00	4	3-4	

Table 48 (Continued) paired comparison of expectations and experiences of learning at university before and after the first year at medical school within the LE group (n = 25, paired)

Expectations/experiences of learning at university [a]	Mean	SD	Median	Interquartile range	p*
I expect to continue studying after I obtain my degree					
At application	4.20	0.76	4	4-5	0.798
At the start of second year	4.28	0.84	4	4-5	
I am interested in considering opportunities for research whilst undertaking university study					
At application	3.96	0.73	4	4-4	0.099
At the start of second year	3.60	1.04	4	3-4	
I am interested in considering a career in research					
At application	3.32	0.75	3	3-4	0.014
At the start of second year	2.72	0.94	3	2-3	

*Notes: * Wilcoxon signed ranks tests*
[a] words in parenthesis indicate the wording for expectations.

Table 49 Paired comparison of expectations and experiences of learning at university before and after the first year at medical school within the vLE group (n = 12, paired)

Expectations/experiences of learning at university [a]	Mean	SD	Median	Interquartile range	p*
I (expect to) can combine study with paid work					
At application	3.08	0.67	3	3-3.5	0.221
At the start of second year	2.75	1.06	3	2-3	
Having ready access to my lecturers and tutors outside of face-to-face teaching (will be) is important to my success at university					
At application	4.17	0.72	4	4-5	0.009
At the start of second year	3.33	0.89	3	3-4	
(I anticipate that) my learning (will involve) involves independent/private study					
At application	4.92	0.29	5	5-5	1.000
At the start of second year	4.92	0.29	5	5-5	
Interactive sessions with other students (will be) are important to my learning					
At application	4.75	0.45	5	4.5-5	0.005
At the start of second year	4.00	0.60	4	4-4	
It is probably not all that important for me to attend most lectures					
At application	1.67	1.15	1	1-2	0.016
At the start of second year	2.92	1.24	3	2-3.5	
I have activities other than university that might affect my ability to study					
At application	2.50	0.80	2.5	2-3	0.105
At the start of second year	3.25	0.97	3	2.5-4	

Table 49 (Continued) paired comparison of expectations and experiences of learning at university before and after the first year at medical school within the vLE group (n = 12, paired)

Expectations/experiences of learning at university [a]	Mean	SD	Median	Interquartile range	p*
I expect to continue studying after I obtain my degree					
At application	4.42	0.79	5	4-5	0.564
At the start of second year	4.50	0.67	5	4-5	
I am interested in considering opportunities for research whilst undertaking university study					
At application	4.25	0.45	4	4-4.5	0.168
At the start of second year	3.92	0.67	4	3.5-4	
I am interested in considering a career in research					
At application	3.58	0.90	3.5	3-4	0.059
At the start of second year	3.17	0.83	3	2.5-4	

*Notes: * Wilcoxon signed ranks tests*
[a] words in parenthesis indicate the wording for expectations.

Table 50 Paired comparison of expectations and experiences of learning at university before and after the first year at medical school within the LJvLE group (n = 11, paired)

Expectations/experiences of learning at university [a]	Mean	SD	Median	Interquartile range	p*
I (expect to) can combine study with paid work					
At application	3.36	1.03	4	3-4	0.887
At the start of second year	3.45	0.93	4	3-4	
Having ready access to my lecturers and tutors outside of face-to-face teaching (will be) is important to my success at university					
At application	3.82	0.98	4	3-5	0.715
At the start of second year	3.73	0.79	4	3-4	
(I anticipate that) my learning (will involve) involves independent/private study					
At application	4.73	0.65	5	5-5	0.401
At the start of second year	4.64	0.50	5	4-5	
Interactive sessions with other students (will be) are important to my learning					
At application	4.27	1.01	5	4-5	0.746
At the start of second year	4.18	0.75	4	4-5	
It is probably not all that important for me to attend most lectures					
At application	1.91	1.14	2	1-2	0.311
At the start of second year	2.27	1.10	2	1-3	
I have activities other than university that might affect my ability to study					
At application	2.27	1.19	2	1-3	0.041
At the start of second year	3.45	1.04	3	3-4	

Table 50 (Continued) paired comparison of expectations and experiences of learning at university before and after the first year at medical school within the LJvLE group (n = 11, paired)

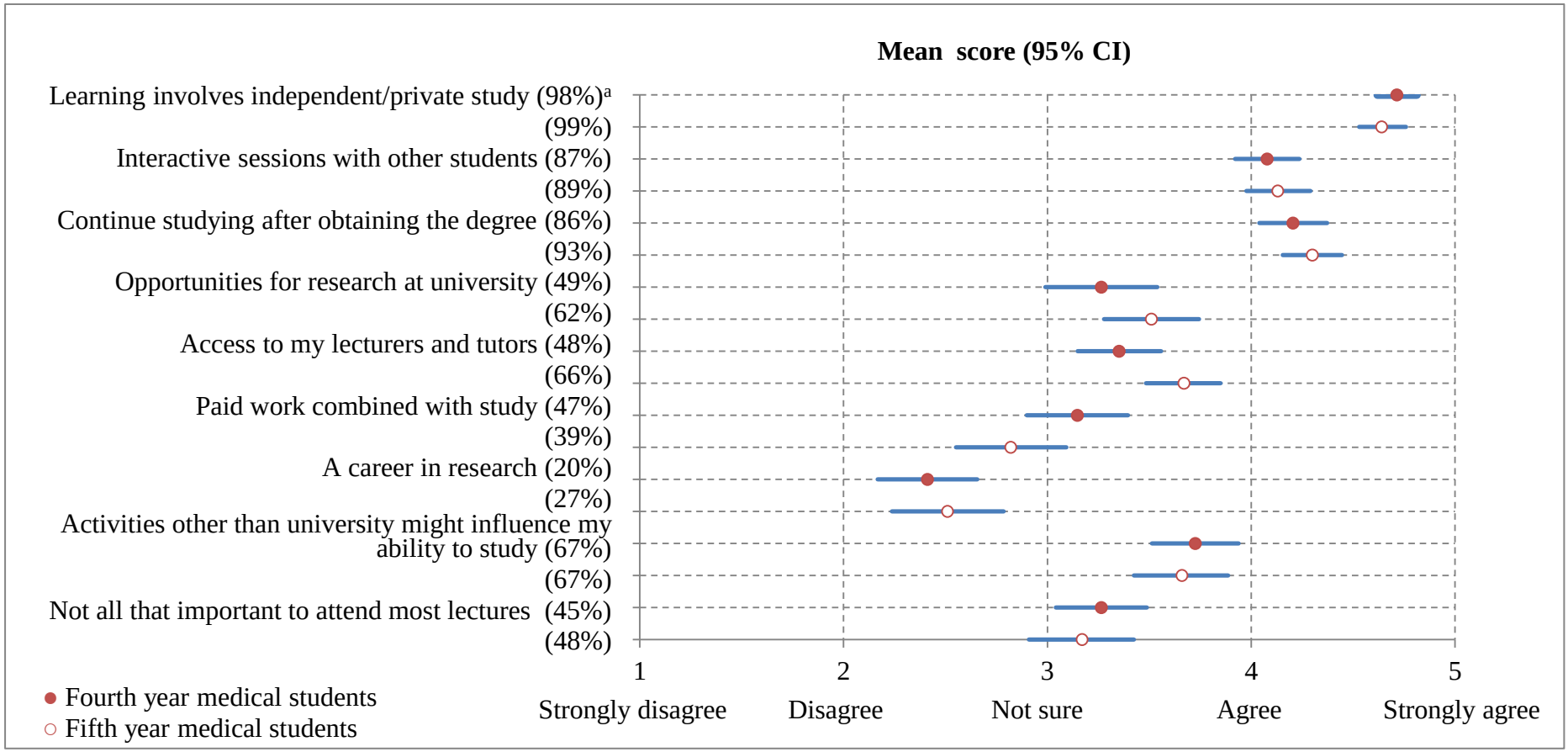
Expectations/experiences of learning at university [a]	Mean	SD	Median	Interquartile range	p*
I expect to continue studying after I obtain my degree					
At application	4.18	1.68	4	4-5	0.781
At the start of second year	4.27	0.79	4	4-5	
I am interested in considering opportunities for research whilst undertaking university study					
At application	4.27	0.65	4	4-5	0.026
At the start of second year	3.36	0.81	3	3-4	
I am interested in considering a career in research					
At application	3.55	0.93	3	3-4	0.031
At the start of second year	2.73	1.10	3	2-3	

*Notes: * Wilcoxon signed ranks tests*
[a] words in parenthesis indicate the wording for expectations.

6.4.2 Changes in experiences of learning at university after the fourth year at medical school

As can be seen in Figure 24, the fourth and fifth year medical students were quite similar in their mean ratings for the nine experience items. A majority of both fourth and fifth year medical students chose ‘agree’ or strongly agree’ for ‘My learning involves independent/private study’, ‘Interactive sessions with other students are important for my study’, and ‘I expect to continue studying after I obtain my degree’. A small proportion of both fourth and fifth year medical students chose ‘agree’ or ‘strongly agree’ for ‘I am interested in considering a career in research’ and ‘It is probably not all that important for me to attend most lectures’.

Figure 24 Comparison of fourth year medical students' (n = 102) and fifth year medical students' (n = 90) experiences of learning at university



Notes: [a] *Percentage of combined 'agree/strongly agree'.*

As shown in Table 51, the comparison between all baseline and follow-up responses using Mann Whitney U-tests indicated that there are no significant differences between the fourth and fifth year medical student's ratings for the nine items regarding experiences of learning at university.

Table 51 Comparison of fourth year medical students' and fifth year medical students' experiences of learning at university

Expectations/experiences of learning at university	Fourth year medical students (n = 102)				Fifth year medical students (n = 90)				Mann-Whitney	
	Mean	SD	Median	Interquartile range	Mean	SD	Median	Interquartile range	z	p*
I can combine study with paid work	3.14	1.26	3	2-4	2.82	1.29	3	2-4	1.72	0.085
Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university	3.35	1.04	3	3-4	3.67	0.87	4	3-4	-2.20	0.028
My learning involves independent/private study	4.72	0.50	5	4-5	4.64	0.55	5	4-5	0.98	0.326
Interactive sessions with other students are important to my learning	4.08	0.80	4	4-5	4.13	0.75	4	4-5	-0.36	0.718
It is probably not all that important for me to attend most lectures	3.26	1.13	3	2-4	3.17	1.23	3	2-4	0.51	0.609
I have activities other than university that might affect my ability to study	3.73	1.08	4	3-5	3.66	1.10	4	3-4	0.41	0.682
I expect to continue studying after I obtain my degree	4.21	0.85	4	4-5	4.30	0.69	4	4-5	-0.52	0.604
I am interested in considering opportunities for research whilst undertaking university study	3.26	1.40	3	2-4	3.51	1.11	4	3-4	-1.01	0.311
I am interested in considering a career in research	2.41	1.25	2	1-3	2.51	1.31	2.5	1-4	-0.51	0.609

*Notes: * Mann Whitney U-test.*

Similarly, comparison between paired baseline and follow-up responses using Wilcoxon signed ranks tests (Table 52) demonstrated no significant differences in the ratings for the nine items regarding experiences of learning at university before and after the fourth year at medical school.

Table 52 Paired comparison of experiences of learning at university before and after the fourth year at medical school (n = 32, paired)

Experiences of learning at university	Mean	SD	Median	Interquartile range	p*
I can combine study with paid work					
At the midpoint of fourth year	3.16	1.35	3.5	2-4	0.219
At the midpoint of fifth year	3.03	1.23	3	2-4	
Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university					
At the midpoint of fourth year	3.53	0.92	4	3-4	0.765
At the midpoint of fifth year	3.59	0.95	4	3-4	
My learning involves independent/private study					
At the midpoint of fourth year	4.69	0.54	5	4-5	0.564
At the midpoint of fifth year	4.75	0.44	5	4.5-5	
Interactive sessions with other students are important to my learning					
At the midpoint of fourth year	4.16	0.81	4	4-5	0.942
At the midpoint of fifth year	4.22	0.66	4	4-5	
It is probably not all that important for me to attend most lectures					
At the midpoint of fourth year	2.97	1.09	3	2-4	0.651
At the midpoint of fifth year	3.06	1.27	3.5	2-4	

Table 52 (Continued) paired comparison of experiences of learning at university before and after the fourth year at medical school (n = 32, paired)

Experiences of learning at university	Mean	SD	Median	Interquartile range	p*
I have activities other than university that might affect my ability to study					
At the midpoint of fourth year	3.66	0.97	4	3-4	0.834
At the midpoint of fifth year	3.63	1.24	4	3-5	
I expect to continue studying after I obtain my degree					
At the midpoint of fourth year	4.03	1.00	4	4-5	0.140
At the midpoint of fifth year	4.34	0.70	4	4-5	
I am interested in considering opportunities for research whilst undertaking university study					
At the midpoint of fourth year	3.19	1.35	3	2-4	0.670
At the midpoint of fifth year	3.41	1.13	4	3-4	
I am interested in considering a career in research					
At the midpoint of fourth year	2.56	1.27	2.5	1.5-3	0.273
At the midpoint of fifth year	2.47	1.37	2	1-3.5	

Notes: Wilcoxon signed ranks tests*

Regarding the time spent on independent/private study, comparison using all baseline and follow-up responses indicated that there were no significant differences in the reported time spent on independent/private study between fourth and fifth year medical students (Fisher's exact = 0.175). In spite of this, as shown in Table 53, fourth year medical students 28% (29/102) reported having spent 11-15 hours per week on independent/private study, while 41% (37/90) of the fifth year medical students' spent 11-15 hours per week on independent/private study. In addition, it was found among the fourth year medical students that the rating for 'I have scientific curiosity' was positively correlated with reported time spent on independent/private study (r_s = 0.27, p = 0.006), while no significant correlations were found between reported time spent on individual/private study and reasons for studying medicine among fifth year medical students.

Table 53 Summary of fourth and fifth year medical students' reported time spent on independent/private study

Expected/reported time (hour/week)	n (%)	
	Fourth year medical students	Fifth year medical students
0 to 5	11 (11)	14 (15.5)
6 to 10	26 (25)	15 (17)
11 to 15	29 (28)	37 (41)
16 to 20	24 (24)	14 (15.5)
Over 20	12 (12)	10 (11)
Total	102 (100)	90 (100)

As described in Section 4.5.2, the 32 fourth year medical students with paired baseline and follow-up responses were classified into one of the following three groups based on their reasons for studying medicine at baseline time:

- Group 1: lower science orientation, lower people orientation, high job status/security group (HJ group)
- Group 2: overall highly motivated group (oH group);
- Group 3: high science orientation, high people orientation, lower job status/security, and low external pressure group (LE group).

Differences between experiences of learning at university within each group are summarised in Table 54 through Table 56. Results from Wilcoxon signed ranks tests indicated that within any groups of the fourth year medical students, there were no significant differences in the ratings for the nine items regarding experiences of learning at university before and after the fourth year at medical school. However, these results need to be interpreted with caution because of the small number of observations in the analysis, which may reduce power for detecting significant differences.

