Copyright Statement

The digital copy of this thesis is protected by the Copyright Act 1994 (New Zealand).

This thesis may be consulted by you, provided you comply with the provisions of the Act and the following conditions of use:

- Any use you make of these documents or images must be for research or private study purposes only, and you may not make them available to any other person.
- Authors control the copyright of their thesis. You will recognise the author's right to be identified as the author of this thesis, and due acknowledgement will be made to the author where appropriate.
- You will obtain the author's permission before publishing any material from their thesis.

To request permissions please use the Feedback form on our webpage. [http://researchspace.auckland.ac.nz/feedback](http://researchspace.auckland.ac.nz/feedback)

General copyright and disclaimer

In addition to the above conditions, authors give their consent for the digital copy of their work to be used subject to the conditions specified on the [Library Thesis Consent Form](http://researchspace.auckland.ac.nz/consent) and [Deposit Licence](http://researchspace.auckland.ac.nz/deposit).
Motivation Changes in Medical Students During Two Years of the Preclinical Curriculum

Clinton Jay Mitchell

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in Medical Education, The University of Auckland, 2015
Abstract

This research comprised three studies conducted over 24 months that investigated motivation and anxiety in preclinical medical students at the University of Auckland. The first study investigated change in motivation orientation and in anxiety levels; the second investigated the effect of differing motivation orientations and of anxiety levels on academic outcome; and the third, a qualitative study, explored the varied influences on students’ motivation.

The studies showed that medical students were generally both intrinsically motivated and had moderate levels of anxiety. Over the course of the study, the levels of intrinsic motivation fell. However, multiple motivation orientations according to a self-determination theory framework were found to exist in students. Comparable changes in motivational constructs towards a more autonomous orientation were associated with a commensurate improvement in academic outcome. Anxiety levels were static, but the influence of anxiety became less pronounced and its detrimental effect on academic outcome waned.

Important differences existed within the research cohort, both with respect to motivation and anxiety. The most striking and pertinent differences were seen with attenuated admission schemes and ethnicity, where attenuated students developed an identity associated with their mode of entry into medical school that had important effects on motivation; analogous effects of ethnicity were also seen with respect to academic outcome. Indigenous students were also shown to be consistently less intrinsically motivated than their colleagues.

Novel thematic maps of influences upon medical students were constructed based upon responses to qualitative avenues of enquiry.

*Keywords: motivation, anxiety, medical education, ethnicity, academic outcome.*
Acknowledgments

"Halfway on my journey through life, I found myself in a dark wood."
– Dante, *The Divine Comedy*

This doctoral thesis could not have been completed without the help of a great many people. First and foremost: my participants. They have given freely of their time with no thought of their own gain. My interview participants are individually inspiring people, each of whom I know will contribute in their own unique ways to the medical profession. I shall follow their progress with much enthusiasm.

I have nothing but kind words for the neurologists at Wellington Hospital, specifically Doctors David Abernethy, Stuart Mossman, and Ian Rosemergy, who encouraged me in this endeavour and saw this research as an extension of my medical training, not a distraction.

Professor Phillippa Poole has always been an inspiration to me from the moment I heard a lecture from her as a medical student; I continue to be awed by her achievements. I feel privileged to have her as a mentor, colleague and friend.

My parents, Anne and Graeme, have been a constant source of support throughout this process. Whether it was encouraging me to keep writing, help with cutting up tiny strips of paper for coding, or sharing in the joy of a well-received draft of a chapter, they have always been there, unwavering in their belief that I could do this.

And finally to my magnificent supervisors, Professor Christine Rubie-Davies and Dr Marcus Henning, who both put up with me moving city and country whilst completing this research, my early drafts, and some harrowing Skype sessions. They have been there through the thick and thin, and have been constantly supportive. I could not have hoped for a better team to have my back. A line from *Madame Bovary* states: “One should be wary of touching one’s idols, for the gilt comes off on the fingers.” Christine and Marcus are not gilded, they are solid gold.

Mā te rongo, ka mōhio; mā te mōhio, ka mārama; mā te mārama, ka mātau; mā te mātau, ka ora.

Clinton Mitchell
March, 2015.
Table of Contents

Abstract ii
Acknowledgments iii
List of Tables vii
List of Figures x
List of Appendices xi

Chapter 1: INTRODUCTION
  The University of Auckland Medical School Learning Environment 1
  Purpose of the Research 3
  Significance of the Research 4
  Design of the Research 5

Chapter 2: LITERATURE REVIEW
  Overview of Motivational Theories and Research 7
    Early Measures of Motivation 7
    Motivation Constructs 9
    Motivation Towards Future Events 12
    Locus of Control 14
    The Role of the Learning Environment 15
    Self-Efficacy and Self-Concept 17
    Goal Theory 18
    Self-Determination Theory 25
  Motivation Theory as Applied to Medical Education 32
    Selection of Medical Students 34
    Curriculum Delivery Methods 38
    The Learning Environment 45
    Lifelong Learning 51
  Qualitative Research in Motivation Including Medical Education 53
  Anxiety and Motivation Theory 56
    Levels of Stress and Anxiety in Medical Students 59
    Changes in Stress Across the Medical School Journey 60
  Opportunities for Further Research 61

Chapter 3: STUDY 1
  Method 64
    Participants 64
    Settings 65
Chapter 4: STUDY 2

Method
- Participants
- Settings
- Ethical Approval
- Materials
- Procedure
- Statistical Analysis

Results
- Results for the Entire Study Participants
- Academic Outcome Differences Between Different Demographic Groups
- The Relationships Between Motivation, Anxiety, and Academic Outcome: MBChB2
- The Relationships Between Motivation, Anxiety, and Academic Outcome: MBChB3

Discussion

Chapter 5: STUDY 3

Method
- Participants
- Ethical approval
- Settings for interview
- Interview schedule
- Procedure
- Data collection and analysis
- Limitations

Results and Discussion
- Learning of Medicine
- Psychosocial Aspects of Medicine
- Non-Medical Student

Conclusion
Table 1. Demographic Data for the Study Cohort

Table 2. Five-Factor Pattern Matrix of the Academic Motivation Scale for the Current Study

Table 3. Rotated Three-Factor Component Matrix of the Academic Motivation Scale for the Current Study

Table 4. Goodness-of-Fit Indicators of Seven-, Five- and Three-Factor Models of the AMS for the Current Study (n = 147)

Table 5. Correlation Matrix for the CFA of the Seven-Factor AMS model (n = 147)

Table 6. Correlation Matrix for the CFA of the Five-Factor AMS model (n = 147)

Table 7. Correlation Matrix for the CFA of the Three-Factor AMS model (n = 147)

Table 8. Covariance Matrix for the CFA of the Seven-Factor AMS model (n = 147)