Table 54 Paired comparison of experiences of learning at university before and after the fourth year at medical school within the HJ group (N = 5, paired)

Experiences of learning at university	Mean	SD	Median	Interquartile range	p*
I can combine study with paid work					
At the midpoint of fourth year	3.00	1.41	4	2-4	0.876
At the midpoint of fifth year	3.20	1.30	4	3-4	
Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university					
At the midpoint of fourth year	2.80	1.10	3	3-3	0.216
At the midpoint of fifth year	3.60	1.14	4	3-4	
My learning involves independent/private study					
At the midpoint of fourth year	4.80	0.45	5	5-5	1.000
At the midpoint of fifth year	4.80	0.45	5	5-5	
Interactive sessions with other students are important to my learning					
At the midpoint of fourth year	3.80	1.10	4	4-4	1.000
At the midpoint of fifth year	3.80	0.84	4	3-4	
It is probably not all that important for me to attend most lectures					
At the midpoint of fourth year	3.60	0.89	4	4-4	1.000
At the midpoint of fifth year	3.60	1.14	4	3-4	
I have activities other than university that might affect my ability to study					
At the midpoint of fourth year	3.40	1.52	4	3-4	0.670
At the midpoint of fifth year	3.20	1.79	3	2-5	
I expect to continue studying after I obtain my degree					
At the midpoint of fourth year	3.60	1.67	4	3-5	0.088
At the midpoint of fifth year	4.60	0.54	5	4-5	

Table 54 (Continued) paired comparison of experiences of learning at university before and after the fourth year at medical school within the HJ group (N = 5, paired)

Experiences of learning at university	Mean	SD	Median	Interquartile range	p*
I am interested in considering opportunities for research whilst undertaking university study					
At the midpoint of fourth year	2.60	1.52	3	1-4	0.090
At the midpoint of fifth year	3.80	0.84	4	3-4	
I am interested in considering a career in research					
At the midpoint of fourth year	2.00	1.14	1	1-3	0.572
At the midpoint of fifth year	2.40	1.95	1	1-4	

*Notes: * Wilcoxon signed ranks tests*

Table 55 Paired comparison of experiences of learning at university before and after the fourth year at medical school within the oH group (N = 10, paired)

Experiences of learning at university	Mean	SD	Median	Interquartile range	p*
I can combine study with paid work					
At the midpoint of fourth year	3.10	1.52	3.5	2-4	0.487
At the midpoint of fifth year	2.90	1.37	3	2-4	
Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university					
At the midpoint of fourth year	3.50	0.85	3.5	3-4	1.000
At the midpoint of fifth year	3.50	0.97	4	3-4	
My learning involves independent/private study					
At the midpoint of fourth year	4.60	0.52	5	4-5	0.180
At the midpoint of fifth year	4.90	0.32	5	5-5	
Interactive sessions with other students are important to my learning					
At the midpoint of fourth year	4.30	0.95	4.5	4-5	0.941
At the midpoint of fifth year	4.50	0.53	4.5	4-5	
It is probably not all that important for me to attend most lectures					
At the midpoint of fourth year	2.50	0.97	2	2-3	0.831
At the midpoint of fifth year	2.70	1.42	2	2-4	
I have activities other than university that might affect my ability to study					
At the midpoint of fourth year	3.70	0.82	4	3-4	0.637
At the midpoint of fifth year	3.50	1.35	4	2-5	
I expect to continue studying after I obtain my degree					
At the midpoint of fourth year	3.90	1.10	4	4-4	0.047
At the midpoint of fifth year	4.50	0.53	4.5	4-5	

Table 55 (Continued) paired comparison of experiences of learning at university before and after the fourth year at medical school within the oH group (N = 10, paired)

Experiences of learning at university	Mean	SD	Median	Interquartile range	p*
I am interested in considering opportunities for research whilst undertaking university study					
At the midpoint of fourth year	3.00	1.49	3	2-4	0.263
At the midpoint of fifth year	3.60	1.07	4	3-4	
I am interested in considering a career in research					
At the midpoint of fourth year	2.60	1.43	2.5	1-4	1.000
At the midpoint of fifth year	2.60	1.43	2.5	1-4	

*Notes: * Wilcoxon signed ranks tests*

Table 56 Paired comparison of experiences of learning at university before and after the fourth year at medical school within the LE group (N = 17, paired)

Experiences of learning at university	Mean	SD	Median	Interquartile range	p*
I can combine study with paid work					
At the midpoint of fourth year	3.24	1.30	3	2-4	0.178
At the midpoint of fifth year	3.06	1.20	3	2-4	
Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university					
At the midpoint of fourth year	3.76	0.83	4	3-4	0.648
At the midpoint of fifth year	3.65	0.93	4	3-4	
My learning involves independent/private study					
At the midpoint of fourth year	4.71	0.59	5	5-5	0.655
At the midpoint of fifth year	4.65	0.49	5	4-5	
Interactive sessions with other students are important to my learning					
At the midpoint of fourth year	4.18	0.64	4	4-5	1.000
At the midpoint of fifth year	4.18	0.64	4	4-5	
It is probably not all that important for me to attend most lectures					
At the midpoint of fourth year	3.06	1.14	4	2-4	0.520
At the midpoint of fifth year	3.12	1.22	4	2-4	
I have activities other than university that might affect my ability to study					
At the midpoint of fourth year	3.71	0.92	4	3-4	0.648
At the midpoint of fifth year	3.82	1.01	4	3-4	
I expect to continue studying after I obtain my degree					
At the midpoint of fourth year	4.23	0.66	4	4-5	0.786
At the midpoint of fifth year	4.18	0.81	4	4-5	

Table 56 (Continued) paired comparison of experiences of learning at university before and after the fourth year at medical school within the LE group (N = 17, paired)

Experiences of learning at university	Mean	SD	Median	Interquartile range	p*
I am interested in considering opportunities for research whilst undertaking university study					
At the midpoint of fourth year	3.47	1.23	4	3-4	0.136
At the midpoint of fifth year	3.18	1.24	4	3-4	
I am interested in considering a career in research					
At the midpoint of fourth year	2.71	1.16	3	2-3	0.059
At the midpoint of fifth year	2.41	1.23	2	1-3	

Notes: Wilcoxon signed ranks tests*

6.5 Summary

Across the four questionnaires in this study, the following three items were rated by a majority of the participants as 'agree' or 'strongly agree': 'My learning will involve independent/private study', 'Interactive sessions with other students will be important to my learning', and 'I expect to continue studying after I obtain my degree'. Two items, namely 'Activities other than university might influence my ability to study' and 'It is not all that important for me to attend lectures', were rated as 'agree' or 'strongly agree' by only a small proportion of medical applicants, while in the other three questionnaires, the item rated as 'agree' or 'strongly agree' by the smallest percentage of participants was 'I am interested in considering a career in research'.

A number of differences were found between medical students' expectations at application and following first year experiences of learning at university. The major differences were that compared with expectations at application, after the first year at medical school medical students had a higher mean rating for 'I have activities other than university that might affect my ability to study' and 'It is probably not all that important for me to attend most lectures', while lower mean ratings were observed for 'I can combine study with paid work' and 'I am interested in considering a career in research'. Between different clusters of medical students determined by their reasons for studying medicine, the extent to which medical students' first year experiences of learning at university aligned with/differed from their expectations varied. There were no statistically significant changes in participants' experiences of learning at university after the fourth year at medical school, either within all paired responses or within groups of fourth year medical students determined by reasons for studying medicine.

The pattern of correlations between expectations/experiences of learning at university and factors of reasons for studying medicine was quite stable across questionnaires. Medical students' score for science orientation was positively correlated with the rating for 'I expected to continue study after obtaining my degree'. Medical students' score for people orientation was positively correlated with the rating for 'Interactive sessions with other students (will be) are important to my learning'. Medical students' scores for job status/security and external pressure were found to be negatively correlated with the

rating for ‘It is probably not all that important for me to attend most lectures’, though these correlations were not stable across the questionnaires.

In the next chapter, findings reported in CHAPTER 3 through CHAPTER 6 will be summarised, interpreted, and discussed with a comparison with previous relevant findings. The implications, strengths, and limitations of this study will also be discussed.

CHAPTER 7. DISCUSSION

7.1 Introduction

This chapter summarises and discusses the findings of this thesis. It starts with a summary of the key study findings in light of the research questions. The chapter then focuses on the similarities and differences regarding medical students' motivations for studying medicine, altruistic attitudes, and expectations/experiences of learning at university, before addressing the role of socio-demographic characteristics in influencing medical students' motivations, altruistic attitudes, and expectations/experiences. The study strengths and limitations are then described, along with areas for future research. The chapter concludes by summarising the study implications.

7.2 How do the study findings answer the research questions?

This section summarises the key study findings in light of the research questions, drawing on all of the results reported in previous chapters.

Questions 1. Do medical students' motivations for studying medicine change during medical school?

Findings. Across all stages of medical training addressed in this thesis, medical students were mainly motivated to study medicine by the humanistic aspects of medicine - particularly altruism - followed by being attracted to medicine as a science. After the first year at medical school, medical students' interest in the people and scientific aspects of medicine became less important, while job status/security and external pressure became more important. However, job status/security and external pressure still made only a small contribution overall to students' motivations for studying medicine. In contrast, there were minimal changes in medical students' motivations for studying medicine after the fourth year at medical school compared with their motivations at the start of the fourth year.

Question 2. Do medical students' altruistic attitudes change during medical school?

Findings. Medical students reported high levels of altruistic attitudes across the various stages of medical school. These attitudes declined to some degree after the first year at medical school, but did not change after the fourth year at medical school compared with the start of the fourth year.

Question 3. Do medical students' experiences of learning at university differ from their expectations at the application stage, and do these experiences change during medical school?

Findings. There were a number of mismatches between medical students' expectations of learning at university at application and their actual first year experiences. First year medical students found ready access to lecturers and tutors, interactive sessions with other students, and attending lectures less important for their learning than they had expected, while activities outside of university affected their ability to study more often than they had expected. They overestimated the time they would spend on independent/private study at application. Their interest in opportunities for research and a career in research both decreased after the first year at medical school. In contrast, experiences of learning at university did not change after the fourth year at medical school compared with the start of the fourth year.

Question 4. What are the relationships between medical students' motivations for studying medicine and their altruistic attitudes?

Findings. Those medical students who rated people-oriented reasons as being more important tended to have higher levels of altruistic attitudes. In paired composition, the changes in altruistic attitudes in the fourth year at medical school appeared to vary between clusters of medical students as determined by their motivations for studying medicine - the group with high score for job status/security had a higher mean and median altruistic attitude score after the fourth year at medical school, while the other two groups had lower mean and median altruistic attitude scores after the fourth year at medical school. However, these changes were not statistically significant in any group.

Question 5. What are the relationships between medical students' motivations for studying medicine and their expectations/experiences of learning at university?

Findings. Those medical students who rated people-oriented reasons as being more important tended to focus more on independent/private study, to have greater agreement about the likelihood of continuing study after graduation, and to find ready access to staff and interaction with other students more important. The medical students who rated science-oriented reasons as being more important tended to focus more on independent/private study, to have greater agreement about the likelihood of continuing study after graduation, and greater interest in opportunities for research at university. Those medical students who rated job status/security as being more important tended to consider activities other than university more important for their study. Those medical students who rated external pressure as being more important tended to focus less on independent/private study, and to find attending lectures less important. In addition, the mismatches of expectations at application and first year experiences of learning at university varied between the distinct groups of medical applicants identified using cluster analysis based on their motivations for studying medicine.

As can be seen from these results, medical students' motivations for studying medicine, altruistic attitudes, and expectations/experiences of learning at university demonstrated a similar pattern of changes to each other in the first year at medical school. In contrast, there were few changes in the fourth year at medical school. This may suggest that the first year at medical school is the critical year for changes in relation to these three domains.

The people-oriented and the science-oriented motivations were intrinsic motivations, because there is a link between these motivations and the feeling that studying medicine can satisfy a desire for helping others/curing disease, offers opportunities for interacting with people, and provides intellectual challenges (Ten Cate et al., 2011). In contrast, the job status/security and external pressure were extrinsic, because these motivations are related to external demands, by what one should do, rather than what one enjoys doing (Ten Cate et al., 2011). In the first year at medical school, the intrinsic motivations declined, while the extrinsic motivations increased.

In addition to these patterns, medical students' motivations for studying medicine were found to be related to their altruistic attitudes and their expectations/experiences of learning at university. Furthermore, after students were divided, using cluster analysis,

into different groups according to their motivations for studying medicine, it was observed that changes in altruistic attitudes, the mismatches of expectations at application and first year experiences of learning at university appeared to vary between these groups. These indicate that these domains are likely to be interacting with each other in a complex way. However, the study design did not enable the exploration of any causal pathways, so any statements about these relationships can only be speculative. It is possible that medical students' altruistic attitudes underpin their motivations for studying medicine; mismatches between expectations and actual experiences may lead to changes in motivations. Conversely, it is also possible that medical students' motivations for studying medicine shape their altruistic attitudes and expectations/experiences of learning at university. Whatever the causal pathways, it is clear that altruistic attitudes and expectation/experience of learning at university are relevant domains to be explored in understanding the changes in medical students' motivations for studying medicine.

7.3 What are the possible explanations for the observed patterns?

As noted above, medical students' motivations, altruistic attitudes, and expectations/experiences are likely to be interacting with each other in a complex way. This section will discuss the patterns of changes and non-changes regarding these three domains. Possible explanations will be discussed from three perspectives: transition to the university learning environment; curriculum design; and professional socialisation (Table 57). These three perspectives overlap, but they are separated out in this section to explore each aspect in detail and provide greater clarity for readers.

Table 57 Summary of possible explanations for changes and non-changes in medical students' motivations for studying medicine, altruistic attitudes, and expectations/experiences of learning at university

Research questions	Findings		Chapter No.	Possible explanations		
	From application to the start of second year	From start of the fourth year to start of the fifth year		Professional socialisation	Transition into university learning	Curriculum design
Do medical students' motivations for studying medicine change during medical school?	• Decreases in people-orientation and science orientation • Increases in job status/security and external pressure	• Minimal change	4	✓	✓	✓
Do medical students' altruistic attitudes change during medical school?	• Decline in altruistic attitudes	• No change	5	✓	✓	✓
Do medical students' experiences of learning at university differ from their expectations at the application stage, and do these experiences change during medical school?	• Decrease in perceived importance of ready access to teaching staff, interactive sessions with other students, and attending lectures • Increase in perceived importance of non-university activities • Students overestimated the time for independent/private study at application • Decrease in interest in opportunities for research or a career in research	• No change	6		✓	✓

Notes: Where there is a '✓', it means that a certain explanation may be applicable.

7.3.1 Transition to the university learning environment

The transition from school to university has been a significant issue for most tertiary programs. Several facets of this process have been highlighted in previous research, including adaptation to university learning styles (McCarthy, 2006, Crisp et al., 2009, Brinkworth et al., 2009, Cook et al., 1999), increased commitment to paid work and decreased engagement in both academic and social life at university (James et al., 2010, Krause et al., 2005, McInnis et al., 2000, McInnis et al., 1995). In medical programs specifically, students have reported the first year at medical school to be stressful (Radcliffe et al., 2003, Guthrie et al., 2009). Understanding these facets of the transition process is important for understanding the findings around the first year at medical school in this study.

An adaptation process to the style of university learning is inevitable, since university learning differs from secondary school learning in multiple aspects. Ready accesses to staff, quick feedback, and feedback on drafts from teachers are much less available at university than at secondary school (Cook et al., 1999, Crisp et al., 2009, Brinkworth et al., 2009). University staff are often involved in a variety of non-teaching activities, and therefore are less available to students (Brinkworth et al., 2009). Lectures at university are often given in large classes, particularly at the first year level; therefore lecturers are less available to individual students. It is because of these differences in learning and teaching styles that expectations for learning at university based on the secondary school learning environment are less likely to be met. This may well explain the findings that in the first year at medical school students found ready access to medical staff and interactive sessions with other students less important for their learning than they had expected when applying to study medicine.

Another phenomenon highlighted in Australian tertiary education is that full time first year university students have been undertaking increased hours of paid employment and spending less time engaging in both academic and social life at university, including preparing for and attending classes (James et al., 2010, Krause et al., 2005, McInnis et al., 2000, McInnis et al., 1995). Some first year university students sacrifice time for study to undertake paid work, because they need to cover living expenses or to be financially independent (James et al., 2010, Krause et al., 2005, McInnis et al., 2000,

McInnis et al., 1995). Having said this, first year university students may actually value the benefits from non-university activities, such as sport commitments, for their personal development. In this case, the non-university activities do not have to be related to financial gains from paid employment (Brinkworth et al., 2009). Also, the combination of university study with paid work may sometimes support more flexible approaches to learning, as one can learn from these experiences. Responding to this trend, tertiary education has provided alternative support such as on-line learning with recorded lectures, e-mails, and on-line discussion boards, which enable university students to arrange their time and place for learning more flexibly (Brinkworth et al., 2009).

Consistent with this trend in general tertiary education, this study showed that, after the first year at medical school, medical students actually place more importance on non-university activities and less importance on attending lectures for their ability to study. They also reported that it was harder than expected to combine medical study with paid work. These behaviours may have some drawbacks for medical study, which cannot be easily addressed by merely providing alternative approaches such as on-line learning. This is because direct contact with the medical profession is important to establish medical students' sense of professional identity, through both 'professional inclusivity', where they feel they are part of the profession and experience high levels of peer inclusivity, and 'social exclusivity', the feeling of being someone special (Weaver et al., 2011a). It is partly through this process that medical students acquire professionalism(Merton et al., 1957). Moreover, direct contact with the medical profession is important to maintain and foster intrinsic motivations in learning, since it generates the feeling of relatedness - being connected to and belonging to some community (Ryan et al., 2000, Deci et al., 1985, Ten Cate et al., 2011). In contrast, less than expected engagement in medical school may lead to the feeling of disconnection, which may explain the observed decrease in the intrinsic motivations in the first year at medical school.

The feelings of inclusivity and relatedness may also explain the increased importance of external pressure as motivation for studying medicine. This has been rarely mentioned in previous literature, but this study has found that after the first year at medical school, influences from friends and expectations from teachers are more important as

motivation for studying medicine. It is possible that during the first year having made friends in the medical program and also getting to know their teachers, makes them more likely to adhere to the medical program. In contrast, at the time of application, students were less motivated by influences from friends and teachers' expectations, since they were relatively more independent individuals.

A third facet of the transition from secondary school to university learning is the stress involved in this process. Stress may arise either from social aspects (e.g. changes in social networking, issues with tutors, and competition with peers), from academic aspects (e.g. heavy workload), or from other aspects (e.g. home sickness and financial pressure) (Radcliffe et al., 2003, Guthrie et al., 2009). The heaviness of workload and difficulties in keeping up with large volumes of work have been highlighted particularly as key problems during this transition process in recent research on the University of Adelaide medical program (Raw, 2013).

Findings from this study also indicate that time issues may be another stressor. This study showed that overall, first year medical students overestimated the extent to which they would do independent/private study, as reported in general tertiary education (O'Keefe et al., 2011, Krause et al., 2005, Lowe et al., 2003, Crisp et al., 2009, Kuh, 2007). It is not likely that medical study does not require as much independent/private study as expected, considering that heavy workload has already been identified as an issue in medical study (Raw, 2013). Instead, this finding may suggest issues with students' time management. Furthermore, when first year medical students were asked about the exact hours spent on independent/private study, both the proportions of students reporting spending below 10 hours and over 20 hours per week increased considerably. It seems that first year medical students ended up with two extreme situations: they spent limited time on individual/private study, or they spent much more time on individual/private study than expected.

These experiences of stress from workload and time management may explain the observed decrease in first year medical students' intrinsic motivations. The feeling of being in control of one's own study (autonomy) and the perception of self-confidence (competence) is important for maintaining intrinsic motivations (Williams et al., 1999, Deci et al., 1985). Struggles in coping with the workload may reduce the feeling of being in control of one's own study, which can be frustrating. With time management

issues, learning behaviours tend to be driven externally by deadlines instead of one's internal interest in study. Completing tasks on time becomes more important than taking time to enjoy the study process. These can reduce the joy of the learning itself and also the feeling of being in control, which may explain the observed decrease in intrinsic motivations in the first year at medical school (Ryan et al., 2000, Deci et al., 1985, Ten Cate et al., 2011).