Table 9. Reasons for Choosing the WTAS in the Current Study

Table 10. Reliability Coefficients of the AMS and WTAS Questionnaires for the Current Study

Table 11. Response Rate to the AMS and WTAS Questionnaires

Table 12. Extrinsic Motivation Scores across the Five Sampling Times

Table 13. Intrinsic Motivation Scores across the Five Sampling Times

Table 14. Relative External, Introjected, and Identified Scores within Extrinsic Motivation

Table 15. Independent Samples t-Tests between Students Aged ≤ 21 Years and > 21 Years

Table 16. Two-Way Mixed ANOVA Results between Students Aged > 21 Years

Table 17. Post Hoc Contrasts of Motivation with Ethnicity as a Factor

Table 18. Paired t-Test Results for Changes in Autonomous Motivation Orientation

Table 19. Anxiety Scores across Different Sampling Times

Table 20. Post Hoc Comparisons of Anxiety and Ethnicity

Table 21. Response Rate across the Five Sampling Times for Free Text Boxes

Table 22. Semester GPA and Semester Anxiety Score Differences Between Responders and Non-Responders to the Free Text Boxes on the AMS and WTAS

Table 23. Grade Point Averages for MBChB2 and MBChB3

Table 24. Independent Samples t-Tests of MCQ and SAQ Scores in End of Semester Examinations
Table 25. Independent Samples t-Tests of Coursework and Examination Scores 112
Table 26. Repeated Measures ANOVA of Courses’ Grade, Semester GPA, and Year GPA with Ethnicity as the Independent Variable 115
Table 27. Linear Regression Coefficients for MBChB2 and MBChB3 GPA by Ethnicity 116
Table 28. Linear Regression Modelling with Ethnicity as the Independent Variable for Coursework, MCQ, and SAQ Scores 117
Table 29. ANOVA Results with Attenuated Admission as the Independent Variable 118
Table 30. Linear Regression Coefficients for MBChB2 and MBChB3 GPA by Attenuated Admission Schemes 119
Table 31. Pearson Correlation Coefficients between Elements of the AMS and WTAS Questionnaires and Course Grade and Semester GPA for MBChB2 Semester One Sampling Times 121
Table 32. Pearson Correlation Coefficients for Average Intrinsic Motivation Scores at Sampling Time Two 122
Table 33. Pearson Correlations between Changes in Motivation Scores and Coursework and Examination Scores 123
Table 34. Simple Linear Regression Modelling of MBChB2 Semester One GPA with Individual Average Motivation Scores as Independent Variables 124
Table 35. Simple Linear Regression Modelling of MBChB2 Semester One GPA with Individual Change in Motivation Scores as Independent Variables 125
Table 36. Simple Linear Regression Modelling of MBChB2 Semester Two GPA with Individual Anxiety Scores as Independent Variables 126
Table 37. Simple Linear Regression Modelling of Coursework Scores with Individual Anxiety Scores as Independent Variables 127
Table 38. Simple Linear Regression Modelling of MCQ Scores with Individual Motivation Orientation Scores as Independent Variables 128
Table 39. Simple Linear Regression Modelling of SAQ Scores with Individual Motivation Orientation Scores as Independent Variables 128
Table 40. Simple Linear Regression Modelling of MCQ Scores with Individual Anxiety Scores as Independent Variables 128
Table 42. Simple Linear Regression Modelling of SAQ Scores with Individual Anxiety Scores as Independent Variables 129

Table 43. Pearson Correlation for MBChB3 Semester Two 131

Table 44. Simple Linear Regression Modelling of MBChB3 Semester One and Two GPA with Respective Contemporaneous Motivation Scores as the Independent Variable 132

Table 45. Simple Linear Regression Modelling of MBChB3 Semester One and Two GPA with Respective Contemporaneous Anxiety Scores as the Independent Variable 132

Table 46. Demographic Data of the Interview Participants 143

Table 47. Medical Student Interview Schedule 146
List of Figures

Figure 1. Continuum classification of motivations based upon to their degree of self-determination 27

Figure 2. Mean anxiety scores at all sampling times 91

Figure 3. Mean anxiety scores at all sampling times in dichotomised aged groups 92

Figure 4. Map of "Inside Medical School" theme and subthemes 96

Figure 5. Map of "Outside Medical School" theme and subthemes 98

Figure 6. Mean grade point averages of New Zealand, Asian, Māori, and Pacific students across the two years of the study 137

Figure 7. U-shaped curve of the relationship between motivation orientations on the self-determination theory framework with SAQ scores 139

Figure 8. Map of "Learning of medicine" theme and subthemes 149

Figure 9. Photograph of Angela’s study wall 154

Figure 10. Map of "Psychosocial aspects of medicine" theme and subthemes 157

Figure 11. Theoretical continuum classification of self-determination theory. 174

Figure 12. Theoretical model of the anxiety "hangover effect". 180
List of Appendices

Appendix A. Academic Motivation Scale (College Version) and Westside Test Anxiety Scale 210
Appendix B. Participation Information Sheets and Consent Forms for all Studies 213
Appendix B-1 214
Appendix B-2 216
Appendix B-3 218
Appendix B-4 219
Appendix C. Confidentiality Agreement 220
“It’s not just the learning that’s important. It’s learning what to do with what you learn and learning why you learn things that matters.”

– Norman Juster, *The Phantom Tollbooth*

The proposed existence of internal and external influences on learning remains a basic tenet of educational psychology (Atkinson, 1974). Over time this theory has been modified and ultimately assumed the form of a spectrum of influence from the *most* external to the *most* internal (Deci & Ryan, 1985), based upon the cognitive ownership of the motivating behaviour. When a behaviour was self-determined, the locus of causality was *internal* to oneself. When a behaviour was controlled (i.e., non-self-determined) the locus was *external* to the self (Deci, Vallerand, Pelletier, & Ryan, 1991). Terrel H. Bell, a former United States Secretary of Education, once stated: “There are three things to remember about education. The first one is motivation. The second one is motivation. The third one is motivation” (Ames, 1990, p. 409).

The overall aim of this research was to examine the change in motivation in medical students over time. This was a complicated issue and required a number of parallel and serial investigations that explored not only the type of motivational construct held by students but also the process of development and refinement of motivation over time, the effect of motivation on academic outcome, and the effect of anxiety on motivation, along with a consideration of the experiences of students while studying medicine.

The remainder of this chapter describes the learning environment in which medical students at the University of Auckland study, and puts forward a number of research questions and hypotheses. The chapter also discusses the significance of this study within a New Zealand setting, and presents an overview of the study design.

**The University of Auckland Medical School Learning Environment**

The principle mode of entry for undergraduate students into the University of Auckland medical programme (Bachelor of Medicine/Bachelor of Surgery; MBChB) is in their second year after a one-year curriculum common to a number of health-related programmes that is referred to as “overlapping year one” (OLY1). Following completion of OLY1 and the minimum requirements in four common core courses, students who have achieved a minimum academic standard (a grade point average (GPA) of greater than six out of nine) are invited to an interview conducted at the Faculty of Medical and Health Sciences. The number of interviews offered is
approximately two to three times the number of positions available and students are informed that these are high-stakes interviews. Based upon combined scores of their GPA, an aptitude test (the Undergraduate Medical Admission Test; UMAT), and their interview scores—in a ratio of 60:15:25 percent respectively, students are ranked in a meritocratic fashion to decide on those who will be offered a place in the programme.

A second mode of entry is reserved for graduate students who have completed a relevant undergraduate, or graduate degree. They are similarly offered an interview upon achievement of the same minimum GPA as OLY1 applicants across the final two years of their relevant degree. They are ranked in a similar manner to their OLY1 colleagues with a combined score of GPA, UMAT, and interview score. The proportion of applicants to offers is similar to the undergraduate mode of entry (Faculty Admissions Office, 2014). Graduate students make up approximately one quarter of the class (P. J. Poole, personal communication, 23 November, 2010).

A third mode of entry is through affirmative admission streams (hence referred to as attenuated admission schemes). These exist to increase the diversity of the student population in the medical programme so it more accurately reflects the society the programme serves; specific places are set aside within the programme for these students (Faculty of Medical and Health Sciences, 2014). There are two such admission streams. The first of these is the Rural Origin Medical Preferential Entry (ROMPE) scheme, which is provided for students who spent the majority of their secondary education (or their entire pre-secondary education) in a rural area (towns with a population of 30,000 or less\textsuperscript{1}). These students can come through either an OLY1 or graduate entry pathway and complete identical requirements to their general entry colleagues, albeit within a stream which sets aside a number of places for these students. The second attenuated admission pathway is available to students of Māori (the indigenous people of New Zealand) or Pacific Island origin (the Māori and Pacific Admission Scheme; MAPAS), who would otherwise not have achieved the necessary grades to be offered an interview in the conventional sense (although they have completed the OLY1 programme or an undergraduate degree). These students are screened through a rigorous process of multiple mini-interviews to determine whether they would manage the demands of the medical programme, and then they participate in an interview process that includes extended whānau (family). This process offers some flexibility in the setting of the minimum GPA for entry to allow for major educational disadvantage. However, in practice, Māori and Pacific students with a GPA of less than four out of nine are seldom offered a place in the programme.

\textsuperscript{1} In 2012, this was changed to students from outside of a major metropolitan centre, and was renamed as the Regional Rural Admission Scheme (RRAS).
Following these competitive selection processes, students are offered a place in the medical programme. Once admitted they are relatively assured of their continued advancement within the programme provided they maintain minimum standards of academic achievement and professional behaviour. Attrition rates are relatively low and account for less than 5% of the student cohort (P. J. Poole, personal communication, 23 November, 2010). The faculty has extensive support and pastoral networks in place for students who are identified, or self-identified, as at risk of failing or doing poorly\(^2\). The medical programme consists of five further years of study. The immediate two years after OLY1 (MBChB2 and MBChB3), referred to as the “preclinical years”, are divided into two semesters per year. The first semester runs from March to June, and the second from July to October. The final three years (MBChB4 through MBChB6) are referred to as the “clinical years” with each consisting of a year-long course that varies according to the year of study. The clinical years are not examined further in the current study. Once the programme is completed to a satisfactory standard, domestic students usually secure a job within a New Zealand hospital, although there might be competition amongst themselves and graduates of the University of Otago for specific sites (Adams, O’Grady, & Pole, 2010).

### Purpose of the Research

This research asked five questions around motivation and anxiety in medical students, and proposed four hypotheses to these same questions. The fifth question, as addressed below, had no specific matched hypothesis.

The first hypothesis was that medical students, whilst acknowledging that they were a highly motivated group of individuals (Kusurkar, Ten Cate, Van Asperen, & Croiset, 2011), would display differing amounts of extrinsic and intrinsic motivation. Students were seen as products of their own personal learning environments: their constructs would change based upon their unique personal experiences of learning and assessment (by extension, their mode of entry into medical school), their demographics (including age, sex, and ethnicity), and their thoughts and feelings. This research was designed to assess student motivation at multiple, discrete points in time, which would reflect individual differences, but also the influence of the learning environment at that time.

The second hypothesis was that student motivation would change over time and become more fully internalised, as originally suggested by Schafer (1968) and later modified by Deci et al. (1991). In the current study, by taking serial measurements to answer the first hypothesis (see above), tracked changes in individuals and groups of individuals could be measured (and, as part

---

\(^2\) The author participated in support network sessions for clinical students in 2010.
of the research, it was further noted if different patterns and rates of change occurred between different groups of students).

An earlier study had shown that as well as being highly motivated individuals, medical students are also more stressed than their non-medical colleagues (Guthrie et al., 1998). The third hypothesis of this research was that anxiety, in a similar fashion to motivation, would differ among the various demographic groups (e.g., mode of entry, age, sex, and ethnicity). It was proposed that at times of higher anxiety, these states would bring about motivational change.

The fourth hypothesis to be addressed by this research was related to the effects that motivation, motivation change, and anxiety had on academic outcome. The expectation was that more fully internalised states of motivation, or movement towards a such a state, was more likely to be associated with a positive academic outcome in terms of grades and satisfaction (e.g., Harackiewicz, Pintrich, Barron, Elliot, & Thrash, 2002), and that higher levels of anxiety would be associated with poorer outcomes in these domains (e.g., Benjamin, McKeachie, Lin, & Holinger, 1981).

The final question addressed by this research had no specific hypothesis, which was a deliberate consequence of the methodology employed (Braun & Clarke, 2006). Using a thematic analysis lens, the various influences on medical students’ motivation were explored using qualitative methods (free text boxes, individual interviews, and focus groups).

**Significance of the Research**

The questions addressed in this research are not only novel but pertinent. Some of the most important decisions in the shaping of the future medical workforce relate to the teaching of medical students. As the vast majority of medical students will graduate with a medical degree, there is a social obligation on universities to facilitate the development of a medical graduate who is able to cope with the demands of an evolving society: with the abilities of lifelong learning, critical appraisal, and enthusiasm (Van Dellen, 2013). In the last decade, a Curriculum Commission for the University of Auckland discussed the concept of lifelong learning and stated:

> The University and its staff need to be conscious of the way the curriculum can be used to develop such skills and need to demonstrate to students that a discipline is more than the sum of its knowledge. It is a way of approaching life. (Curriculum Commission, 2002, p. 16)

At present, 64% of general practitioners and 61% of specialists registered with the Medical Council of New Zealand are locally trained; there have been recent efforts to train more doctors locally through a steady increase in the number of places in the medical programmes nationally (Health Workforce New Zealand, 2012). By studying motivation, one can assess
critical areas within the programme where changes are needed to maintain the quality of the graduate end-product: “By failing to acknowledge the complex and multilayered motivations that drive medical students, we relinquish invaluable opportunities to craft medical training so as to produce the types of physicians we say we value” (Misch, 2002, p. 159).