Furthermore, the structure of learning in the University of Adelaide medical program may also bring additional learning challenges during the transition from secondary school to university learning. This will be further discussed in the next section on curriculum design.

7.3.2 Curriculum design

The previous section on the transition from secondary school to university learning has, to some extent, explored changes during the first year. Still, it is not clear why there were minimal changes in medical students' motivations, altruistic attitudes, and learning experiences in the fourth year at medical school. In this section the curriculum design at University of Adelaide medical program will be discussed to help understand the findings around the fourth year.

In the medical program, the fourth year is the first year of training based predominantly in the clinical environment. Extensive previous literature has reported that medical students at the early stage of clinical training may have diverse difficulties and problems related to workload, time management, linking theory to practice, and particularly the establishment of professional identity (Hodges, 2010, Prince et al., 2000, Moss et al., 1992, Babaria et al., 2009, Prince et al., 2005, Pitkala et al., 2003, O'Brien et al., 2007, Hayes et al., 2004, Van Gessel et al., 2003). The curriculum at the medical program has been designed to maximize the integration between the first three years of training (predominantly at university) and the second three years of training (predominantly in a clinical environment). Two components of this curriculum design are important: Case-Based Leaning (CBL) and the Medical Personal and Professional Development (MPPD) stream.

CBL, similar to the more common Problem-Based Learning (PBL), uses a problem, a case, or an inquiry, to fulfil the goal of obtaining knowledge, skills, and attitudes (Setia

et al., 2011). In CBL and PBL, acquiring knowledge is driven by the need to solve a medical case which relates to future practice and which maximizes the integration of theoretical knowledge and authentic medical practice (Barrows, 1986, Williams, 2005). CBL and PBL encourage self-directed learning (SDL) (Schmidt, 2000, Barrows, 1986). Students mostly work independently to set objectives, look for learning resources and materials, and share what have they learnt with others (White, 2007). CBL and PBL students study in small groups, which allows them to develop a collaborative, team-based learning approach (Williams, 2005).

These attributes of CBL may help to stabilize medical students' motivations, altruistic attitudes, and learning experiences during the transition from the preclinical training and clinical training by providing some aspects of the clinical setting in advance of encountering it in the fourth year. There are a number of ways in which this impact from CBL on the motivations for studying medicine may take place. First, the perceived connection of course content with future practice and the challenges from problem solving may foster medical students' intrinsic interest in learning (Barrows, 1986); in contrast, the perceived disconnection between the preclinical curriculum and actual practice may make medical students perceive this aspect of the educational experience as less meaningful and valuable for their future work and this may be associated with a reduction in their interest in the course content (Del-Ben et al., 2013). Second, encouraging self-directed learning in CBL increases medical students' feeling of autonomy in learning (Williams, 2005). Third, working collaboratively with other students may foster the feeling of relatedness. These have all been identified as critical psychological needs for retaining intrinsic motivations (Deci et al., 1985).

Regarding altruistic attitudes, in CBL the cases are often provided with patients' background and other clinical situations (Williams, 2005). This orients the curriculum towards the social context of practice, improves students' confidence in approaching patients, and helps students to understand the role of doctors in authentic medical situations (Dornan et al., 2004). These are all likely to help students understand their roles, responsibilities, and others' expectations during their clinical training, thereby reducing the challenges from professional socialisation.

Regarding learning experiences, learning in a self-directed and collaborative approach in CBL may also equip medical students with the skills, such as time management,

sensitivity to personal learning needs, identification of appropriate information sources and interpersonal and communication, which are important for learning in a clinical environment (Barrows, 1986).

It has previously been found that PBL students reported growing comfort with self-regulated learning and transferred smoothly from the preclinical to clinical training with intrinsic motivations for learning, while students in traditional curricula reported a rougher transition, with frustrations in meeting expectations, finding their roles in clinical cultures, adjusting their learning techniques, and setting priorities (White, 2007). In the present study, the small and few changes in motivations for studying medicine, altruistic attitudes, and experiences of learning at university in the fourth year, may also suggest that CBL may adequately assist medical students to deal with the transition from preclinical training to clinical training.

CBL may also work to 'shift' difficult transitions at medical school to the first year (White, 2007). CBL students have been reported to feel inadequately prepared for tutorials during their first year at medical school; they did not appreciate their tutor's guidance in an autonomy-supportive way and they felt the demands of work outside tutorials in a self-directed way of learning to be unrealistic (Raw, 2013). A similar pattern appears to be occurring in this study, where the changes in learning experiences appeared mainly in the first year at medical school.

Another component of the medical program curriculum design of relevance to these findings is the introduction of the MPPD stream. The aim of the MPPD stream is to incorporate an emphasis on medical professionalism, ethical practice and communication with patients and peers in undergraduate medical training. It starts from the first year and continues throughout the medical program. MPPD is actually a formal curriculum in medical professionalism. Same as the CBL, MPPD is also likely to prepare medical students for understanding their roles, responsibilities, and others' expectations in the fourth year. This may explain the study finding that medical students' altruistic attitudes changed little in the early stage of clinical training. The formal teaching of medical professionalism also directs medical students to reconsider and adjust their professionalism right from the first year at medical school. This may explain why there were changes in medical students' motivations and altruistic attitudes in the first year at medical school.

As discussed above, the CBL and MPPD are likely to contribute to the pattern of changes in medical students' motivations, altruistic attitudes, and learning experiences. As part of the formal curriculum design at the medical program, they also contribute to the medical students' professional socialisation into the role of doctors. The next section will further discuss the process of professional socialisation.

7.3.3 Professional socialisation

It is well recognised that professional socialisation includes the learning of all aspects of medicine: values and attitudes; skills; and knowledge (Merton et al., 1957). Understanding how medical students acquire professionalism in this process – the moral aspects of professional socialisation at medical school (Hafferty et al., 1994) – may help to explain the changes and non-changes in medical students' motivations for studying medicine and altruistic attitudes.

As discussed in Section 2.5.4, the acquisition of professionalismduring medical training occurs in three interrelated ways: the hidden curriculum, the informal curriculum, and the formal curriculum. The hidden curriculum is the 'set of influences that function at the level of organizational structure and culture'; the informal curriculum is the 'unscripted, predominantly ad hoc and highly interpersonal form of teaching and learning that takes place among and between faculty and students'; the formal curriculum is the 'stated, intended, and formally offered and endorsed curriculum' (Hafferty, 1998).

Influences from the formal curriculum (the MPPD stream) have been discussed in the previous section. Through the hidden curriculum, hidden values embedded in the institutional culture may influence what medical students appreciate. If the institutional culture embraces characteristics such as detachment, the entitlement of doctors to high income, prestige and social power, it may implicitly influence what medical students appreciate about medicine, (Coulehan et al., 2001, Conrad, 1988, Cohen, 2006, Ludmerer, 1999, Swick, 1998). When faculty members act in unprofessional ways, medical students may unconsciously pick up the unprofessionalism from these role models as a result of daily observation and interaction through the informal curriculum (Maheux et al., 2000, Feudtner et al., 1994, Lindstrom et al., 2011, Fins et al., 2003, American Board of Internal Medicine et al., 2002, Ludmerer, 1999, West et al., 2007).

Possibly, the values and attitudes explicitly taught to medical students (e.g. empathy, compassion, and altruism) may differ from the values and attitudes implicitly taught to medical students (e.g. detachment, self-interest, and objectivity) (Shrank et al., 2004, Fins et al., 2003, Dyrbye et al., 2005, Hafferty et al., 1994, Stern, 1998, Gaufberg et al., 2010, Lamiani et al., 2011, Hafferty, 1998, Coulehan, 2005). This mixed message may lead to declines of professionalism (Fins et al., 2003, Coulehan et al., 2001).

These negative influences from professional socialisation may contribute to an increase in the perceived importance for students of job security/status and high income as motivations for studying medicine, while reducing their appreciation of altruism as a core goal of medicine. This may explain the observed declines in medical students' people-oriented motivations and altruistic attitudes, and increases in their perceived importance of job status/security as motivation during the first year at medical school.

Previous literature on informal curriculum has frequently discussed the influence of role models (Hafferty et al., 1994). This suggests that its impacts are likely to be stronger when interactions between medical students and medical professionals are more frequent, as in the second three years at the University of Adelaide medical program which is predominantly in the clinical environment. Previous studies have also highlighted clinical training, particularly the first year of clinical training, as the time where negative changes in professionalismare most likely to happen (Maheux et al., 1986, Neumann et al., 2011, Griffith et al., 2001, Hojat et al., 2009, Hojat et al., 2004). Only a few studies reported changes in medical students' professionalismduring the first year at medical school, and these findings were contradictory: Crandall and colleagues found that medical students' attitudes towards providing to the underserved declined after the first year at medical school (Crandall et al., 1997); in contrast, Roche and colleagues observed in a PBL program that students' altruism increased, along with a decrease in cynicism at end of the first year (Roche III et al., 2003).

These results are very different from the current study findings. Explanations for the disparities in findings are multiple. First of all, role models actually occur at all levels of medical training (Hafferty, 1998). Second, the hidden curriculum, as distinct from the informal curriculum, is embedded at the institutional level and thus does not necessarily depend on interpersonal interactions (Hafferty, 1998). Third, factors other than the curriculum may also contribute to the changes in professionalism. For example, a doctor

may find it hard to put the needs of others first while experiencing a personal crisis (West et al., 2007). This may extend to medical students; when they experience difficulties in learning transition, they may be less likely to put the patients' needs first. Finally, it must also be borne in mind that the professional socialisation is only one of a number of explanations. The observed pattern of changes and non-changes is the combined effect of transition into university, curriculum design, and professional socialisation and possibly other unknown factors.

To summarise, this section has discussed a range of explanations for the study findings, focusing on transition to the university learning environment, curriculum design, and professional socialisation. Despite the changes observed, overall the medical students still showed a desire for caring and a passion for learning. So could the changes during the first year reflect the maturation of medical students? Could it be that they just become less idealistic and more realistic in considering their career choice of medicine (Griffith et al., 2001)? For example, being a year older, they may have become more rational in weighting the importance of an ideal career and the basic needs for a secure job with proper income. Having experienced one year in medical study, their parents may also have higher expectations for them to become doctors. These are all realistic and important issues to be considered. The observed changes in the first year at medical school are not necessarily undesirable. Alternatively, they could reflect more sensible, considered, and realistic motivations for studying medicine, altruistic attitudes, and expectations for studying medicine, which are less likely to change in the later years of medical school.

7.4 Do socio-demographic characteristics matter?

The transition to the university learning environment, curriculum design, and professional socialisation all occur within the medical school context, so their influence can vary during medical school and according to the structure of the medical program. However, medical students enter the medical program with certain socio-demographic characteristics, which cannot or are less likely to be modified during medical school. This section discusses the role of these socio-demographic characteristics in influencing medical students' motivations, altruistic attitudes, and expectations/experiences.

It has been known from the literature that cultural background and sex are important factors in determining medical students' motivations for studying medicine. It is generally considered that the Asian culture is more oriented to the goals of collectives (e.g. the family), while the 'English-speaking culture' is oriented to individual goals (the students) (Klimidis et al., 1997). Therefore, Asian students tend to prioritise their family's wishes above their own. It has been found that Asian students are more likely to enrol into medicine to satisfy their parents than 'English-speaking background' medical students (Klimidis et al., 1997). In Pakistan and India, family influence was reported to be one of the most important motivations for studying medicine, but this finding has not been found in studies from Europe and Australia (Shahab et al., 2013, Saad et al., 2011, Diwan et al., 2013). The female gender is considered to be related to certain personality characteristics and traditional values, such as sensitivity, compassion, and empathy (Burkett et al., 1981, Vaglum et al., 1999b). Therefore, female medical students are assumed to be more caring and willing to serve. Some studies have shown that female medical students are more motivated by the desire to work with and help people (Wierenga et al., 2003, Vaglum et al., 1999a, Burkett et al., 1981).

This study also found that medical applicants who spoke a language other than English at home (applicants being mainly from Asian or South-east Asian backgrounds) rated the external pressures from family, friends, and teachers as being more important as motivations for applying to study medicine. However, this difference was no longer evident among the fourth year medical students in this study. Possibly, this difference gradually diminished as medical students socialized into the homogeneous professional identity before the fourth year. This may be especially true in Australia, where the multicultural environment promotes people's exposure to and adoption of different cultures.

The differences between male and female medical applicants' regarding motivations for studying medicine and altruistic attitudes were not apparent until the later years of medical school. Female fourth year medical students had a higher level of people-oriented motivation and altruistic attitudes. This may possibly indicate that socio-demographic characteristics also have an impact on how medical students' motivations and altruistic attitudes are shaped during medical school. For example, being influenced by the stereotypical role that females are expected to play in medical practice, female

medical students may gradually acquire a set of motivations for studying medicine and altruistic attitudes which are different from male medical students (Burkett et al., 1981). It has been reported that, during clinical placement, female medical students perceived their experiences to be affected by gender in multiple aspects, such as defaulted gender roles on the wards and workplace inter-relationships (Babaria et al., 2009). This suggests that sex may influence the process of professional socialisation. Male and female students may experience a quite different hidden curriculum and informal curriculum during training, such that gender stereotypes may be reinforced in this process.

This study also found associations between learning expectations and experiences with socio-demographic characteristics. The findings show that medical applicants were relatively homogeneous in their expectations for learning at university, while fourth year medical students varied considerably in their experiences of learning at university according to cultural background, sex, secondary schooling, and parents' educational level. Again, this may indicate that socio-demographic characteristics are important in shaping medical students' experiences in later years at medical school. However, these findings need to be interpreted with caution. This is because only bivariate analysis has been conducted for exploring these associations.

Observed differences according to secondary schooling and parents' occupation were not clearly understood. Possibly, the institutional culture at secondary school has an impact on students' motivations for studying medicine. However, similar to the findings regarding cultural background, influences from secondary schooling seem to diminish by the fourth year of medical school. Considering the factor of parents' occupation, differences in medical students' motivations for studying medicine exist among both medical applicants and fourth year medical students. Possibly, parents working in health-related professions may act as role models similar to those in the informal curriculum, and therefore impact on medical students' initial professionalism, and also influence their later socialisation into the medical profession. However, as parents' occupation influenced medical applicants and fourth year medical students in different ways; it is difficult to explain the impact of this factor without further investigation.

As can be seen from the above discussion, socio-demographic characteristics may influence medical students' motivations for studying medicine and altruistic attitudes,

either directly or by influencing other factors which shape these aspects during medical school. The effect of socio-demographic characteristics may gradually diminish during medical school. They may also be important as factors underpinning medical students' transition into university learning, adaptation to curriculum design, professional socialisation, and possibly other unknown processes. This is a complex area of study and needs to be further explored.

7.5 Strengths and limitations

The strengths of this study include the study design, the selection of altruistic attitudes and expectations/experiences of learning at university to be explored together with motivations for studying medicine, and the measurement of motivations for studying medicine. The study also has several limitations, including the follow-up time, the response rate, and response biases. This section discusses these strengths and limitations.

7.5.1 Strengths

Using data collected at different time points at medical school, this study provided information about changes in medical students' motivations for studying medicine during their medical course. In previous studies, medical students' motivations for studying medicine between earlier and later years at medical school have been compared (Morley et al., 2013, Puljak et al., 2007a, Powell et al., 1987), but few studies have used a longitudinal design to directly explore the changes in motivations. To the researcher's knowledge, in a study from Brazil (Del-Ben et al., 2013) and another study from Australian (Wilkinson, 2007b) used a longitudinal design to explore the changes in medical students motivation. However, in this Brazilian study, it was the intrinsic academic motivation to know, to accomplish, and to experience that was explored. In the Australian study, motivation was constructed as one aspect of learning approach. Differently, the current study has focused on motivations related to medical students' decision for entering and staying in the medical profession.

The study design also enabled the investigator to track individual changes, thereby allowing the researcher to disentangle changes in individuals from changes in the composition of respondents at the different time points. Some differences detected in the general comparison of baseline and follow-up responses were no longer significant

in the paired analysis. This may be due to some systematic differences between those participants who did both baseline and follow-up questionnaires and those who completed only one of them. Alternatively, in paired comparison the number of observations was substantially reduced, which could have decreased the power of the analysis. Matched pair analysis is highly powerful and would outweigh the impact of the reduction in numbers. Nevertheless, most of the differences detected in the general comparison of the baseline and follow-up responses were also significant in paired comparison, thus indicating that the observed differences are due to real changes.

In this study medical students' motivations for studying medicine were explored together with altruistic attitudes and expectations/experiences of learning at university during two critical transitions in the medical program. This is the very first study exploring these domains in medical education simultaneously. Selection of these domains was based on an extensive literature review. The literature demonstrated that a desire for helping others has always been an important factor attracting students to enter medicine and that it also reflects the essence of medical professionalism - altruism. The literature has also shown that during the transition from school to medical school and the transition from the preclinical to clinical phase, students are overwhelmed by stressors in both the academic and social aspects of medical study. Understanding medical students' expectations/experiences helped to identify possible factors which contribute to changes in motivations for studying medicine.

The tools used for measuring altruistic attitudes and expectations/experiences of learning at university have been validated and used in previous research. However, the measurement of motivation for studying medicine is much more complex, since motivation is a multi-faceted concept and can be constructed in different ways. In order to clearly define the 'motivation' measured in this study and to find a validated tool to measure it, the researcher conducted an extensive review of studies with tools for measuring motivation in medical education. Through this, a catalogue of tools for measuring motivation in medical education was created, which will be useful for future research. More importantly for the present study, the review of tools helped to clearly define the motivations for studying medicine and added rigour to the methodology.

This study explored medical students' motivations for studying medicine by asking about the reasons behind their decision for entering medicine. In order to cover a full

range of reasons for studying medicine, the researcher developed a new scale comprising items selected and derived from existing scales used in previous studies. A construct validation process was undertaken to justify the use of this new scale. Three of the four factors (labelled as 'people-orientation', 'science-orientation', and 'job status/security') have been widely discussed in previous research (Wierenga et al., 2003, Puljak et al., 2007b, Crossley et al., 2002, Vaglum et al., 1999a, Price et al., 1994a), while the fourth factor, labelled as 'external pressure', has rarely been discussed in previous studies. The identification of 'external pressure' may be important for future research, since related research has shown that in tertiary education generally, expectations from parents or family have been playing an increasingly important role in shaping students' decisions to enrol into university programs (McCarthy, 2006, Cook et al., 1999, Crisp et al., 2009, Brinkworth et al., 2009, Kuh, 2007). The four factors identified in the present study showed good internal consistency and reliability and can be used in future research.

7.5.2 Limitations

A key limitation was that two cohorts were used and it was only possible to track them over a one-year period. This means that the observed changes cannot be applied throughout the medical program. Additionally, since this study was conducted within the University of Adelaide medical program, it may only reflect the situation in one medical program in one institution.

The medical applicants' responses may not be representative of the students who enrolled into the first year, who are actually the population of interest for exploring changes during medical school. Therefore, the changes observed during the first year may be biased due to the attrition of those applicants who were not selected into medical school, as they would not be re-surveyed at the end of the first year. Since all the questionnaires were completed anonymously, it is impossible to differentiate and compare the responses of applicants who subsequently enrolled to those who did not enrol. Nevertheless, for any comparison between the baseline and follow-up responses, both general comparison and paired comparison were conducted. Furthermore, it is necessary for the first questionnaire to be conducted with applicants coming to the oral assessment (as described in Section 3.4.1) for 2012 entry into the University of Adelaide medical program. This is because that experiences in the interview process

may have brought about changes in motivations, altruistic attitudes and expectations, because they are important topics explored in the interview and thus measurement of these at a later date could be influenced by the interview.

It is unknown how representative the 48 matched medical applicants were of all enrolled medical applicants. However, they were representative of all medical applicants attending oral assessment for all demographic characteristics except for sex. Of note, in this study sex was found to have no impact on medical applicants' motivations for studying medicine or altruistic attitudes.

The best study design for this study is to conduct the fourth-year entry questionnaire and fourth-year follow-up questionnaires at the start of the fourth and fifth year. However, because of logistical reasons, the participants were approached at the midpoint of the fourth year and the fifth year. .

With the exception of the response rate for the entry baseline questionnaire, the response rate for all other questionnaires was around 50%, despite incentives and the application of Dilman's approach to maximize response rate (Dillman, 2000). The power calculations of the minimum detectable effect sizes indicated that the number of responses appeared to be sufficiently large to investigate the aims of the thesis. Still, small subsamples may also reduce the generalizability of the findings, as sample subset may not represent the whole population. Furthermore, this may cause response bias - those who did not respond to the questionnaires may differ from those who did. However, the response rate of around 50% in our study was in keeping with other published medical education research with response rates that have varied from 26.6% (Kusurkar et al., 2013b) to 99% (Agyei-Baffour et al., 2011). Other authors have reported that achieving high response rates in medical education research has been challenging (Paolo et al., 2000, Grava-Gubins et al., 2008, Forester et al., 2005).

Self-administered questionnaires might also generate response bias, if participants tend to give more socially desirable responses. This is particularly pertinent for the entry-baseline questionnaire, when participants were invited just prior to their interviews for medical school. Previous research has found that impression management is a significant factor when surveys are conducted prior to or in conjunction with a selection process such as an interview – medical applicants are likely to fake good when

completing self-report tests of personality used for selection (Griffin et al., 2012). This issue could be addressed in future research by measuring the strength of participants' social desirability bias (Edwards, 1957, Crowne et al., 1960). However, Laurence's study found that the main motivations for applying to medical school were the same at different stages prior to and after the oral assessment (Laurence et al., 2013). Efforts were made to ensure participants' anonymity in this study and they were fully informed that they could choose not to take part in the study. It was emphasized that the survey was irrelevant to any assessment outcomes.

An additional limitation may be the interpretation of the items in the questionnaire by the participants. For example, the item 'It is probably not all that important for me to attend most lectures' is fairly broad and students may have interpreted this to mean all scheduled learning or just lectures. This could be addressed in future questionnaire by refining the question and clarifying what is meant by 'lectures'.

7.6 Future research

The study has highlighted several areas for future research.

First, this study has identified a number of elements that help to explain the changes in medical students' motivations for studying medicine: the transition to the university learning environment, curriculum design, professional socialisation, and socio-demographic characteristics. However, what has been observed in this study is a combined effect of all the above elements. The influences from individual elements have not been measured and explored. Future research could focus on one or two of these elements and explore their influences in depth.

Second, this study has confirmed that altruistic attitudes and expectations and experiences of learning at university are interacting with medical students' motivations for studying medicine in a complex way. Future research may further explore the meaning of these inter-relations and unpack the mechanism of changes in motivations for studying medicine. For this purpose, the use of the qualitative method may be of particular importance.

Third, this study has conducted multivariable analysis of the association between socio-demographic characteristics and medical students' motivations for studying medicine and altruistic attitudes. However, some of the findings, such as the differences in motivations for studying medicine by secondary schooling and parents' occupation, were relatively new and there was little previous literature assisting the interpretations of these findings. Further investigation could be conducted to understand these specific points. The interactions between socio-demographic characteristics (e.g. interaction between parents' occupation, cultural background and sex) in determining the motivations and altruistic attitudes are also topics of interest for future research.

Third, the study findings suggest that the first year is a critical year for changes, while there were few changes in the fourth year. However, what happened between these two years cannot be known, since data were collected around only these two critical years at the medical program. The differences between the first and the fourth year at medical school cannot be separated from differences between the two groups of students in this study, since two different groups of medical students were recruited in this study. Future research may consider collecting longitudinal data from one cohort across all years during medical training. This may help to understand other periods of transition during medical training, including the year from clinical training to prevocational training, from prevocational training to specialist training, and from specialist training to actual practice in which graduates undertake continuing medical education.

Finally, this study was conducted within one Australian medical program, in which the majority of applicants are secondary school leavers. Future research may consider include multiple institutions, particularly those with graduate-entry medical programs. Graduate-entry medical students might be quite different from those in undergraduate-entry medical programs, since they already have university experience and may have previous professional experiences. Future research focused on specific groups of students, such as students with certain cultural backgrounds, may also be interesting.

7.7 Implications

This study has generated rich information for medical educators to use in medical programs. The implications of this study mainly fall into two areas: medical school selection and the medical school curriculum.

7.7.1 Medical school selection

Since the late 1990s, selection strategies in Australian medical schools have commonly reduced the weighting of medical applicants' academic achievement (e.g. academic score) in selection, while taking more into account the assessment of aptitude for future study (e.g. Undergraduate Medicine and Health Sciences Admission Test) and personal characteristics (e.g. interview) (Wilson et al., 2012, Mercer et al., 2011). One of the aims of this practice was to reduce the limits placed on student diversity through use of the sole criterion of academic achievement (Wilson et al., 2012). More significantly for this study, this practice takes into account those non-cognitive abilities and personal attributes which prepare medical applicants to be good doctors. It was generally assumed that medical applicants, who already have the core personal characteristics expected in good doctors, have the better potential to be good doctors in the future. There is limited direct evidence for this, but previous research has shown that unprofessionalism at medical school is likely to last into future practice (Papadakis et al., 1999, Papadakis et al., 2001, Papadakis et al., 2004, Papadakis et al., 2005, Teherani et al., 2005). In any case, of the core personal characteristics expected in good doctors, 'recognition that patient care is the primary concern of a doctor' and 'motivation and commitment to medical profession' are two of the most important characteristics (Lambe et al., 2010).

This study, as well as the extensive previous research from Europe and Australia since 1990s, showed that medical students are mainly motivated to study medicine by the humanistic aspects of the profession followed by the attraction of medicine as science (Vaglum et al., 1999b, Puljak et al., 2007a, Rolfe et al., 2004, Klimidis et al., 1997, Molnar et al., 2008). This study also showed that medical students kept their highly intrinsic motivations for studying medicine during medical school, in spite of the transition in the first year. This confirmed that the current selection system in the University of Adelaide medical program has been working well in selecting the group of students with those desirable motivations and altruistic attitudes for a career in medicine.

What needs to be remembered is that there may also be a 'self-selection' by medical students themselves. Stepping into the medical profession means a laborious journey ahead. Years of training are required before becoming a doctor. Even at the very beginning of this professional journey, the competitive selection process is highly demanding. In brief, medicine is not a good choice for quick external rewards. Therefore, it is possible that medical students who are not really intrinsically motivated are less likely to 'select' themselves to apply and stay in medical school, while those who find medicine interesting, enjoyable, and satisfactory are more likely to 'select' themselves to study medicine and stay in medicine. The latter group are more willing to invest the substantial time and effort needed for the medical profession (Ten Cate et al., 2011).

Still, arguments exist for whether medical schools should recruit students from secondary school leavers (undergraduate-entry program) or from those who had previously completed a tertiary degree (graduate-entry program). Proponents of graduate-entry program emphasize the efficiency of this approach in improving the medical workforce diversity, shortening the training period, and fostering better educational outcomes, while these purported advantages have rarely been supported by evidence (Powis et al., 2004, Searle, 2004, Rolfe et al., 2004). Graduate-entry programs also have some obvious disadvantages. This approach delays the age of graduation. More mature students may have more responsibilities in life than secondary school leavers, and therefore may have more difficulties in balancing medical study and other priorities (Searle, 2004, Powis et al., 2004). In spite of this, since the 1990s, Australian medical schools have been encouraged to consider this approach (Searle, 2004). Currently there are nine medical schools running only graduate-entry medical programs, five running only undergraduate-entry medical programs, and four providing both undergraduate and graduate pathway to medicine.

This study has not provided any direct evidence supporting the graduate-entry approach. However, most of the influences discussed concerning transition to the university environment, curriculum design, and professional socialisation can be avoided to some degree in graduate-entry programs. Graduate-entry students have already experienced the transition from secondary school to university learning in their previous tertiary degree. They have the prior knowledge and skills of learning at university, therefore are

likely to transit into learning at medical school much more easily and quickly. Graduate medical students may have reflected on their career choices while completing their previous tertiary degree, thus being able to make a more informed decision about entering medicine. Compared to secondary school leavers, graduate-entry students have had more opportunity to have some previous work experience in health related fields, which is highly beneficial for later professional socialisation in a medical school. In short, indirectly this study suggests that there may be advantages for graduate-entry programs over undergraduate-entry programs in helping students to maintain intrinsic motivations for studying medicine and altruistic attitudes, and to better fit into the learning mode at medical schools.

This study has shown that the expected attributes were maintained in later years at medical school after a first year of adjustment. This indicates that the transition in the first year is not long-lasting; there is thus no strong reason to restrict the undergraduate-entry approach. However, a range of strategies could be considered to help assist medical students through this transition process and these are discussed in the next section.

7.7.2 Medical school curriculum

First, medical schools may need to consider providing specialised orientation programs or more graduated first year experiences. A diversity of orientation programs are provided by Australian universities to help students in general to fit into the new social and academic environment. Specialised programs are also designed to meet the needs of certain groups of medical students, such as international students, Aboriginal and Torres Strait Islander students, and mature-age students. These orientation programs also take a variety of formats, such as workshops and information sessions and peer support programs. However, orientation programs for medical students have rarely been discussed in the wider literature. Students entering medical programs not only need orientation which is aimed at addressing general issues relating to the first year of study at university (such as time management and stress management), but also more specialised orientation which helps students with the transition to CBL (Raw, 2013). For example, these specialised programs should inform medical students about the ideas underlying CBL, because helping students to understand the theory and objectives of this educational approach may foster their willing and active participation (Moust et al.,

2005). As the first year medical students varied in their ability for self-directed learning, the orientation program may also need to provide instruction about and initial training in such skills needed for CBL (Moust et al., 2005).

Second, medical schools should make both students and teaching staff aware of what the experiences during the first year are going to be like. Medical students should be informed that upheavals in the first year will not necessarily have long-term negative impacts on their medical study and professional development. This would help to reduce s unnecessary stress and anxiety. This information could be integrated into orientation programs. For teaching staff, the first year at medical school should be flagged as a time of transition, so as to sensitise them to common student issues. This can also help teaching staff to differentiate between those issues which do not have significant consequences, and those issues experienced by struggling students, so as to be more focused in providing care and support. In addition, teaching staff should pay special attention to certain groups of medical students in the first year. Female students are likely to be influenced by the stereotypical role of female doctors, and therefore may have different experiences during this critical year to male students. Asian students are more likely to be influenced by family with the possibility of negative outcomes, as studies found that being externally motivated may lead to negative outcomes in learning, such as lower academic performance (Alfayes et al., 1990).

Third, it should also be emphasized in medical school that, for better long-term professional development, engagement with university life either academically or socially is one important component of medical study. Explicit emphasis on the importance of medical professionalism is necessary, such as the existing MPPD stream. It needs to be made clear to students that, although some academic activities can now happen without being on campus, attending lectures and direct interaction with other students are significant for establishing their professional identities. Membership of existing student organisations, such as the Adelaide Medical Students' Society, should be encouraged since such organisations foster social engagement in university life and as well as with the medical profession. Students' engagement with the university could also be promoted provided that they can adequately deal with the conflicts between university activities and commitments outside university. Balancing the university activities and commitments outside university relates to some of the skills needed for a

better transition into medical school and clinical practice, such as time management and priority settings, which could be addressed in the orientation program as mentioned before. For those students facing financial problems or those who need to commit to paid work outside university, the best situation might be that paid work can be combined with medical study. Medical schools should be supportive in exploring such opportunities for students, such as part-time working experience in health-related fields. However, the chance for such working opportunities for individual students might be relatively limited because of the large size of the student population.

7.8 Summary

The study findings showed that medical students' motivations, altruistic attitudes, and expectations/experiences are interrelated and likely to be interacting with each other in a complex way. The first year at medical school was a critical year of transition, while in the fourth year there were few changes.

This chapter has discussed the possible explanations for the common pattern of changes and non-changes concerning medical students' motivations for studying medicine, altruistic attitudes, and experiences of learning at university from three perspectives. First, mismatches between expectations and experiences during the transition from secondary school to university may explain the decline in intrinsic motivations (the people-oriented and the science-oriented motivations) and altruistic attitudes in the first year. Second, curriculum design, in particular CBL and MPPD, may have helped to stabilise medical students' motivations, altruistic attitudes, and learning experiences during later years at medical school. On the other hand, the curriculum design may also have shifted the key changes from later years at medical school to the first year. Third, the changes in professionalism during professional socialisation may explain the decline in people-oriented motivation and altruistic attitudes in the first year at medical school. Socio-demographic characteristics also play a role in this process. They may determine medical students' motivations, altruistic attitudes, and learning expectations/experiences, either directly or by having an impact on how other factors shape these aspects during medical school.

The strengths of this study lie in the study design, the exploration of altruistic attitudes and expectations/experiences of learning at university together with motivations for studying medicine, and the measurement of motivations for studying medicine. The study also has some limitations, including the length of follow-up, the timing of questionnaire, the response rate, and the potential response bias.

Future research may consider narrowing the focus to one or two of the identified elements in explaining the changes in medical students' motivations for studying medicine. In- depth exploration of individual elements is needed. A longitudinal study observing all years of medical training would also provide more comprehensive information. Larger scale studies including multiple institutions, particularly including

those institutions with graduate-entry medical programs, are both warranted and necessary.

This study has a number of important implications. It demonstrates that the current medical school selection system is probably effective. This study supports, to some extent, the use of graduate-entry programs over undergraduate-entry programs. Undergraduate-entry programs should target first year medical students' motivations for studying medicine. Medical schools should also consider a range of strategies to assist first year medical students in their professional socialisation and their transition from secondary schools to medical schools.