Design of the Research

Approval to undertake this research was obtained from the University of Auckland Human Participants Ethics Committee (reference 2011/041). Pursuant to the guidelines from the committee, strict procedures were followed to ensure minimal to no harm befell participants, and that all materials pertinent to the research were treated in a confidential manner. Copies of all participant information sheets, consent forms, and confidentiality agreements are available in the appendices.

The research for this research is presented over three studies. The first three hypotheses are addressed in Study 1, the fourth hypothesis by Study 2, and the final question by Study 3. Study 1 examined the differences in measures of motivation and anxiety between demographic groups, and the changes in motivation and anxiety measures over time between these same groups. This was achieved through serial sampling of a class of preclinical medical students over the course of a two-year period using dual questionnaires. Matched results were achieved by using unique student identification numbers on each student’s serial responses.

These responses formed the basis for Study 2, which measured the interactions and predictive value of these data on academic outcome. Academic outcome included individualised results for coursework, tests and examinations, course grades, and average semester and year GPA.

Study 3 investigated the qualitative responses of a cohort of 13 medical students from the sample of the earlier studies. These participants were interviewed and participated in focus groups on numerous occasions during the course of the study. The author sought to explore an holistic view of their preclinical learning experience: their changing attitudes towards their studies; the influences upon their studies; and their hopes, fears, and anxieties for the future.

The following chapter is a review of the literature in motivational psychology and medical education. The review charts the development of motivation theory from the individualistic psychology of Atkinson (1964) and McClelland (1958b), through to the emergence of goal theory (Dweck, 1986) and its subsequent expansion into a 2 × 2 model, and finally to a cognitive theory of motivation in self-determination theory (Deci & Ryan, 1985). This is followed by a review of medical education literature, with a particular focus on the unique aspects of medical education over general education theories and outcomes. Additional sections of the
literature review include a scrutiny of qualitative research in motivation, and an exploration of anxiety and motivation, and specifically anxiety in medical education.

The subsequent three chapters set forth the three studies which investigate the hypotheses described, and the final chapter presents a discussion of the educational significance and implications of the research as a whole.
Chapter 2

Literature Review

“I cannot fix on the hour, or the look, or the words, which laid the foundation. It is too long ago. I was in the middle before I knew that I had begun.”

– Jane Austen, Pride and Prejudice

This chapter begins with an overview of the development of motivation theory from achievement motivation to self-determination theory. This includes a discussion of the role of the learning environment in motivation development. The next section discusses motivation theory as applied to medical education. This is followed by a review of qualitative studies of motivation, including those in medical education. Next, there is a review of anxiety literature pertaining to motivation theory, and its role in medical education. The chapter concludes with a discussion of gaps in the research and the opportunities this presents for future research.

Overview of Motivational Theories and Research

The following review provides a narrative on the evolution of the theory of motivation from its earliest manifestations to the current theories in accepted use and application. As the current research investigated a population aged at least 18 years and older, it was thought most appropriate to use self-determination theory in the investigation of motivation in medical students.

Early Measures of Motivation

Achievement motivation, or the motivation to achieve, describes an autotelic experience: a learning for learning’s sake. It remains an evolving concept, crafted by the input of researchers over the past 60 years. The beginnings can be traced back to the early work of McClelland in Methods of Measuring Human Motivation, who described the theoretical construct of the achievement motive as “the mainspring of entrepreneurial activity fostering the economic development of society” (McClelland, 1958b) and noted interactions between the need for achievement (nAchievement) and economic indices measuring the ebbs and flows of societal strengths.

The nAchievement was measured using Thematic Apperception Tests (TAT) and as designed were early attempts in the qualification and assessment of needs and motives, which represented personality as an interaction of forces (Morgan & Murray, 1935). The basis of the tests was for an individual to interpret a still picture of a complex social situation which was
generally negative in nature (e.g., a woman holding her head in her hands outside the room of a man unconscious on a bed). The interpretation relied on the biases and experiences of the interpreter as much as the situation itself. It provided a window into presumed unconscious thoughts. However, the examiners had their own biases about the pictures, which if Morgan and Murray were to be believed, were also unconscious. More recently, the TAT had been criticised as being non-valid and unreliable with reliability coefficients which rarely exceeded 0.30 (Lilienfeld, Wood, & Garb, 2000). However, the implication from McClelland that individual psychology could have such a profound societal effect allowed a redefinition of the approach to human motivation. Furthermore, the systems elaborated upon in The Achieving Society (McClelland, 1961) caused other researchers to sharpen the theory of motivation into a more refined tool.

The achievement scores were initially felt to be an unconscious representation of motivation, but Holmes (1971) later noted that when undergraduate students were given specific reference points (i.e., the ranking of their peers), they were able to give accurate reflections of their achievement scores through self-ranking. This suggested that motivation and outcome were not entirely subconscious, and could be directly measured, although this required a degree of comparison to do so. However, the participants in Holmes’ study were small numbers of fraternity or sorority pledges and thus reflected a unique subset of freshman undergraduate students. Indeed, in part because of the effort required in pledging societies, it could also be argued that these participants were more motivated than a typical university cohort.

Contemporaneously, Atkinson (1957) noted two difficulties of motivation theory that researchers needed to reconcile: the first was to explain why individuals would choose a particular path; and the second was to account for the fervour with which the individual would continue on this path once selected, and the length of time continued until task fatigue set in. Atkinson noted that one could not equate differences in strength of motivation to performance output, especially when the output was the dependent variable. Put another way, one could not assume that the student who received a distinction grade was more motivated than the student who received a passing grade. What may be considered straightforward in the present day was not always clear half a century ago. The inability to equate intelligence and output reflected a particular theory that intelligence quotient (IQ) provided a threshold, below which effective scientific thinking was not possible (McClelland, 1958a). This was felt to explain why Gibson and Light (1967) were unable to distinguish between 180 University of Cambridge scientists from different disciplines (across 33 departments) on the basis of IQ alone, or indeed identify a discriminatory level between scientists and non-scientists.
With an increasing suggestion that one could measure and quantify motivation, thoughts invariably turned to methods of increasing this quantity. McClelland collaborated with a group of psychologists to design a programme with the aim of increasing achievement motivation in business people. This involved educational sessions discussing the achievement motive; the definition of the achievement motive, and how research had shown it to be important in entrepreneurship; and how one thought, acted, and perceived the world through a high achievement motive lens (McClelland, 1965). McClelland suggested that the “person with a high need for achievement is more self-confident, enjoys taking carefully calculated risks, researches his environment actively, and is very much interested in concrete measures of how well he is doing” (p. 7). These programmes were subsequently adapted for use in education settings. In one study of 54 twelfth-grade students who attended a vocational training centre as part of their school curriculum, achievement motive programmes led to statistically significant changes in feelings of internal control in the experimental group, and a consequent statistically significant reduction in external control feelings in the same group, as measured using Rotter’s Internal-External Control Scales (Rotter, 1966; Smith & Troth, 1975). Despite these changes, no statistically significant effect was identified on measures of test anxiety or grade point average. The fact that changes in internal and external control were possible, but their meanings unclear, led the authors to claim that “for total effects to be observed, studies should be more comprehensive; this is, the criteria must be expanded beyond grades, instructor ratings, and pencil-and-paper instruments. One’s life has to become the laboratory” (p. 503).

What these early researchers stimulated was a discussion around what motivation in education meant. However, the major stumbling block with this early work was the simplistic view of motivation as a unitary construct. By evolving beyond this view, a more nuanced appreciation began to emerge.

**Motivation Constructs**

The $n$Achievement scores were conceived as surrogates for individual differences in the strength of the achievement motive (a desire for achievement or success), which was presumed to be latent until aroused by situational cues. Once aroused, the motivation to achieve was contrived to be a function of the strength of the achievement motive, and the expectancy of success. Using the TAT, Atkinson and Reitman (1956) noted in a group of male psychology undergraduate students that performance output and motive were positively related if the expectancy of satisfying that motive through the performance was sufficiently aroused, and that the expectancy of satisfying other motives through the same activity had not been sufficiently aroused to the level of recognition (i.e., the motive was exclusive, or at least not contradictory). When motives demonstrated the same salience, an additive equation of motivation was proposed.
to exist. In a theoretical setting, Tolman (1955) proposed a third variable, incentive, which described the value or attractiveness of success. Together motive, expectancy, and incentive were combined to describe an algebraic, multiplicative theory of motivation.

Atkinson (1957) noted that incentives can also be negative: the relative unattractiveness of an outcome (e.g., failure). What this concept allowed was that the total motivation as an algebraic sum could be negative: a motivation away from a task. An approach motivation aimed to maximise satisfaction whereas an avoidant motivation aimed to minimise pain in connection with negative consequences. An avoidant tendency always opposed, resisted, or dampened the influence of motivation to achieve success (it was always inhibitory in nature): “The hope of success and fear of failure are two phenotypically dissimilar alternatives that are genotypically similar” (Clark, Teevan, & Ricciuti, 1956, p. 182). The concept of a motivation to approach and a motivation to avoid further allowed that when these two conditions were similarly triggered, the net motivation was the sum of the two values (Atkinson, 1957).

Further equations were derived for the incentive value of success and the incentive value of failure. These were defined as a function of the subjective probability of success (i.e., the self-reported likelihood of achieving this goal):

\[
\text{Incentive value of success} = (1 - \text{probability of success})
\]

\[
\text{Incentive value of failure} = - (\text{probability of success})
\]

These equations sought to explain the observation that the degree of humiliation accompanying failure was greatest when the expectation or probability of success was high. The corollary of these equations was that the motivation to achieve was strongest when the uncertainty regarding the outcome was highest. When an individual was presented with either an easier or a more difficult task, the strength of motivation manifested was lower because the certainty of success or failure respectively was assured. It was the experience of uncertainty that provided the most effective motivation to achieve. A bell-shaped curve of motivation versus probability of success was proposed to exist. This “goldilocks principle” where a learning task should be neither too easy nor too hard had been noted to enhance and promote learning (Winne & Nesbit, 2010).

An individual who wished to achieve success would be more likely to choose a task which had an intermediate probability of success; there was little to gain for this individual by choosing extremely hard or extremely easy tasks as the outcome was almost guaranteed. An individual whose disposition was to avoid failure would avoid all tasks from which there could be a negative outcome. However, in a situation where social pressures demanded a task be undertaken, the individual would avoid those of intermediate difficulty (where the anxiety...
associated with failure would be greatest), and instead choose tasks that were so easy that failure was virtually impossible, or a task so difficult that failure would not be attributed to the individual themselves and the sense of embarrassment lessened (Atkinson, 1957). What this demonstrated was the concept of task fatigue in achievement individuals: as a task became easier and easier (the probability of success approached 1.0) the incentive value would fall. The achievement motive could remain insatiable, but motive for the particular task would be rapidly sated.

However several problems existed with these theories. They relied on the assumption that achieving a grade in the face of overwhelming odds would promote an outpouring of emotion, whereas success in an easy task would barely rate a mention in the individual’s psyche. These assumptions may have had a sense of correctness, but were still speculative. Clark et al. (1956) asked undergraduate students prior to a final examination about their range of expectations for their final grade, the grade they were trying for, and the grade they would accept if excused from the examination. Students were separated into “hopeful of success”, where the acceptable grade was near the maximum of what they expected to achieve; “fearful of failure”, where the acceptable grade was at the lower end of their expectations; and “intermediate”, where it fell between the two. The level of aspiration between the hopeful and fearful students trended towards but did not achieve a statistically significantly difference suggesting that Atkinson’s assumption of affective differences in outcome was not as straightforward as assumed.

Additionally, a further difficulty lay in the interpretation of a subjective probability of success. Another study of female teaching college students found that while aspirational and actual grades had normal distributions, the means of these grades were statistically significantly different (Mitchell, 1959). Using Bills’ Index of Adjustment and Values3 (Bills, 1951), students were divided into self-acceptant and self-rejectant groups. Self-acceptant under-achievers (students who rated themselves as higher than others on such traits as happiness, self-confidence, worrying less, being calm and not easily upset—but lower on ambition) always had the greatest discrepancy between previous outcome and aspirational level of success in upcoming tasks. It is not surprising that previous tasks and outcomes provided the lens through which students filtered future tasks; but Atkinson’s earlier proposed model suggested that all learners have the same lens with regards to probability of success. Mitchell’s work showed that this was not so straightforward, although some reservation is required. Granted that Mitchell’s participants were from differing year levels and extraneous variables were controlled for as far as possible; however, the participants were all female and from a university with limited ethnic

---

3 This scale purported to separate students into distinct groups that exhibited different kinds of goal-setting behaviour.
diversity, thereby restricting the variability of the sample. Furthermore, Matell and Smith (1970) reflected in a small sample of undergraduate psychology students, that in an achievement-oriented society, behaviours instrumental to academic achievement were reinforced by parents, teachers, and peers. Students with approval-oriented motivations would be more cautious in estimates of their performance (i.e., to not be in a situation where they had over-promised but under-delivered on results) and would therefore select more narrowed estimates of their expected performance, in a similar, but opposite vein to Mitchell’s self-acceptant under-achievers. In experimental studies of such orientations in male psychology undergraduates, no statistically significant difference was found between the groups of high approval-motivated and low approval-motivated students in actual outcome; although statistically significant differences were seen in their expected outcomes (Petzel, 1972).