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Appendix 1 Summary of tools used for measuring other motivations at medical school

Tool and citation	What is measured?	Description	Psychometric properties*		Types/ Constructs	Study populations
			Reliability	Validity		
'Motivation for studying at university' section of Amin's questionnaire (Amin et al., 2009)	Motives to pursue university study	Self-administered questionnaire with eight reasons and one open-ended item "other"; ranking the reasons in order of importance	Not reported	Not reported	N/A	237 medical students (from 2nd year to 5th year) at Yong Loo Lin School of Medicine at the National University of Singapore (Amin et al., 2009)
Borges' Thematic Apperception Test (TAT) (Borges et al., 2010)	Motivation as a human personality	Open-ended, projective assessment technique comprised of picture cards; each picture card depicts a unique situation with different people and events; responses purport to indicate underlying needs, motives, drives and personality conflicts.	Internal consistency (Cronbach's alpha): adequate Inter-rater: from 0.83 to 0.92 Test-retest: estimates from 0.64 to 0.83	Construct: proved by 40 years of research	1) need for Achievement 2) need for Affiliation 3) need for Power	426 1st year students at one medical school in US (Borges et al., 2010)

Tool and citation	What is measured?	Description	Psychometric properties*		Types/ Constructs	Study populations
			Reliability	Validity		
Zeldow's TAT test for intimacy and power motivation (Zeldow et al., 1988)	Two social motivation: power motivation and intimacy motivation	Five TAT pictures; respondents were given five minutes to write an imaginative story in response to each picture.	Inter-rater: coders demonstrated agreement for motive imagery categories greater than 85% and reliability coefficients greater than 0.85 for scoring for practice stories in the training manuals	Construct: proven adequate in previous studies	1) Need for power 2) Need for intimacy	Sample size unknown. responses from 57 male and 29 female medical students from a single class at a mid-western medical school (Zeldow et al., 1988) Two consecutive classes of students (120 in each) at Rush Medical College (Zeldow et al., 1991)
The motive subscale of Study Process Questionnaire (SPQ) (Biggs, 1987)	Motives underlying approaches to learning	Self-administered five-point Likert scale with 21 items indicating situations in leaning; items are divided into three constructs (seven items each); rating how true each statement is according to personal situation.	Internal consistency (Cronbach's alpha): 0.51-0.72	Construct: developed based on a'General Model of Student Learning'; consistent correlations with students performance from a number of previous studies; factor analysis	1) Surface motive 2) Deep motive 3) Achieving motive	All 731 students in Years 2 to 5 in the medical course at the University of Otago (Wilkinson et al., 2004) 752 medical students and 780 medical students two years later in the medical course at the University of Otago (Wilkinson et al., 2007b) 213 fourth- and fifth-year medical students in a six-year curriculum (Wilkinson et al., 2007a)

Tool and citation	What is measured?	Description	Psychometric properties*		Types/ Constructs	Study populations
			Reliability	Validity		
The motive subscale of shortened Study Process Questionnaire (SPQ) (Fox et al., 2001)	Motives underlying students' approaches for learning	Self-administered five-point Likert scale with nine items indicating situations in leaning; items are divided into three constructs (three items each); rating how true each statement is according to personal situation.	Internal consistency (Cronbach's alpha): 0.288-0.762	Content: shortened from the original 21-item motive subscale of SPQ based on a previous factor analysis Construct: factor analysis; structural equation modelling to examine the longitudinal stability of the factor structure Criterion: factor score are predictive of passing medical finals and attaining more clinical experiments at medical schools	1) Surface motive 2) Deep motive 3) Achieving motive	1963 applicants to five British Medical schools (Fox et al., 2001)
Perrot's goal orientation scale (Perrot et al., 2001)	motivation defined as goal orientation	Self-administered five-point Likert scale with 68 items divided into four subscales; guide question not provided	Internal consistency (Cronbach's alpha): 0.87	Content: items derived from a previous instrument for measuring goal orientation Construct: factor analysis; correlations with learning strategy preferences and locus of control; detect differences by sex, age, and marital status	1) Mastery orientation 2) Performance orientation 3) Academic alienation	252 students in the first year from Colleges of Medicine (150), Nursing(50), and Pharmacy (52) at a mid-southern health sciences campus (Perrot et al., 2001)

Tool and citation	What is measured?	Description	Psychometric properties*		Types/ Constructs	Study populations
			Reliability	Validity		
Patterns of Adaptive Learning (Midgley et al., 1998)	Motivation defined as goal orientation	Self-administered five-point Likert scale with 18 items addressing three dimensions; rating the level of agreement.	Internal consistency (Cronbach's alpha): 0.60-0.89 Test-retest: stability coefficient from 0.41 to 0.63 for 'Mastery goal orientation', and from 0.34 to 0.61 for performance-approach goal	Construct: base on Achievement Goal Theory within a social-cognitive framework; significant positive correlations (rho from 0.63 to 0.67) with measures for task and ego goals; correlations with academic self-efficacy, reported use of adaptive/maladaptive learning strategies, and affect at school; detection of differences in motivation by schools/years; factor analysis	1) Mastery (task) goal orientation 2) Performance (ability)-approach goal 3) Performance (ability)-avoidance	143 first-year medical students (Madjar et al., 2012)
The motivation section of Moulaert's deliberate practice scale (Moulaert et al., 2004)	Motivation as one essential aspect in deliberate practice	Self-administered five-point Likert scale with four items addressing motivation, as one essential aspect of deliberate practice; rating how often a situation happens.	Internal consistency: (Cronbach's alpha): 0.58	Content: expert review Construct: factor analysis Face: pilot study	Motivation construct of deliberate practice	863 medical students from year 1 to 6 at Maastricht University Medical School (Moulaert et al., 2004)

Appendix 2 Entry baseline questionnaire

MedEEM study

Medical Students Expectations, Experiences

and Motivation Study

December 2011

Questionnaire on the motivations and expectations of students applying to study medicine at the University of Adelaide

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Purpose of this questionnaire

This questionnaire aims to explore your reasons for applying to medicine and your expectations for learning at University. We are interested in the change of motivation and expectation/experiences at the time of application, during preclinical and clinical training and how this is associated with your altruistic attitudes. This information will in turn have implications for the selection, training, and development of future medical applicants and students.

Management and Security of Data

The information that you provide on this questionnaire is entirely confidential. Data will only be accessible by the researchers and results will only be reported in an aggregated format. Your name and contact details will be kept separately from the information you provide in this questionnaire, and will be replaced by a project ID for follow-up purposes. At no time will identifiable individual data be reported.

Consent

Your participation is voluntary and your consent to participate in this study is implied by the return of this questionnaire.

Instructions

This questionnaire will take less than 15 minutes to complete. Most questions only require a tick in the appropriate box, but some will ask you to provide additional comment.

By completing the questionnaire, you can elect to go into the draw for a $20 iTunes voucher (10 vouchers available). We look forward to receiving your questionnaire.

If you have any queries, please do not hesitate to contact either:

Pro. Maree O'Keefe, Faculty of Health Sciences, University of Adelaide
Ph: +61 8 8303 3864 maree.okeefe@adelaide.edu.au

or

Dr Caroline Laurence, Discipline of General Practice, University of Adelaide
Ph: +61 8 8313 4951 caroline.laurence@adelaide.edu.au

Instructions: please circle answers, mark × in boxes or give your answer where appropriate.

Replies are strictly confidential. Please answer all questions.

YOUR PROJECT ID:

Some of you may be invited to do a follow-up questionnaire 12 months later. In order to pair the answers of the same participant and to protect the participants' personal information, we ask every responder to generate a project ID by the identifier calculation as below:

Please indicate the last two letters of your given name (e.g. the last two letters of Bill Jobs's given name are "ll")

☐☐

Please indicate your month of birth (e.g. "06" for June; "12" for December)

☐☐

Please indicate the number of your siblings (e.g. "00" for none; "03" for three siblings)

☐☐

A person named Bill Jobs, born in June and with 3 siblings will generate the ID: ll0603

In this case, your project ID is: ☐☐☐☐☐☐☐☐☐☐

SECTION 1: ABOUT YOU:

This section will collect information regarding your personal information, cultural background, educational background and family background.

1. Sex: ☐ Male ☐ Female

2. Age in years: _____

3. Country of Birth: _____

   └If not Australia, how many years have you been living here for? _____

4. What is your country of citizenship?

   ☐ Australian

   ☐ Other (please specify) _____

5. What is the main language spoken at home?

☐ English

☐ Another language other than English (please specify)_____

6. Where did you complete your secondary schooling?

☐ Australia Government school (i.e. public)

☐ Australia Non-Government school (i.e. private, Catholic)

☐ Other country (please specify) _____

7. Does your father work in a health care profession?

☐ Yes

☐ No

☐ N/A

If yes, what health profession? _____

8. Does your mother work in a health care profession?

☐ Yes

☐ No

☐ N/A

If yes, what health profession? profession?_____\

9. Have any of your other family members (except your patents) worked in a health related profession

☐ No

☐ Yes

If yes, what health profession _____

10. What is your father's highest level of complete educational qualification?

☐ Postgraduate degree (eg. Master Degree, Doctoral Degree)

☐ Graduate diploma/ certificate (eg. Professional Specialist Diploma/Certificate)

☐ Bachelor degree (including Honour Degree)

☐ Advanced diploma/diploma (eg. Higher National Diploma, TAFE)

☐ Certificate (eg. Certificate IV)

☐ Secondary education (eg. Year 12)

☐ Primary education (eg. Year 7)

☐ Pre-primary education

☐ Other education (eg. non-award courses, apprenticeship training)

☐ N/A

Please specify if you choose "other education": _____

11. What is your mother's highest level of complete educational qualification?

☐ Postgraduate degree (eg. Master Degree, Doctoral Degree)

☐ Graduate diploma/ certificate (eg. Professional Specialist Diploma/Certificate)

☐ Bachelor degree (Honour Degree included)

☐ Advanced diploma/diploma (eg. Higher National Diploma, TAFE)

☐ Certificate (eg. Certificate IV)

☐ Secondary education (eg. Year 12)

☐ Primary education (eg. Year 7)

☐ Pre-primary education

☐ Other education (eg. non-award courses, apprenticeship training)

☐ N/A

Please specify if you choose "other education": _____

12. Have you applied to other medical schools?

☐ Yes

└If yes, how many? _____

☐ No

SECTION 2: ABOUT YOUR REASONS FOR APPLYING TO MEDICAL SCHOOL

This section will collect information regarding your reasons for applying to study medicine.

Please answer each item by selecting one option.

13. Please rate the importance of the following statements for your reasons for applying to medical school.

Reasons	Very important	Slightly important	Not sure	Not important	Not at all important
1) I have scientific curiosity	5	4	3	2	1
2) I have a desire for helping others	5	4	3	2	1
3) Professional independence is important to me	5	4	3	2	1
4) I have previous experiences with illness (personal or family)	5	4	3	2	1
5) I am attracted to the high prestige associated with medicine	5	4	3	2	1
6) I have relatives in health care	5	4	3	2	1
7) Medicine will provide intellectual satisfaction	5	4	3	2	1
8) I have a desire to cure/prevent diseases	5	4	3	2	1
9) My parents expect me to applying to study medicine	5	4	3	2	1
10) A high income is important to me	5	4	3	2	1
11) I enjoy interacting with people	5	4	3	2	1
12) Most of my friends are applying to study medicine	5	4	3	2	1
13) Having job security is important to me	5	4	3	2	1
14) My teachers expect me to apply to study medicine	5	4	3	2	1
15) Other	Please indicate here:				

SECTION 3: YOUR EXPECTATIONS FOR STUDYING AT UNIVERSITY

This section will collect information regarding your expectations for studying at university.

Please answer each item by selecting one option.

14. How much time per week do you expect to spend in independent/private study at university?

- ☐ 0 – 5 hours
- ☐ 6 – 10 hours
- ☐ 11 – 15 hours
- ☐ 16 – 20 hours
- ☐ Over 20 hours

15. To what extent do you agree with the following statements regarding your expectation for learning at university?

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1) I expect to be able to combine study with paid work	5	4	3	2	1
2) Having ready access to my lecturers and tutors outside of face-to-face teaching will be important to my success at university	5	4	3	2	1
3) I anticipate that my learning will involve independent/private study	5	4	3	2	1
4) Interactive sessions with other students will be important to my learning	5	4	3	2	1
5) It is probably not all that important for me to attend most lectures	5	4	3	2	1
6) I have activities other than university that might affect my ability to study	5	4	3	2	1
7) I expect to continue studying after I obtain my degree	5	4	3	2	1
8) I am interested in considering opportunities for Research whilst undertaking university study	5	4	3	2	1
9) I am interested in considering a career in research	5	4	3	2	1

SECTION 4: ABOUT YOUR ALTRUISTIC ATTITUDES

In this section, there are some questions about your altruistic attitudes. Please answer each item by selecting one option.

16. To what extent do you agree with the following statements? (please circle the appropriate score)

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1) Working with the poor is important for practice of medicine	5	4	3	2	1
2) Helping disadvantaged communities is important for practice of medicine	5	4	3	2	1
3) Doctors should be required to provide medical care to the disadvantaged	5	4	3	2	1
4) Doctors should volunteer some of their time to provide free services	5	4	3	2	1
5) I feel personally responsible for providing services to the disadvantaged	5	4	3	2	1
6) I would be interested in volunteering on my own time for programs which provide medical care for the disadvantaged during my medical school experiences	5	4	3	2	1
7) All medical students should become involved in community health efforts	5	4	3	2	1
8) Society is responsible for providing for the health care of all its members	5	4	3	2	1

17. If you would like to be entered into a draw for an iTunes voucher, please provide you email address. This email address will not be stored with your questionnaire responses and not used for any other purpose.

Are you happy to be entered into the draw?

☐ Yes ☐ No

If yes, your e-mail address: _____

ANY OTHER COMMENTS

_____

_____

_____

Thank you for completing this questionnaire, we greatly appreciate it. Your completed questionnaire will be collected after the lecture

Appendix 3 Fourth-year baseline questionnaire

MedEEM study

Medical Students Expectations, Experiences

and Motivation Study

June 2012

Questionnaire on medical students expectations, experiences and motivation at the University of Adelaide

Purpose of this questionnaire

This questionnaire aims to explore your reasons for studying medicine and your experiences of learning at University. We are interested in the change of motivation and expectation/experiences at the time of application, during preclinical and clinical training and how this is associated with your altruistic attitudes. This information will in turn have implications for the selection, training, and development of future medical applicants and students.

Management and Security of Data

The information that you provide on this questionnaire is entirely confidential. Data will only be accessible by the researchers and results will only be reported in an aggregated format. Your name and contact details will be kept separately from the information you provide in this questionnaire, and will be replaced by a project ID for follow-up purposes. At no time will identifiable individual data be reported.

Consent

Your participation is voluntary and your consent to participate in this study is implied by the return of this questionnaire.

Instructions

This questionnaire will take less than 15 minutes to complete. Most questions only require a tick in the appropriate box, but some will ask you to provide additional comment.

By completing the questionnaire, you can elect to go into the draw for a $20 iTunes voucher (10 vouchers available). We look forward to receiving your questionnaire.

If you have any queries, please do not hesitate to contact either:

Pro. Maree O'Keefe, Faculty of Health Sciences, University of Adelaide
Ph: +61 8 8303 3864 maree.okeefe@adelaide.edu.au

or

Dr Caroline Laurence, Discipline of General Practice, University of Adelaide
Ph: +61 8 8313 4951 caroline.laurence@adelaide.edu.au

Instructions: please circle answers, mark × in boxes or give your answer where appropriate

Replies are strictly confidential. Please answer all questions.

CREATING YOUR PROJECT ID

We will invite you to do a follow-up questionnaire after your first year in clinical training. So that you can remain anonymous we ask you to generate an unique ID using the instructions below:

Please indicate the last two letters of your given name (e.g. the last two letters of Bill Jobs's given name are "ll")

☐ ☐

Please indicate your month of birth (e.g. "06" for June; "12" for December)

☐ ☐

Please indicate how many siblings you have (e.g. "00" for none; "03" for three siblings)

☐ ☐

Please indicate the last two digits of your current postcode (e.g. "05" for "5005")

☐ ☐

Putting these together, a person named Bill Jobs, born in June, with 3 siblings and the postcode "5005" will

generate the ID: ll060305

In this case, your project ID is:

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

SECTION 1: ABOUT YOU:

This section will collect information regarding your personal information, cultural background, educational background and family background.

1. Your sex: ☐ Female ☐ Male

2. Your age in years: _____(exact number)

3. Your country of Birth: ☐ Australia ☐ Other countries

└If not Australia, how many years have you been living here for? _____

4. What is your country of citizenship?

☐ Australian

☐ Other (please specify) _____

5. What is the main language spoken at home?

☐ English

☐ Another language other than English (please specify)_____

6. Where did you complete your secondary schooling?

☐ Australia Government school (i.e. public)

☐ Australia Non-Government school (i.e. private, Catholic)

☐ Other country (please specify) _____

7. Does your father work in a health care profession?

☐ Yes

☐ No

☐ N/A

If yes, what health profession? _____

8. Does your mother work in a health care profession?

☐ Yes

☐ No

☐ N/A

If yes, what health profession? _____

9. Have any of your family members, other than your parents, worked in a health related profession?

☐ Yes

☐ No

☐ N/A

If yes, who and what health profession? _____

10. What is your father's highest level of complete educational qualification?

- ☐ Postgraduate degree (eg. Master Degree, Doctoral Degree)
- ☐ Graduate diploma/ certificate (eg. Professional Specialist Diploma/Certificate)
- ☐ Bachelor degree (including Honour Degree)
- ☐ Advanced diploma/diploma (eg. Higher National Diploma, TAFE)
- ☐ Certificate (eg. Certificate IV)
- ☐ Secondary education (eg. Year 12)
- ☐ Primary education (eg. Year 7)
- ☐ Pre-primary education
- ☐ Other education (eg. non-award courses, apprenticeship training)
- ☐ N/A

Please specify if you choose "other education": _____

11. What is your mother's highest level of complete educational qualification?

- ☐ Postgraduate degree (eg. Master Degree, Doctoral Degree)
- ☐ Graduate diploma/ certificate (eg. Professional Specialist Diploma/Certificate)
- ☐ Bachelor degree (Honour Degree included)
- ☐ Advanced diploma/diploma (eg. Higher National Diploma, TAFE)
- ☐ Certificate (eg. Certificate IV)
- ☐ Secondary education (eg. Year 12)
- ☐ Primary education (eg. Year 7)
- ☐ Pre-primary education
- ☐ Other education (eg. non-award courses, apprenticeship training)
- ☐ N/A

Please specify if you choose "other education": _____

SECTION 2: ABOUT YOUR REASONS FOR STUDYING MEDICINE

In this section, there are some questions about your reasons for studying medicine. Please answer each item by selecting one option.