With respect to inaccurate estimates of their academic performance, more recently, poorer performing undergraduate students were found to consistently provide more inaccurate estimates than more able students (Burger, 1992; Moreland, Miller, & Laucka, 1981). In additional consecutive studies of freshmen and sophomore psychology students, Simon and Feather (1973) showed that when undergraduate students received an unexpected grade they tended to ascribe this performance to external factors. Thus where students made consistently inaccurate estimates of their performance, they would attribute these outcomes to measures outside of their control. This became a cycle whereby the student was unable to return the concept and reason for failure to an internalised state.

Motivation Towards Future Events

The early motivation theories discussed to date were dominated by an individualistic psychology. These theories were limited in their focus on the here-and-now results of the activity to which the motivation was being ascribed. Raynor (1969) further expanded upon these theories by applying distant successes within theoretical models. Some years later other authors (Eccles et al., 1983) concurred and differentiated between motivational beliefs for the present and the future. Ability beliefs focused on present ability, whereas expectancies for success addressed future events. Achievement-related motives were accentuated among female mathematics undergraduate students when individuals determined that the present activity was conducive to the achievement of immediate and future success. It was noted, however, that female students’ grades did not relate as highly to their attitudes and past performance as they did for male students.

Raynor used the term “tendency” to explain the motivation aroused by a sequence of expected successes and failures. The tendencies were multiplicative functions of motive, subjective probability (i.e., expectancy), and incentive, akin to Atkinson’s earlier motivation
function. Hence the value of incentive was much more “winner takes all” than previous authors had mooted. The subjective probability of future success was contingent on a positive performance at each step and was therefore a function of the probabilities of success at each preceding step in the path. Failure at any one step (i.e., a negative value) guaranteed future failure (the overall probability retains a negative value). This was not an altogether different viewpoint to successive failure from Atkinson’s model where failure at a task with a high subjective probability of success (e.g., 0.9) would lead the individual to choose an easier task (0.8) and so on, until the frustrated individual would reconcile that the most difficult task (0.1) was the least unattractive (i.e., failure in this task would not be attributed to a fault on their part) and would therefore self-handicap (Atkinson, 1957). Raynor also hypothesised that “the theory of achievement motivation applies only when an individual has sufficient ability to have ...
cognitive expectations concerning the long-term implications of immediate activities” (p. 609), and that in these situations of high-stakes tasks the consequent motivation to do well would be larger. What this line of reasoning failed to appreciate was that any task can have future ramifications depending on how far one takes a natural progression (e.g., a Year 9 mathematics test could conceivably be linked in a stepwise fashion to a doctoral defence). Admittedly, few learners would take this approach, and Raynor presented evidence that learners below a median-level intelligence noted statistically significantly fewer concerns over future goals. In a later course using undergraduate psychology students, this argument was tempered by clarifying that students with uncertain academic and career plans might not recognise the importance of immediate learning tasks, and this would reduce the influence of future implications on contemporary tasks (Raynor, 1970). This somewhat aligned with the idea that students with greater vocational interests and ambition were less sated with learning and therefore persisted at it (Slater, 1957).

Expanding upon a multiplicative model, social theorists described expectancy shifts (increments after success and decrements after failure) when individuals performed in tasks based on skill rather than chance (Eccles et al., 1983). Tasks which an individual deemed as skill-determined were subject to internal control (i.e., the individual could influence the outcome), compared with those that were chance-determined and therefore not amenable to internal control; that is, there were external forces at work (Burger, 1992). In identical situations, individuals with a skill-determined outlook would exhibit more expectancy shifts than their chance-determined colleagues (Rotter, 1966).

Continued learning beyond a single task had also been recognised to involve individual motivation. A tendency for interest to accumulate as a result of learning by discovery (versus being spoon-fed) was noted (Kersh, 1962). In an experiment with high school students, Kersh grouped learners into experimental conditions of directed learning, guided discovery, and rote learning. In addition to the finding about interest, it was also noted that “lecture-drill”...
techniques were helpful under certain conditions of learning and produced better results than those that attempted to develop students’ understanding. However in counterpoint to this, and in some ways reminiscent of current theories around habit formation (Graybiel & Smith, 2014), efforts to gain understanding after a rule or principle had been memorised might be inhibitory (the neural pathways had already been laid). Therefore, although these rote learning techniques might have short-term gains, their long-term effects stifled a more complete understanding.

Returning to the concept of something beyond IQ that explained the difference in motivation between individuals, Cropley and Field (1969) studied 178 Australian final-year high school students across several sites with IQ tests and tests that measured “intellectual style” (tests of originality, flexibility, category width, and a test of the abstractness of intellectual functioning). These authors suggested a style rather than a level of intellectual performance accounted for the difference in motivation between individuals. This style accounted for a degree of variance in achievement not explained by IQ. Although these authors found that this relationship held true across all subjects, others suggested that a particular style was more adept for science learners (Cropley, 1967; Hudson, 1963a, 1963b, 1966).

**Locus of Control**

In a similar vein to Cropley and Field’s concept of a difference in style to explain outcome, Rotter and Mulry (1965) felt that the perception by individuals of the locus of control for a situation would account for differences in outcome. They conceived that individual differences in reinforcement were responsible. Where an expectancy that reinforcement was dependent on one’s own behaviour existed, the individual was said to have an internal locus of control. Where the reinforcement was felt to be determined by luck or chance, then the individual was said to have an external locus of control.

Holland (1966) noted in regular undergraduate students that vocationally consistent individuals (individuals who expressed satisfaction with their course of study and their intended career) were less influenced by Rotter and Mulry’s external factors, than their colleagues with less consistent vocational desires. However, in later studies of male freshman undergraduate students, no statistically significant interactions were shown between vocational consistency and Rotter’s Internal–External Control Scale measures (Foster & Gade, 1973), suggesting that a consistent vocational approach was not the same as having an internal locus of control. Other authors (James, 1963) using the same scale had found that undergraduate students classified as “internals” performed better academically, and perceived reinforcement as dependent on their own actions and not external factors. Equally, however, others (Hjelle, 1970) found no statistically significant relationship between locus of control and academic outcome in similar study populations.
These musings about vocation related somewhat to the concept of the effect of a reward. If a reward was perceived as controlling (i.e., the reward was external), it could undermine future effort (Deci, 1975). In the converse situation where a reward was perceived as positive feedback or in a cooperative context (i.e., one had bettered oneself), it was more motivating.

Up until this point, motivation literature focused on the individual or the individual's goals for the future. What was becoming more apparent was that learning did not occur in a pedagogical bubble. The learning environment provided an additional layer of influence on the same individual's learning and goals.