12. Please rate the importance of the following statements for your reasons for continuing to study medicine.

Reasons	Very important	Slightly important	Not sure	Not important	Not at all important
1) I have scientific curiosity	5	4	3	2	1
2) I have a desire for helping others	5	4	3	2	1
3) Professional independence is important to me	5	4	3	2	1
4) I have previous experiences with illness (personal or family)	5	4	3	2	1
5) I am attracted to the high prestige associated with medicine	5	4	3	2	1
6) I have relatives in health care	5	4	3	2	1
7) Medicine will provide intellectual satisfaction	5	4	3	2	1
8) I have a desire to cure/prevent diseases	5	4	3	2	1
9) My parents expect me to continue studying medicine	5	4	3	2	1
10) A high income is important to me	5	4	3	2	1
11) I enjoy interacting with people	5	4	3	2	1
12) Most of my friends are studying medicine	5	4	3	2	1
13) Having job security is important to me	5	4	3	2	1
14) My teachers expect me to continue studying	5	4	3	2	1
15) Other	please indicate here:				

SECTION 3: ABOUT YOUR EXPERIENCES FOR STUDYING AT UNIVERSITY IN THE LAST YEAR

In this section, there are some questions about your experiences for studying at university. Please answer each item by selecting one option.

13. I spent the following time per week in independent/private study.

- ☐ 0 – 5 hours
- ☐ 6 – 10 hours
- ☐ 11 – 15 hours
- ☐ 16 – 20 hours
- ☐ Over 20 hours

14. To what extent do you agree with the following statements regarding your experiences for learning at university?

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1) I can combine study with paid work	5	4	3	2	1
2) Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university	5	4	3	2	1
3) My learning involves independent/private study	5	4	3	2	1
4) Interactive sessions with other students are important to my learning	5	4	3	2	1
5) It is probably not all that important for me to attend most lectures	5	4	3	2	1
6) I have activities other than university that might affect my ability to study	5	4	3	2	1
7) I expect to continue studying after I obtain my degree	5	4	3	2	1
8) I am interested in considering opportunities for Research whilst undertaking university study	5	4	3	2	1
9) I am interested in considering a career in research	5	4	3	2	1

SECTION 4: ABOUT YOUR ALTRUISTIC ATTITUDES

In this section, there are some questions about your altruistic attitudes. Please answer each item by selecting one option.

15. To what extent do you agree with the following statements?

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1) Working with the poor is important for practice of medicine	5	4	3	2	1
2) Helping disadvantaged communities is important for practice of medicine	5	4	3	2	1
3) Doctors should be required to provide medical care to the disadvantaged	5	4	3	2	1
4) Doctors should volunteer some of their time to provide free services	5	4	3	2	1
5) I feel personally responsible for providing services to the disadvantaged	5	4	3	2	1
6) I would be interested in volunteering on my own time for programs which provide medical care for the disadvantaged during my medical school experiences	5	4	3	2	1
7) All medical students should become involved in community health efforts	5	4	3	2	1
8) Society is responsible for providing for the health care of all its members	5	4	3	2	1

17. If you would like to be entered into a draw for an iTunes voucher, please provide you email address. This email address will not be stored with your questionnaire responses and not used for any other purpose.

Are you happy to be entered into the draw?

☐ Yes ☐ No

If yes, your e-mail address: _____

ANY OTHER COMMENTS:

_____

_____

_____

Thank you for completing this questionnaire, we greatly appreciate it. Your completed questionnaire will be collected after the lecture

Appendix 4 Entry follow-up questiionnaire

MedEEM

Medical Students Expectations, Experiences

and Motivation Study

March 2013

Questionnaire on medical students expectations, experiences and motivation at the University of Adelaide

Purpose of this questionnaire

This questionnaire aims to explore your reasons for studying medicine and your experiences of learning at University. We are interested in the change of motivation and expectation/experiences at the time of application, during preclinical and clinical training and how this is associated with your altruistic attitudes. This information will in turn have implications for the selection, training, and development of future medical applicants and students.

Management and Security of Data

The information that you provide on this questionnaire is entirely confidential. Data will only be accessible by the researchers and results will only be reported in an aggregated format. You will generate a project ID in order to match your response with the one year ago. At no time will identifiable individual data be reported.

Consent

Your participation is voluntary and your consent to participate in this study is implied by the return of this questionnaire.

Instructions

This questionnaire will take less than 15 minutes to complete. Most questions only require a tick in the appropriate box, but some will ask you to provide additional comment.

By completing the questionnaire, you can elect to go into the draw for a $20 iTunes voucher (10 vouchers available). We look forward to receiving your questionnaire.

If you have any queries, please do not hesitate to contact either:

Prof. Maree O'Keefe, Faculty of Health Sciences, University of Adelaide
Ph: +61 8 8303 3864 maree.okeefe@adelaide.edu.au

or

A.Prof. Caroline Laurence, Discipline of General Practice, University of Adelaide
Ph: +61 8 8313 4951 caroline.laurence@adelaide.edu.au

Instructions: please circle answers, mark × in boxes or give your answer where appropriate

Replies are strictly confidential. Please answer all questions.

CREATING YOUR PROJECT ID

As part of this study, we have asked all applicants for 2012 entry to participate in an on-line survey last year (prior to your interview). To keep you anonymous we ask you to generate a unique ID using the instructions below. This should be the same as the one you generated in the on-line survey one year ago.

Please indicate the last two letters of your given name (e.g. the last two letters of Bill Jobs's given name are "ll")

☐ ☐

Please indicate your month of birth (e.g. "06" for June; "12" for December)

☐ ☐

Please indicate how many siblings you have (e.g. "00" for none; "03" for three siblings)

☐ ☐

Putting these together, a person named Bill Jobs, born in June, and with 3 siblings will generate the ID: ll060305

In this case, your project ID is:

☐ ☐ ☐ ☐ ☐ ☐

SECTION 1: ABOUT YOUR REASONS FOR STUDYING MEDICINE

In this section, there are some questions about your reasons for continuing to study medicine. Please answer each item by selecting one option.

1. Please rate the importance of the following statements for your reasons for continuing to study medicine.

Reasons	Very important	Slightly important	Not sure	Not important	Not at all important
1) I have scientific curiosity	5	4	3	2	1
2) I have a desire for helping others	5	4	3	2	1
3) Professional independence is important to me	5	4	3	2	1
4) I have previous experiences with illness (personal or family)	5	4	3	2	1
5) I am attracted to the high prestige associated with medicine	5	4	3	2	1
6) I have relatives in health care	5	4	3	2	1
7) Medicine will provide intellectual satisfaction	5	4	3	2	1
8) I have a desire to cure/prevent diseases	5	4	3	2	1
9) My parents expect me to continue studying medicine	5	4	3	2	1
10) A high income is important to me	5	4	3	2	1
11) I enjoy interacting with people	5	4	3	2	1
12) Most of my friends are studying medicine	5	4	3	2	1
13) Having job security is important to me	5	4	3	2	1
14) My teachers expect me to continue studying	5	4	3	2	1
15) Other	please indicate here:				

SECTION 2: ABOUT YOUR EXPERIENCES AT UNIVERSITY IN THE LAST YEAR

In this section, there are some questions about your experiences for studying at university. Please answer each item by selecting one option.

2. I spent the following time per week in independent/private study.

- ☐ 0 – 5 hours
- ☐ 6 – 10 hours
- ☐ 11 – 15 hours
- ☐ 16 – 20 hours
- ☐ Over 20 hours

3. To what extent do you agree with the following statements regarding your experiences for learning at university?

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1) I can combine study with paid work	5	4	3	2	1
2) Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university	5	4	3	2	1
3) My learning involves independent/private study	5	4	3	2	1
4) Interactive sessions with other students are important to my learning	5	4	3	2	1
5) It is probably not all that important for me to attend most lectures	5	4	3	2	1
6) I have activities other than university that might affect my ability to study	5	4	3	2	1
7) I expect to continue studying after I obtain my degree	5	4	3	2	1
8) I am interested in considering opportunities for research whilst undertaking university study	5	4	3	2	1
9) I am interested in considering a career in research	5	4	3	2	1

SECTION 3: ABOUT YOUR ALTRUISTIC ATTITUDES

In this section, there are some questions about your altruistic attitudes. Please answer each item by selecting one option.

4. To what extent do you agree with the following statements?

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1) Working with the poor is important for practice of medicine	5	4	3	2	1
2) Helping disadvantaged communities is important for practice of medicine	5	4	3	2	1
3) Doctors should be required to provide medical care to the disadvantaged	5	4	3	2	1
4) Doctors should volunteer some of their time to provide free services	5	4	3	2	1
5) I feel personally responsible for providing services to the disadvantaged	5	4	3	2	1
6) I would be interested in volunteering on my own time for programs which provide medical care for the disadvantaged during my medical school experiences	5	4	3	2	1
7) All medical students should become involved in community health efforts	5	4	3	2	1
8) Society is responsible for providing for the health care of all its members	5	4	3	2	1

5. If you would like to be entered into a draw for an iTunes voucher, please provide you email address. This email address will not be stored with your questionnaire responses and not used for any other purpose.

Are you happy to be entered into the draw?

☐ Yes ☐ No

If yes, your e-mail address: _____

ANY OTHER COMMENTS:

_____

_____

_____

Thank you for completing this questionnaire, we greatly appreciate it.

Appendix 5 Fourth-year follow-up questionnaire

MedEEM

Medical Students Expectations, Experiences

and Motivation Study

June 2013

Questionnaire on medical students expectations, experiences and motivation at the University of Adelaide

Purpose of this questionnaire

This questionnaire aims to explore your reasons for studying medicine and your experiences of learning at University. We are interested in the change of motivation and expectation/experiences at the time of application, during preclinical and clinical training and how this is associated with your altruistic attitudes. This information will in turn have implications for the selection, training, and development of future medical applicants and students.

Management and Security of Data

The information that you provide on this questionnaire is entirely confidential. Data will only be accessible by the researchers and results will only be reported in an aggregated format. You will generate a project ID in order to match your response with the one year ago. At no time will identifiable individual data be reported.

Consent

Your participation is voluntary and your consent to participate in this study is implied by the return of this questionnaire.

Instructions

This questionnaire will take less than 15 minutes to complete. Most questions only require a tick in the appropriate box, but some will ask you to provide additional comment.

By completing the questionnaire, you can elect to go into the draw for a $20 iTunes voucher (10 vouchers available). We look forward to receiving your questionnaire.

If you have any queries, please do not hesitate to contact either:

Prof. Maree O'Keefe, Faculty of Health Sciences, University of Adelaide
Ph: +61 8 8303 3864 maree.okeefe@adelaide.edu.au

or

A.Prof. Caroline Laurence, Discipline of General Practice, University of Adelaide
Ph: +61 8 8313 4951 caroline.laurence@adelaide.edu.au

Instructions: please circle answers, mark × in boxes or give your answer where appropriate

Replies are strictly confidential. Please answer all questions.

CREATING YOUR PROJECT ID

As part of this study, we have asked you to participate in a survey last year. To keep you anonymous we ask you to generate a unique ID using the instructions below. This should be the same as the one you generated in the survey one year ago.

Please indicate the last two letters of your given name (e.g. the last two letters of Bill Jobs's given name are "ll")

☐ ☐

Please indicate your month of birth (e.g. "06" for June; "12" for December)

☐ ☐

Please indicate how many siblings you have (e.g. "00" for none; "03" for three siblings)

☐ ☐

Please indicate the last two digits of your current postcode (e.g. "05" for "5005")

☐ ☐

Putting these together, a person named Bill Jobs, born in June, with 3 siblings and the postcode "5005" will

generate the ID: ll060305

In this case, your project ID is:

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

SECTION 1: ABOUT YOUR REASONS FOR STUDYING MEDICINE

In this section, there are some questions about your reasons for continuing to study medicine. Please answer each item by selecting one option.

1. Please rate the importance of the following statements for your reasons for continuing to study medicine.

Reasons	Very important	Slightly important	Not sure	Not important	Not at all important
1) I have scientific curiosity	1	2	3	4	5
2) I have a desire for helping others	1	2	3	4	5
3) Professional independence is important to me	1	2	3	4	5
4) I have previous experiences with illness (personal or family)	1	2	3	4	5
5) I am attracted to the high prestige associated with medicine	1	2	3	4	5
6) I have relatives in health care	1	2	3	4	5
7) Medicine will provide intellectual satisfaction	1	2	3	4	5
8) I have a desire to cure/prevent diseases	1	2	3	4	5
9) My parents expect me to continue studying medicine	1	2	3	4	5
10) A high income is important to me	1	2	3	4	5
11) I enjoy interacting with people	1	2	3	4	5
12) Most of my friends are studying medicine	1	2	3	4	5
13) Having job security is important to me	1	2	3	4	5
14) My teachers expect me to continue studying medicine	1	2	3	4	5
15) Other	please indicate here:				

SECTION 2: ABOUT YOUR EXPERIENCES AT UNIVERSITY IN THE LAST YEAR

In this section, there are some questions about your experiences for studying at university. Please answer each item by selecting one option.

2. I spent the following time per week in independent/private study.

- ☐ 0 – 5 hours
- ☐ 6 – 10 hours
- ☐ 11 – 15 hours
- ☐ 16 – 20 hours
- ☐ Over 20 hours

3. To what extent do you agree with the following statements regarding your experiences for learning at university?

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1) I can combine study with paid work	5	4	3	2	1
2) Having ready access to my lecturers and tutors outside of face-to-face teaching is important to my success at university	5	4	3	2	1
3) My learning involves independent/private study	5	4	3	2	1
4) Interactive sessions with other students are important to my learning	5	4	3	2	1
5) It is probably not all that important for me to attend most lectures	5	4	3	2	1
6) I have activities other than university that might affect my ability to study	5	4	3	2	1
7) I expect to continue studying after I obtain my degree	5	4	3	2	1
8) I am interested in considering opportunities for research whilst undertaking university study	5	4	3	2	1
9) I am interested in considering a career in research	5	4	3	2	1

SECTION 3: ABOUT YOUR ALTRUISTIC ATTITUDES

In this section, there are some questions about your altruistic attitudes. Please answer each item by selecting one option.

4. To what extent do you agree with the following statements?

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1) Working with the poor is important for practice of medicine	5	4	3	2	1
2) Helping disadvantaged communities is important for practice of medicine	5	4	3	2	1
3) Doctors should be required to provide medical care to the disadvantaged	5	4	3	2	1
4) Doctors should volunteer some of their time to provide free services	5	4	3	2	1
5) I feel personally responsible for providing services to the disadvantaged	5	4	3	2	1
6) I would be interested in volunteering on my own time for programs which provide medical care for the disadvantaged during my medical school experiences	5	4	3	2	1
7) All medical students should become involved in community health efforts	5	4	3	2	1
8) Society is responsible for providing for the health care of all its members	5	4	3	2	1

5. If you would like to be entered into a draw for an iTunes voucher, please provide you email address. This email address will not be stored with your questionnaire responses and not used for any other purpose.

   Are you happy to be entered into the draw?

   ☐ Yes ☐ No

   If yes, your e-mail address: _____

ANY OTHER COMMENTS:

_____

_____

_____

Thank you for completing this questionnaire, we greatly appreciate it.

Appendix 6 University of Adelaide Human Research Ethics Committee approval

THE UNIVERSITY of ADELAIDE

RESEARCH BRANCH
RESEARCH ETHICS AND COMPLIANCE UNIT

BEVERLEY DOBBS
EXECUTIVE OFFICER
HUMAN RESEARCH ETHICS SUB-COMMITTEES
THE UNIVERSITY OF ADELAIDE
SA 5005
AUSTRALIA

TELEPHONE +61 8 8303 4725
FACSIMILE +61 8 8303 7325
email: beverley.dobbs@adelaide.edu.au
CRICOS Provider Number 00123M

18 August 2011

Professor M O'Keefe
Faculty of Health Sciences

Dear Professor O'Keefe

PROJECT NO: H-204-2011
Motivation, learning expectation and experiences of students applying to and study in medicine at the University of Adelaide

I write to advise you that on behalf of the Human Research Ethics Committee I have approved the above project. Please refer to the enclosed endorsement sheet for further details and conditions that may be applicable to this approval.

The ethics expiry date for this project is: 31 August 2012

Where possible, participants taking part in the study should be given a copy of the Information Sheet and the signed Consent Form to retain.

Please note that any changes to the project which might affect its continued ethical acceptability will invalidate the project's approval. In such cases an amended protocol must be submitted to the Committee for further approval. It is a condition of approval that you immediately report anything which might warrant review of ethical approval including (a) serious or unexpected adverse effects on participants (b) proposed changes in the protocol; and (c) unforeseen events that might affect continued ethical acceptability of the project. It is also a condition of approval that you inform the Committee, giving reasons, if the project is discontinued before the expected date of completion.

A reporting form is available from the Committee's website. This may be used to renew ethical approval or report on project status including completion.

Yours sincerely

PROFESSOR GARRETT CULLITY
Convenor
Human Research Ethics Committee

THE UNIVERSITY of ADELAIDE

RESEARCH BRANCH
RESEARCH ETHICS AND COMPLIANCE UNIT

BEVERLEY DOBBS
EXECUTIVE OFFICER
HUMAN RESEARCH ETHICS SUB-COMMITTEES
THE UNIVERSITY OF ADELAIDE
SA 5005
AUSTRALIA

TELEPHONE +61 8 8303 4725
FACSIMILE +61 8 8303 7325
email: beverley.dobbs@adelaide.edu.au
CRICOS Provider Number 00123M

Applicant: Professor M O'Keefe

Faculty: Health Sciences

Project Title: ***Motivation, learning expectation and experiences of students applying to and study in medicine at the University of Adelaide***

THE UNIVERSITY OF ADELAIDE HUMAN RESEARCH ETHICS COMMITTEE

Project No: **H-204-2011** RM No: 0000012229

APPROVED for the period until: **31 August 2012**

Refer also to the accompanying letter setting out requirements applying to approval.

PROFESSOR GARRETT CULLITY
Convenor
Human Research Ethics Committee

Date: 18 AUG 2011

Appendix 7 Medical program Curriculum Committee Approval

THE UNIVERSITY of ADELAIDE

FACULTY OF HEALTH SCIENCES
Medicine Learning & Teaching Unit

A/Professor Mitra Guha
Chair, MBBS Curriculum Committee
Medical School North
The University of Adelaide SA 5005
Australia

Telephone: +61 8303 6221
Facsimile: +61 8303 6225
CRICOS Provider Number 00123M

31 August 2011

Professor Maree O'Keefe
Associate Dean, Learning And Teaching
Plaza Building
The University Of Adelaide Sa
Australia 5005

Via email: maree.okeefe@adelaide.edu.au

Dear Maree,

The Curriculum Committee discussed your request on behalf of your PhD candidate, Ms Maoyi Xu, to survey currently enrolled MBBS students as part of her research.

The Committee has given in principle approval, subject to the project receiving approval from the Ethics Committee.

The research will be interesting and the Committee would look forward to a report upon completion.

Yours sincerely

Associate Professor Mitra Guha
Chair
MBBS Curriculum Committee

Copy to: maoyi.xu@adelaide.edu.au
caroline.laurence@adelaide.edu.au

Appendix 8 Pilot study package

August 2011

Dear medical student,

Thank you for agreeing to pilot the questionnaire for the study Motivation, Learning Expectation and Experiences of Students Applying to and Study in Medicine at the University of Adelaide. Your participation is most appreciated.

This questionnaire aims to explore medical students' reasons for learning medicine, their altruistic attitude and their expectation and experiences of learning at University. This information will in turn have implications for the selection, training, and development of future medical applicants and students. Before implementing this questionnaire on a larger scale it is important to determine how much time it takes to complete the questionnaire, whether any item in the questionnaire is unclear, confusing or could be improved. Therefore your feedback is very valuable.

Enclosed in the envelope are an information sheet, the questionnaire and a feedback sheet. We would like to ask you to complete the questionnaire and the feedback sheet. Please put the completed ones back into the envelope and return it as soon as possible.

Thank you for your participation.

Yours sincerely

Maoyi Xu
PhD Candidate
Discipline of Paediatrics/General Practice

Instructions: please circle answers, mark × in boxes or give your answer where appropriate.

Replies are strictly confidential. Please answer all questions.

YOUR PROJECT ID:

Some of you may be invited to do a follow-up questionnaire 12 months later. In order to pair the answers of the same participant and to protect the participants' personal information, we ask every responder to generate a project ID by the identifier calculation as below:

Please indicate the last two letters of your given name (e.g. the last two letters of Bill Jobs's given name are "ll")

☐☐

Please indicate your month of birth (e.g. "06" for June; "12" for December)

☐☐

Please indicate the number of your siblings (e.g. "00" for none; "03" for three siblings)

☐☐

A person named Bill Jobs, born in June and with 3 siblings will generate the ID: ll0603

In this case, your project ID is: ☐☐☐☐☐☐☐☐☐☐

SECTION 1: ABOUT YOU:

This section will collect information regarding your personal information, cultural background, educational background and family background.

1. Sex: ☐ Male ☐ Female

2. Age in years: _____

3. Country of Birth: _____

   └If not Australia, how many years have you been living here for? _____

4. What is your country of citizenship?

☐ Australian

☐ Other (please specify) _____

5. What is the main language spoken at home?

☐ English

☐ Another language other than English (please specify) _____

6. Where did you complete your secondary schooling?

☐ Australia

- ☐ Government school (i.e. public)
- ☐ Non-Government school (i.e. private)
- ☐ Other: _____

☐ Other country (please specify) _____

7. Please select which of the following categories best describes your Father's main occupation:

- ☐ Managers (e.g. advertising manager)
- ☐ Professional
  - ☐ Medicine
  - ☐ Nursing
  - ☐ Other health (e.g. pharmacist)
  - ☐ Other Professional (e.g. art/education/business/law)
- ☐ Technicians and Trades Workers (e.g. electrician)
- ☐ Community and Personal Service Workers (e.g. child care worker)
- ☐ Clerical and Administrative Workers (e.g. secretary)
- ☐ Sales Workers (e.g. sales representative)
- ☐ Machinery Operators and Drivers (e.g. bus drivers)
- ☐ Labourers (e.g. construction labourers)
- ☐ Unemployed/home duties

8. Please select which of the following categories best describes your Mother's main occupation:

- ☐ Managers (e.g. advertising manager)
- ☐ Professional
  - ☐ Medicine
  - ☐ Nursing
  - ☐ Other health (e.g. pharmacist)
  - ☐ Other Professional (e.g. art/education/business/law)
- ☐ Technicians and Trades Workers (e.g. electrician)
- ☐ Community and Personal Service Workers (e.g. child care worker)
- ☐ Clerical and Administrative Workers (e.g. secretary)
- ☐ Sales Workers (e.g. sales representative)
- ☐ Machinery Operators and Drivers (e.g. bus drivers)
- ☐ Labourers (e.g. construction labourers)
- ☐ Unemployed/home duties

9. Have any of your other family members (except your patents) worked in a health related profession

☐ No

☐ Yes

If yes, what health profession _____

10. Have you applied to other medical schools?

☐ Yes

If yes, how many? _____

☐ No

SECTION 2: ABOUT YOUR REASONS FOR APPLYING TO MEDICAL SCHOOL

This section will collect information regarding your reasons for applying to study medicine.

Please answer each item by selecting one option.

11. Please rate the importance of the following statements for your reasons for applying to medical school.

Reasons	Very important	Slightly important	Not sure	Not important	Not at all important
1) I have scientific curiosity	5	4	3	2	1
2) I have a desire for helping others	5	4	3	2	1
3) Professional independence is important to me	5	4	3	2	1
4) I have previous experiences with illness (personal or family)	5	4	3	2	1
5) I am attracted to the high prestige associated with medicine	5	4	3	2	1
6) I have relatives in health care	5	4	3	2	1
7) Medicine will provide intellectual satisfaction	5	4	3	2	1
8) I have a desire to cure/prevent diseases	5	4	3	2	1
9) My parents expect me to study medicine	5	4	3	2	1
10) A high income is important to me	5	4	3	2	1
11) I enjoy interacting with people	5	4	3	2	1
12) Most of my friends are applying to medicine	5	4	3	2	1
13) Having job security is important to me	5	4	3	2	1
14) My teachers expect me to apply to medicine	5	4	3	2	1
15) Other	Please indicate here:				

SECTION 3: YOUR EXPECTATIONS FOR STUDYING AT UNIVERSITY

This section will collect information regarding your expectations for studying at university.

Please answer each item by selecting one option.

12. How much time per week do you expect to spend in independent/private study at university?

☐ 0 – 5 hours

☐ 6 – 10 hours

☐ 11 – 15 hours

☐ 16 – 20 hours

☐ Over 20 hours

13. To what extent do you agree with the following statements regarding your expectation for learning at university?

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1) I expect to be able to combine study with paid work	5	4	3	2	1
2) Having ready access to my lecturers and tutors outside of face-to-face teaching will be important to my success at university	5	4	3	2	1
3) I anticipate that my learning will involve independent/private study	5	4	3	2	1
4) Interactive sessions with other students will be important to my learning	5	4	3	2	1
5) It is probably not all that important for me to attend most lectures	5	4	3	2	1
6) I have activities other than university that might affect my ability to study	5	4	3	2	1
7) I expect to continue studying after I obtain my degree	5	4	3	2	1
8) I am interested in considering opportunities for Research whilst undertaking university study	5	4	3	2	1
9) I am interested in considering a career in research	5	4	3	2	1

SECTION 4: YOUR ALTRUISITC ATTITUDES

This section will collect information regarding your altruistic attitudes. Please answer each item by selecting one option.

14. To what extent do you agree with the following statements? (please circle the appropriate score)

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1) Working with the poor is important for practice of medicine	5	4	3	2	1
2) Helping disadvantaged communities is important for practice of medicine	5	4	3	2	1
3) Doctors should be required to provide medical care to the disadvantaged	5	4	3	2	1
4) Doctors should volunteer some of their time to provide free services	5	4	3	2	1
5) I feel personally responsible for providing services to the disadvantaged	5	4	3	2	1
6) I would be interested in volunteering on my own time for programs which provide medical care for the disadvantaged during my medical school experiences	5	4	3	2	1
7) All medical students should become involved in community health efforts	5	4	3	2	1
8) Society is responsible for providing for the health care of all its members	5	4	3	2	1

Motivation, Learning Expectation and Experiences of Students Applying to and Study in Medicine at the University of Adelaide

Feedback Sheet

Once you have completed the questionnaire, please complete this feedback sheet.

1. Name of person completing feedback sheet _____

2. Did you understand all of the questions? ☐ Yes ☐ No

   If no, please list the questions you did not understand and the reason why?

3. Approximately how long did it take you to complete the questionnaire?

_____ (minutes)

4. Would you prefer to complete the questionnaire: ☐ on-line ☐ on paper

5. Was there sufficient space for extra comments? ☐ Yes ☐ No

6. Please rate the overall ease of completion of the questionnaire

Very Hard complete		Uncertain		Very easy to complete
1	2	3	4	5

Any other comments

Thank you for your time in completing the questionnaire and feedback sheet.

Appendix 9 Bivariate analysis of the associations between medical applicants' expectations of learning at university and socio-demographic characteristics

Characteristics	I expected to be able to combine study with paid work						Having ready access to my lecturers and tutors outside of face-to-face teaching will be important to my success at university					
	Mean	SD	Median	Interquartile range	z [a] / K-W χ^{2} [b]	p*	Mean	SD	Median	Interquartile range	z / K-W χ^{2}	p
Sex					-1.25	0.211					-1.43	0.152
Male	3.62	0.83	4	3-4			3.87	0.81	4	3-4		
Female	3.73	0.83	4	3-4			3.97	0.78	4	4-4		
Country of birth					-0.73	0.467					-1.01	0.312
Australia	3.65	0.84	4	3-4			3.89	0.79	4	4-4		
Other countries	3.71	0.82	4	3-4			3.96	0.84	4	4-5		
Citizenship					0.02	0.986					-1.46	0.144
Australian	3.67	0.83	4	3-4			3.89	0.82	4	3-4		
Other	3.67	0.81	4	3-4			4.08	0.65	4	4-4		
Language spoken at home					-1.67	0.095					-2.54	0.011
English	3.63	0.85	4	3-4			3.85	0.81	4	3-4		
Other	3.79	0.76	4	3-4			4.09	0.74	4	4-5		
Family members working in health-related profession (except parents)					-0.73	0.464					-0.59	0.557
Yes	3.62	0.84	4	3-4			3.87	0.83	4	4-4		
No	3.70	0.84	4	3-4			3.94	0.78	4	4-4		

Characteristics	I expected to be able to combine study with paid work						Having ready access to my lecturers and tutors outside of face-to-face teaching will be important to my success at university					
	Mean	SD	Median	Interquartile range	z [a] / K-W χ^{2} [b]	p*	Mean	SD	Median	Interquartile range	z / K-W χ^{2}	p
Father's occupation					-1.75	0.079					-0.84	0.400
Heath-related profession	3.55	0.75	4	3-4			3.86	0.78	4	3-4		
Other profession	3.69	0.85	4	3-4			3.93	0.81	4	4-4		
Mother's occupation					0.95	0.344					-1.35	0.176
Heath-related profession	3.74	0.82	4	3-4			3.82	0.84	4	3-4		
Other profession	3.64	0.83	4	3-4			3.94	0.79	4	4-4		
Father's highest level of complete educational qualification					0.83	0.406					0.50	0.620
Bachelor or above	3.68	0.84	4	3-4			3.91	0.84	4	4-4		
Below bachelor	3.63	0.80	4	3-4			3.91	0.66	4	4-4		
Mother's highest level of complete educational qualification					0.29	0.772					-0.83	0.406
Bachelor or above	3.68	0.85	4	3-4			3.88	0.83	4	3-4		
Below bachelor	3.64	0.79	4	3-4			3.99	0.71	4	4-4		
Secondary schooling					4.56	0.102					2.06	0.357
Aust government school	3.74	0.88	4	3-4			3.98	0.83	4	4-4		
Aust non-government school	3.66	0.80	4	3-4			3.87	0.80	4	3-4		
Other country	3.33	0.76	3	3-4			3.92	0.65	4	4-4		

Characteristics	I anticipated that my learning will involve independent/private study						Interactive sessions with other students will be important to my learning					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Sex					-1.14	0.253					0.16	0.870
Male	4.71	0.51	5	4-5			4.55	0.65	5	4-5		
Female	4.78	0.43	5	5-5			4.56	0.56	5	4-5		
Country of birth					0.75	0.454					-0.40	0.689
Australia	4.75	0.49	5	5-5			4.55	0.59	5	4-5		
Other countries	4.72	0.47	5	4-5			4.55	0.67	5	4-5		
Citizenship					-0.89	0.372					0.13	0.894
Australian	4.73	0.48	5	5-5			4.56	0.61	5	4-5		
Other	4.79	0.46	5	5-5			4.54	0.62	5	4-5		
Language spoken at home					1.90	0.058					-0.73	0.464
English	4.77	0.45	5	5-5			4.55	0.59	5	4-5		
Other	4.64	0.56	5	4-5			4.57	0.69	5	4-5		
Family members working in health-related profession (except parents)					1.05	0.295					0.40	0.687
Yes	4.77	0.45	5	5-5			4.58	0.58	5	4-5		
No	4.72	0.50	5	4-5			4.54	0.64	5	4-5		

Characteristics	I anticipated that my learning will involve independent/private study						Interactive sessions with other students will be important to my learning					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Father's occupation					-0.47	0.641					-1.47	0.141
Heath-related profession	4.74	0.44	5	4-5			4.52	0.52	5	4-5		
Other profession	4.74	0.49	5	5-5			4.57	0.64	5	4-5		
Mother's occupation					-0.00	0.997					-0.95	0.342
Heath-related profession	4.76	0.43	5	5-5			4.53	0.54	5	4-5		
Other profession	4.73	0.50	5	5-5			4.56	0.64	5	4-5		
Father's highest level of complete educational qualification					0.26	0.797					0.88	0.377
Bachelor or above	4.74	0.47	5	5-5			4.57	0.60	5	4-5		
Below bachelor	4.73	0.52	5	5-5			4.49	0.64	5	4-5		
Mother's highest level of complete educational qualification					0.91	0.364					1.94	0.053
Bachelor or above	4.75	0.46	5	5-5			4.59	0.60	5	4-5		
Below bachelor	4.70	0.54	5	4-5			4.47	0.65	5	4-5		
Secondary schooling					0.57	0.752					0.31	0.858
Aust government school	4.73	0.54	5	5-5			4.55	0.66	5	4-5		
Aust non-government school	4.74	0.46	5	4-5			4.55	0.58	5	4-5		
Other country	4.83	0.38	5	5-5			4.58	0.65	5	4-5		

Characteristics	It is probably not all that important for me to attend most lectures						I have activities other than university that might affect my ability to study					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Sex					1.42	0.156					1.57	0.116
Male	1.75	0.73	2	1-2			2.76	0.97	3	2-3		
Female	1.70	0.86	2	1-2			2.59	0.92	3	2-3		
Country of birth					-2.33	0.020					0.36	0.717
Australia	1.67	0.74	2	1-2			2.70	0.97	3	2-3		
Other countries	1.89	0.89	2	1-2			2.66	0.92	3	2-3		
Citizenship					-1.33	0.184					-0.34	0.731
Australian	1.71	0.77	2	1-2			2.68	0.96	3	2-3		
Other	1.90	0.90	2	1-2			2.73	0.89	3	2-3		
Language spoken at home					-2.26	0.024					-1.76	0.079
English	1.68	0.77	2	1-2			2.65	0.95	3	2-3		
Other	1.89	0.84	2	1-2			2.84	0.96	3	2-4		
Family members working in health-related profession (except parents)					0.38	0.703					-1.10	0.270
Yes	1.76	0.83	2	1-2			2.61	0.94	3	2-3		
No	1.71	0.77	2	1-2			2.74	0.96	3	2-3		

Characteristics	It is probably not all that important for me to attend most lectures						I have activities other than university that might affect my ability to study					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Father's occupation					-0.26	0.799					-0.57	0.567
Heath-related profession	1.67	0.63	2	1-2			2.63	0.93	3	2-3		
Other profession	1.75	0.83	2	1-2			2.70	0.96	3	2-3		
Mother's occupation					-0.10	0.917					-0.14	0.890
Heath-related profession	1.72	0.73	2	1-2			2.64	0.94	3	2-3		
Other profession	1.74	0.81	2	1-2			2.70	0.95	3	2-3		
Father's highest level of complete educational qualification					0.05	0.962					0.31	0.757
Bachelor or above	1.74	0.82	2	1-2			2.71	0.98	3	2-3		
Below bachelor	1.71	0.69	2	1-2			2.64	0.88	3	2-3		
Mother's highest level of complete educational qualification					0.33	0.741					0.76	0.449
Bachelor or above	1.75	0.83	2	1-2			2.71	0.96	3	2-3		
Below bachelor	1.69	0.70	2	1-2			2.63	0.94	3	2-3		
Secondary schooling					4.64	0.098					1.23	0.542
Aust government school	1.77	0.78	2	1-2			2.75	0.97	3	2-3		
Aust non-government school	1.67	0.76	2	1-2			2.65	0.96	3	2-3		
Other country	2.13	1.08	2	1-2.5			2.75	0.79	3	2-3		