The Role of the Learning Environment

In reference to the connectedness of the individual, the classroom, and society-at-large, Weiner (1990) noted that institutional “motivation cannot be divorced from the social fabric in which it is embedded” (p. 621). In learning settings that were socially comparative, the affective significance of one's own and others’ outcomes could be increased, which might have further stifled learning in a struggling student (Ames, Ames, & Felker, 1977). Ames and colleagues noted that in a non-competitive environment pairs of male fifth-grade students, where one achieved and one did not, the successful student rated the unsuccessful student magnanimously, and noted their ability was equal to their own (whereas the unsuccessful student was more self-effacing). This point provided an ideal opportunity for intervention. When failing students were shown that their attributions for failure were incorrect (i.e., it was not an ability issue but an effort or strategy issue) with short rehabilitatory statements (e.g., “Very good [effort], we usually fail because we don't try hard enough, don't we?”), changes were produced in levels of persistence which were long-standing when measured four months after the intervention, and tended to generalise across school subjects beyond the original mathematics realm (Andrews & Debus, 1978).

The consequence of the results of Ames et al. (1977), albeit in a small sample of young learners, showed that a non-competitive learning environment fostered a completely different culture of cooperation, irrespective of a number of other potentially influencing factors. However, maladaptive learning practices were not the exclusive domain of poorer students: in some experimental conditions (especially deliberate confusion through poor instruction, or continued failure), bright elementary school students (especially girls) displayed low expectancies and challenge avoidance, and in spite of recognising themselves as talented, showed greater uncertainty than their lower achieving peers (Licht & Dweck, 1984). Whether these same findings can be applied in higher education settings has not been tested. The findings showed that the learning environment had additional significant effects on motivation. Earlier, Atkinson (1964) had also noted that in an identical environment some individuals acted as if
they were more aroused than others. These individuals were more aware of achievement cues and exhibited “augmented achievement strivings” (Weiner, 1990, p. 619). Similarly, Renninger and Snyder (1983) noted that in a cohort of privately educated 11th- and 12th-grade students, field-independent individuals were more resilient in differing learning environments (i.e., they performed well in field-dependent and field-independent classrooms, compared with their colleagues who performed best in a classroom that matched their own dependence state). The authors also noted that student cognisance of the learning environment was greater in congruent matches (i.e., where student and teacher orientation matched), and in fact this relationship was stronger in field-dependent students (which perhaps reflects a lack of resilience on their part). However, the difficulty with these findings was related to the fact that in Renninger and Snyder’s study, all field-dependent teachers taught English, and all field-independent teachers taught mathematics. Peterson (1977) remarked that it was important to remember that a caveat existed about the effect of the environment on motivation. An instructional method with recognised positive cognitive outputs might not have similar positive affective outcomes; that is, just because secondary school students were learning social sciences more, or in a better way, did not predispose them to enjoy it any more. It was observed that students’ approach to a learning task, and whether to tackle it in a superficial manner or to endeavour to understand the source material, was affected by their perception of the task, which in turn was dependent on students’ level of interest, personal commitment, and previous experience.

In an undergraduate setting, Holden and Rotter (1962) examined Weiner’s “achievement strivings” in students under differing conditions when confronted with an impossible task. In one situation students were made aware that their behaviour affected the outcome rather than chance (“skilled conditions”); in another, the outcome was determined by chance alone; and in the final group, an ambiguous instruction was given. Students in the skilled condition habituated more quickly (i.e., quit a futile experiment) than their chance and ambiguous instruction colleagues, who persisted for longer. One conclusion reached was that conditioning was more rapid when individuals were exposed to aversive (including environmental) stimuli. This was felt to be akin to anxiety. In undergraduate students, individuals high in anxiety scores were found to condition faster than those with lower scores (Spence, 1958).

Additionally, in older undergraduate students, where deliberate attempts to undermine attribution were staged, important consequences were associated with even temporary losses of control: cognitive, emotional, and motivational deficits could be so debilitating as to negate the effects of an expressive teacher who would have typically facilitated achievement (Perry & Dickens, 1984). These same consequences were also seen when students received non-contingent feedback associated with learning tasks, which was felt to contribute to a loss of a

4 A synonym for internal locus of control. Field-dependence was a synonym for an external locus of control.
locus of control (Abramson, Garber, & Seligman, 1980). It has also been shown that undergraduate students across a variety of disciplines adopt an approach that they know to be detrimental to their learning if the learning environment encourages such an outcome (Ramsden, 1979).

**Self-Efficacy and Self-Concept**

The concept of a locus of control still allowed that motivation was a static rather than dynamic phenomenon. The authors presented in this review to date have noted ways in which motivation could be influenced, but their descriptions saw this as a binary procedure: motivation was influenced to change from one state to another, or it was not. The presence of a need would motivate an individual from a state of rest (the proposed ideal state) to initiate a state of activity (the less-than-ideal state) that would continue until the need was reduced to zero and the individual could return to a state of rest (Weiner, 1990). However, Weiner, in conjunction with Raynor (1970), acknowledged that individuals were always active, and the dependent variables of motivation moved away from immediacy values to values of choice and persistence, and returned to the earlier concepts of future motivational events and vocational consistency.

Into this setting, Bandura (1977) introduced the theory of self-efficacy which described a set of unconscious cognitive steps undertaken by an individual when faced with a learning task. The individual determined whether coping behaviours would need to be employed, how much effort was to be expended, and how long this effort would be sustained, especially in the face of negative experiences and outcomes. This latter element was reminiscent of Atkinson’s theory and the consequences of repeated failure. Bandura’s theory relied on previous performance to provide students with an objective measure of evaluating their future self-efficacy; however the accuracy between perceived ability and actual ability was far from perfect (Lent, Brown, & Larkin, 1984; Matell & Smith, 1970).

Betz and Hackett (1981) found that self-efficacy expectations in psychology undergraduate students were related to career development options and vocational interests. Greater self-efficacy was associated with a greater number of future options, which amalgamated self-efficacy theory among existing theoretical frameworks. Wilhite (1990) noted that the Self-Concept of Academic Ability Test (SCAAT) was a statistically significant predictor of academic achievement in a university setting, but also remarked that it was not as important a predictor as locus of control. These conclusions were based upon a difference in correlation coefficient values of .07 (i.e., approximately 7% more variance was explained with locus of control measures than with SCAAT measures); however, no statistical measure of partial correlation or multiple regression was provided to give assurance that these scales were not assessing the same
variable. Additionally, the results were seen in a single introductory university class and the generalisability of the findings remained in doubt.