Characteristics	I expect to continue studying after I obtain my degree						I am interested in considering opportunities for research whilst undertaking university studies					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Sex					-0.28	0.784					0.73	0.467
Male	4.26	0.79	4	4-5			4.10	0.71	4	4-5		
Female	4.30	0.75	4	4-5			4.06	0.70	4	4-5		
Country of birth					-1.98	0.048					-0.86	0.393
Australia	4.23	0.80	4	4-5			4.06	0.73	4	4-5		
Other countries	4.40	0.69	5	4-5			4.14	0.64	4	4-5		
Citizenship					-0.57	0.566					0.03	0.978
Australian	4.27	0.78	4	4-5			4.08	0.73	4	4-5		
Other	4.35	0.70	4	4-5			4.10	0.56	4	4-4		
Language spoken at home					-0.73	0.464					-1.27	0.203
English	4.25	0.80	4	4-5			4.05	0.73	4	4-5		
Other	4.35	0.68	4	4-5			4.18	0.63	4	4-5		
Family members working in health-related profession (except parents)					1.08	0.282					0.68	0.497
Yes	4.31	0.82	4	4-5			4.10	0.76	4	4-5		
No	4.26	0.74	4	4-5			4.07	0.68	4	4-5		

Characteristics	I expect to continue studying after I obtain my degree						I am interested in considering opportunities for research whilst undertaking university studies					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Father's occupation					-2.78	0.006					-1.44	0.151
Heath-related profession	4.08	0.81	4	4-5			3.99	0.69	4	4-4		
Other profession	4.33	0.76	4	4-5			4.11	0.71	4	4-5		
Mother's occupation					-0.10	0.920					0.24	0.811
Heath-related profession	4.25	0.80	4	4-5			4.09	0.74	4	4-5		
Other profession	4.28	0.77	4	4-5			4.08	0.69	4	4-5		
Father's highest level of complete educational qualification					-0.28	0.780					-0.22	0.823
Bachelor or above	4.27	0.79	4	4-5			4.08	0.73	4	4-5		
Below bachelor	4.31	0.73	4	4-5			4.11	0.60	4	4-4		
Mother's highest level of complete educational qualification					2.85	0.004					0.28	0.779
Bachelor or above	4.34	0.74	4	4-5			4.08	0.73	4	4-5		
Below bachelor	4.09	0.83	4	4-5			4.08	0.65	4	4-4		
Secondary schooling					0.71	0.702					4.13	0.127
Aust government school	4.34	0.69	4	4-5			4.20	0.66	4	4-5		
Aust non-government school	4.24	0.81	4	4-5			4.02	0.74	4	4-5		
Other country	4.29	0.81	4.5	4-5			4.08	0.58	4	4-4		

Characteristics	I am interested in considering a career in research					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Sex					0.03	0.975
Male	3.36	0.84	3	3-4		
Female	3.34	0.92	3	3-4		
Country of birth					-0.90	0.366
Australia	3.32	0.88	3	3-4		
Other countries	3.43	0.87	3	3-4		
Citizenship					-0.62	0.534
Australian	3.34	0.88	3	3-4		
Other	3.42	0.79	3	3-4		
Language spoken at home					-1.88	0.061
English	3.31	0.88	3	3-4		
Other	3.51	0.84	3	3-4		
Family members working in health-related profession (except parents)					-1.24	0.217
Yes	3.28	0.89	3	3-4		
No	3.40	0.86	3	3-4		
Father's occupation					-1.97	0.049
Heath-related profession	3.19	0.91	3	3-4		
Other profession	3.39	0.86	3	3-4		

Characteristics	I am interested in considering a career in research					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Mother's occupation					-1.14	0.256
Heath-related profession	3.27	0.93	3	3-4		
Other profession	3.38	0.85	3	3-4		
Father's highest level of complete educational qualification					0.12	0.903
Bachelor or above	3.35	0.89	3	3-4		
Below bachelor	3.35	0.81	3	3-4		
Mother's highest level of complete educational qualification					-0.21	0.833
Bachelor or above	3.35	0.90	3	3-4		
Below bachelor	3.36	0.80	3	3-4		
Secondary schooling					1.68	0.432
Aust government school	3.44	0.86	3	3-4		
Aust non-government school	3.30	0.88	3	3-4		
Other country	3.36	0.08	3	3-4		

*Note: * Mann Whitney U-test or Kruskal Wallis test as appropriate;*
[a] z score for Mann Whitney U-test;
[b] K-W χ^2 for Kruskal Wallis test, only for the comparison by secondary schooling.

Appendix 10 Bivariate analysis of the associations between fourth year medical students' experiences of learning at university and socio-demographic characteristics

Characteristics	I can combine study with paid work						Having ready access to my lecturers and tutors outside of face-to-face teaching important to my success at university					
	Mean	SD	Median	Inter-quartile range	z [a] / K-W χ^{2} [b]	p*	Mean	SD	Median	Inter-quartile range	z / K-W χ^{2}	p
Sex					0.35	0.724					-1.47	0.141
Male	3.22	1.12	2.5	2-3			3.14	1.02	3	2-4		
Female	3.16	1.34	3	2-4			3.47	1.04	4	3-4		
Country of birth					2.58	0.010					-2.70	0.007
Australia	3.41	1.22	4	2-4			3.13	1.02	3	2-4		
Other countries	2.76	1.24	2	2-4			3.68	0.99	4	3-4		
Citizenship					1.97	0.049					-1.51	0.130
Australian	3.26	1.24	4	2-4			3.27	1.06	3	2.5-4		
Other	2.61	1.24	2.5	2-4			3.72	0.89	4	3-4		
Language spoken at home					0.39	0.700					-0.97	0.334
English	3.17	1.27	3	2-4			3.01	1.02	3	3-4		
Other	3.06	1.26	3	2-4			3.56	1.15	4	3-4		
Family members working in health-related profession (except parents)					-0.25	0.801					-0.97	0.328
Yes	3.12	1.20	3	2-4			3.22	1.07	3	3-4		
No	3.17	1.33	3	2-4			3.47	1.01	4	3-4		

Characteristics	I can combine study with paid work						Having ready access to my lecturers and tutors outside of face-to-face teaching important to my success at university					
	Mean	SD	Median	Inter-quartile range	z [a] / K-W χ^{2} [b]	p*	Mean	SD	Median	Inter-quartile range	z / K-W χ^{2}	p
Father's occupation					1.07	0.281					-0.02	0.985
Heath-related profession	3.34	1.23	4	2-4			3.31	1.15	3.5	3-4		
Other profession	3.06	1.27	3	2-4			3.37	1.00	3	3-4		
Mother's occupation					0.55	0.585					0.05	0.961
Heath-related profession	3.25	1.24	3.5	2-4			3.31	1.18	4	2.5-4		
Other profession	3.10	1.28	3	2-4			3.37	0.98	3	3-4		
Father's highest level of complete educational qualification					0.66	0.508					0.306	0.002
Bachelor or above	3.19	1.26	3	2-4			3.52	1.03	4	3-4		
Below bachelor	3.00	1.29	3	2-4			2.84	0.90	3	2-3		
Mother's highest level of complete educational qualification					-0.14	0.887					0.59	0.559
Bachelor or above	3.13	1.28	3	2-4			3.38	1.12	3.5	3-4		
Below bachelor	3.18	1.24	3	2-4			3.29	0.87	3	3-4		
Secondary schooling					15.74	< 0.001					4.84	0.089
Aust government school	2.71	1.33	2	2-4			3.08	1.10	3	2-4		
Aust non-government school	3.57	1.09	4	3-4			3.32	1.03	3	3-4		
Other country	2.33	1.14	2	2-3			3.83	0.86	4	3-4		

Characteristics	My learning involves independent/private study						Interactive sessions with other students are important to my learning					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Sex					-0.71	0.479					0.823	0.822
Male	4.67	0.53	5	4-5			4.06	0.92	4	4-5		
Female	4.74	0.47	5	5-5			4.09	0.74	4	4-5		
Country of birth					-0.36	0.722					0.34	0.737
Australia	4.70	0.49	5	4-5			4.08	0.84	4	4-5		
Other countries	4.73	0.50	5	5-5			4.07	0.75	4	4-4		
Citizenship					0.65	0.514					-0.11	0.916
Australian	4.73	0.50	5	4.5-5			4.08	0.78	4	4-5		
Other	4.67	0.49	5	4-5			4.06	0.94	4	4-5		
Language spoken at home					0.08	0.936					-0.08	0.932
English	4.71	0.50	5	4-5			4.06	0.86	4	4-5		
Other	4.72	0.46	5	4-5			4.17	0.51	4	4-4		
Family members working in health-related profession (except parents)					-0.02	0.986					0.78	0.435
Yes	4.71	0.50	5	4-5			4.18	0.60	4	4-5		
No	4.72	0.50	5	4-5			3.98	0.95	4	4-5		

Characteristics	My learning involves independent/private study						Interactive sessions with other students are important to my learning					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Father's occupation					-0.17	0.866					0.75	0.455
Heath-related profession	4.72	0.46	5	4-5			4.16	0.77	4	4-5		
Other profession	4.71	0.51	5	4-5			4.04	0.82	4	4-5		
Mother's occupation					0.77	0.441					0.38	0.708
Heath-related profession	4.78	0.42	5	5-5			4.03	1.03	4	4-5		
Other profession	4.69	0.53	5	4-5			4.10	0.68	4	4-5		
Father's highest level of complete educational qualification					-0.38	0.704					1.04	0.330
Bachelor or above	4.70	0.51	5	4-5			4.13	0.77	4	4-5		
Below bachelor	4.76	0.44	5	5-5			3.92	0.91	4	4-4		
Mother's highest level of complete educational qualification					0.38	0.704					-0.59	0.553
Bachelor or above	4.72	0.51	5	4.5-5			4.06	0.79	4	4-5		
Below bachelor	4.71	0.46	5	4-5			4.12	0.84	4	4-5		
Secondary schooling					3.13	0.210					1.69	0.429
Aust government school	4.92	0.28	5	5-5			4.25	0.79	4	4-5		
Aust non-government school	4.65	0.55	5	4-5			4.02	0.77	4	4-4		
Other country	4.67	0.49	5	4-5			4.06	0.94	4	4-5		

Characteristics	It is probably not all that important for me to attend most lectures						I have activities other than university that might affect my ability to study					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Sex					2.73	0.006					0.55	0.576
Male	3.69	1.01	4	3-4.5			3.81	1.06	4	3-4.5		
Female	3.03	1.14	3	2-4			3.68	1.10	4	3-5		
Country of birth					1.17	0.239					2.69	0.007
Australia	3.38	1.04	3	3-4			3.95	1.01	4	4-5		
Other countries	3.10	1.26	3	2-4			3.39	1.11	3	3-4		
Citizenship					-0.25	0.807					0.89	0.371
Australian	3.25	1.12	3	2-4			3.76	1.08	4	3-5		
Other	3.33	1.24	3	2-4			3.56	1.10	3.5	3-4		
Language spoken at home					0.38	0.703					2.42	0.016
English	3.29	1.16	3	2-4			3.83	1.07	4	3-5		
Other	3.17	1.04	3	2-4			3.22	1.00	3	2-4		
Family members working in health-related profession (except parents)					0.94	0.347					1.16	0.246
Yes	3.67	1.09	3	3-4			3.84	1.11	4	3-5		
No	3.17	1.17	3	2-4			3.62	1.06	4	3-4		

Characteristics	It is probably not all that important for me to attend most lectures						I have activities other than university that might affect my ability to study					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Father's occupation					1.53	0.126					1.86	0.064
Heath-related profession	3.50	1.22	4	2.5-4			4.00	1.05	4	3.5-5		
Other profession	3.16	0.09	3	2-4			3.60	1.08	4	3-4		
Mother's occupation					1.64	0.102					0.25	0.800
Heath-related profession	3.53	1.16	4	2.5-4			3.72	1.22	4	3-5		
Other profession	3.14	1.11	3	2-4			3.73	1.02	4	3-4		
Father's highest level of complete educational qualification					-0.74	0.462					-0.31	0.756
Bachelor or above	3.21	1.18	3	2-4			3.70	1.11	4	3-5		
Below bachelor	3.44	0.96	3	3-4			3.80	1.00	4	4-4		
Mother's highest level of complete educational qualification					0.65	0.519					1.23	0.217
Bachelor or above	3.31	1.19	3	2-4			3.81	1.10	4	3-5		
Below bachelor	3.18	1.03	3	2-4			3.56	1.05	4	3-4		
Secondary schooling					0.61	0.738					6.79	0.034
Aust government school	3.42	1.06	4	3-4			3.42	1.32	4	2-4.5		
Aust non-government school	3.23	1.09	3	2-4			3.98	0.89	4	4-5		
Other country	3.17	1.38	3	2-4			3.28	1.13	3	3-4		

Characteristics	I expect to continue studying after I obtain my degree						I am interested in considering opportunities for research whilst undertaking university studies					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Sex					0.07	0.942					0.25	0.805
Male	4.14	1.05	4	4-5			3.31	1.43	4	2-4.5		
Female	4.24	0.72	4	4-5			3.24	1.39	3	2-4		
Country of birth					-1.68	0.092					-1.40	0.163
Australia	4.07	0.96	4	4-5			3.10	1.45	3	2-4		
Other countries	4.41	0.59	4	4-5			3.51	1.31	4	3-5		
Citizenship					-1.20	0.232					-0.63	0.527
Australian	4.15	0.88	4	4-5			3.21	1.45	3	2-4.5		
Other	4.44	0.62	4.5	4-5			3.50	1.15	3.5	3-4		
Language spoken at home					-1.05	0.296					-1.06	0.289
English	4.15	0.90	4	4-5			3.19	1.44	3	2-4		
Other	4.44	0.51	4	4-5			3.61	1.20	4	3-5		
Family members working in health-related profession (except parents)					0.32	0.750					-0.83	0.407
Yes	4.16	1.03	4	4-5			3.14	1.43	3	2-4		
No	4.25	0.65	4	4-5			3.38	1.38	4	2-5		

Characteristics	I expect to continue studying after I obtain my degree						I am interested in considering opportunities for research whilst undertaking university studies					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Father's occupation					-0.02	0.981					0.04	0.971
Heath-related profession	4.13	1.07	4	4-5			3.22	1.66	3.5	1-5		
Other profession	4.24	0.73	4	4-5			3.29	1.28	3	2-4		
Mother's occupation					0.71	0.475					-1.33	0.183
Heath-related profession	4.28	0.85	4	4-5			2.97	1.53	3	1-4		
Other profession	4.17	0.85	4	4-5			3.40	1.32	4	2-5		
Father's highest level of complete educational qualification					-0.15	0.885					0.14	0.889
Bachelor or above	4.18	0.90	4	4-5			3.27	1.42	3	2-5		
Below bachelor	4.28	0.68	4	4-5			3.24	1.36	4	2-4		
Mother's highest level of complete educational qualification					0.62	0.537					1.09	0.276
Bachelor or above	4.22	0.90	4	4-5			3.35	1.48	4	2-5		
Below bachelor	4.18	0.76	4	4-5			3.09	1.22	3	2-4		
Secondary schooling					0.75	0.688					0.98	0.614
Aust government school	4.21	0.98	4	4-5			3.00	1.50	3	2-4		
Aust non-government school	4.15	0.86	4	4-5			3.32	1.41	3.5	2-5		
Other country	4.39	0.61	4	4-5			3.44	1.25	3.5	3-4		

Characteristics	I am interested in considering a career in research					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Sex					0.51	0.608
Male	2.50	1.30	2	1-4		
Female	3.36	1.22	2	1-3		
Country of birth					-3.12	0.002
Australia	2.11	1.21	2	1-3		
Other countries	2.85	1.17	3	2-4		
Citizenship					-3.05	0.002
Australian	2.25	1.23	2	1-3		
Other	3.17	1.04	3	3-4		
Language spoken at home					-2.67	0.008
English	2.26	1.21	2	1-3		
Other	3.11	1.18	3	2-4		
Family members working in health-related profession (except parents)					-0.94	0.347
Yes	2.29	1.19	2	1-3		
No	2.53	1.30	2	1-3		
Father's occupation					0.37	0.710
Heath-related profession	2.50	1.34	2	1-3.5		
Other profession	2.37	1.21	2	1-3		

Characteristics	I am interested in considering a career in research					
	Mean	SD	Median	Interquartile range	z / K-W χ^2	p
Mother's occupation					-0.72	0.475
Heath-related profession	2.31	1.33	2	1-3		
Other profession	2.46	1.21	2	1-3		
Father's highest level of complete educational qualification					1.00	0.319
Bachelor or above	2.47	1.21	2	2-3		
Below bachelor	2.24	1.36	2	1-3		
Mother's highest level of complete educational qualification					0.32	0.753
Bachelor or above	2.46	1.31	2	1-3		
Below bachelor	2.32	1.12	2	1-3		
Secondary schooling					9.71	0.008
Aust government school	2.29	1.40	2	1-3		
Aust non-government school	2.22	1.15	2	1-3		
Other country	3.22	1.06	3	3-4		

*Note: * Mann Whitney U-test or Kruskal Wallis test as appropriate;*
[a] z score for Mann Whitney U-test;
[b] K-W χ^2 for Kruskal Wallis test, only for the comparison by secondary schooling.