What self-efficacy theory allowed was the concept of a set of non-academic skills and attributes that could influence the academic facet. Byrne and Shavelson (1986) developed a multidimensional model of self-concept which described a distinct but influential set of non-academic dimensions, including physical ability, and peer and parent relationships, with the stipulation that this semi-hierarchical model became less obvious and less robust with increasing age. The change in salience with age was mirrored in other studies where self-concept facets (academic skills, past classroom performance, future aspirations) were thought to arise from social comparison; as students moved through high school into tertiary and workforce environments, the facets associated with academic success were no longer as stable, or influential, as previously (Bachman & O’Malley, 1977). This change was felt to be a representation of the experience of the learner.

Since social comparison played a large part in the definition of self-concept, younger students might be more heavily influenced by the school environment because they have had less opportunity to gain feedback about their abilities from sources external to the school environment (Bachman & O’Malley, 1986). Bachman and O’Malley also noted that actual ability was more important than self-concept in predicting “long-range educational attainment” (p. 41), and that teachers’ focus needed to be directed towards improving ability. The notion of improving ability was original: the idea that intelligence and ability were largely fixed had dominated educational psychology theory until this date. This novel approach set the groundwork for the concept of goal theory.

**Goal Theory**

The renaissance of educational psychology might not have precisely begun with the publication of a seminal paper on goal theory by Dweck (1986) but it certainly distilled a body of work that had begun several decades earlier and allowed a new trajectory of thinking in this area. Goal theory emerged in the latter half of the 20th century as a means to re-examine motivation in the individual; *goals* were used as a representation of desired results. It materialised as a way of bringing together the extremes of purely external and internal approaches to learning, with a social-cognitive emphasis. External and internal states remained important, but were interpreted through this lens. A focus was made “on psychological factors, other than ability, that determine how effectively the individual acquires and uses skills” (Dweck, 1986, p. 1040). What goal theory allowed was a theoretical basis to move away from so-called “common sense” approaches to learning, such as the assumption about gifted children having naturally adaptive patterns of learning and persistence, or that praise alone was enough to
establish and maintain appropriate learning patterns. In fact, positive reinforcement as a method of creating high-performance learners was found to be flawed: the idea that frequent praise for short and easy tasks fostered a desire for challenging tasks, or fostered persistence in the setting of continued failure, was erroneous (Kohn, 1993; Terrace, 1969). As detailed by Kohn, this practice “frames learning as something one does in exchange for a prize, rather than as something intrinsically valuable” (p. 23). Additionally, continued success at low impact tasks (easy tasks, or difficult tasks within a performance framework) did not foster stable confidence, persistence, or challenge-seeking behaviour (Dweck, 1975), and so the concept of praise for these activities was found to be ineffective.

Goal theory provided a change in emphasis away from focusing on whether individuals possessed or lacked motivation, and instead on to how these same individuals thought about themselves, their tasks, and their subsequent performance. Goals were thought to exist as a “filtering mechanism for beliefs about the self and subsequent action” (Lemos, 1996, p. 152), and motivations “serve as templates by which experience can be mapped onto the individual’s self-system” (Middleton & Toluk, 1999, p. 100). An important note was made by Dweck that children displaying these different patterns did not differ in intellectual ability and some of the seemingly more able students exhibited maladaptive learning processes. These different patterns of learning were proposed to have far-reaching consequences on cognitive performance. Two achievement goals were described by Dweck: a mastery goal and a performance goal. These were perceived as a dichotomy based upon the individual’s theories on the concept of intelligence. A mastery goal was a goal to develop ability; individuals with this goal orientation believed intelligence was a malleable quality and could be enhanced. A performance goal was a goal to demonstrate ability (or to avoid the demonstration of a lack of ability). Performance goals were perceived as a maladaptive pattern of learning: a failure to establish reasonable goals, or a failure to maintain effective striving toward reasonable goals. Dweck noted that learners with a “maladaptive pattern [of learning] are seriously hampered in the acquisition and display of cognitive skills when they meet obstacles” (Dweck, 1986, p. 1041), whereas learners with adaptive patterns had their performance enhanced by the increased challenge, or at the very least were undismayed by this. Maladaptive practices generally manifested in a number of ways: attributing failure to personal inadequacies, task-irrelevant behaviour (in a diversionary manner from the task at hand), and negative affect (Dweck & Legget, 1988). These manifestations were typically followed by further decrements in performance across future failure trials, where students used primitive strategies that were highly unlikely (given an unlimited number of attempts) to result in success. This degradation in strategy was perceived as a face-saving measure. Learners did not think they could be held accountable for their self-assessed inadequate intelligence and ability.
When intelligence was viewed as a fixed ability, individuals were focused on achieving favourable judgements (or avoiding unfavourable judgements) of their intelligence. This concept related back to the theories on the incentive value of success and failure. If an individual’s goal was to achieve a favourable demonstration of their ability they would pick a task that was so easy to avoid the chance of failure, or a task so difficult that failure could not reasonably be expected to reflect poorly on their individual ability. In the case of failure, such learners would attribute this to a lack of ability (Ames et al., 1977; Anderson & Jennings, 1980).

In contrast with this, in tasks to develop ability, individuals were willing to risk displays of inexperience or ignorance to acquire new skills or knowledge (Dweck, 1986). Even where individuals rated their ability as poor, a mastery goal promoted the choice of a challenging task to cultivate this ability (Elliott & Dweck, 1988), and during the process individuals used positive prognostic statements such as “I have it now”, or “I did it before, I can do it again”, which indicated both solution-oriented behaviour and self-reflective strategies (Dweck & Legget, 1988). Motivation enhancement was often equated with quantifiable changes in outcome measures (e.g., achievement).

What was frequently overlooked were the qualitative changes in the way students viewed themselves and their approach to tasks, engagement, and their response to failure (Ames, 1992; Urdan & Maehr, 1995). By using motivation orientations as a framework, learners could engage in self-reflective practices and determine, for example, how to marshal and distribute their resources for learning tasks, or the benefit of continued effort at a learning task (Pintrich, 2000c). This constant reflective nature allowed for an increase in the robustness and generalisability of the motivation orientation framework (Middleton & Toluk, 1999), although in early iterations this remained primarily a framework measured in children rather than older adults.

The outcome and evaluation of rewards associated with tasks also differed between the two goal theory groups. Those with performance goals were satisfied when their apparent ability had been displayed favourably, whereas mastery goal individuals were more satisfied with the effort exerted in pursuit of a goal. Indeed it was proposed that performance-oriented individuals would perceive excess effort as a sign of poorer ability (Ames et al., 1977; Dweck & Legget, 1988). Additionally, performance goals were conceived, in widely differing populations from high school to undergraduate students, to have “appearance” and “normative” facets (Elliot, 1999; Hulleman, Schrager, Bodmann, & Harackiewicz, 2010; Urdan & Mestas, 2006). An appearance facet focused on the impression of having greater ability, or conversely on avoiding looking incompetent. An appearance facet required a comparative element in the classroom setting (e.g., comparing grades with others). In contrast, a normative facet relied on the individual knowing how they had done relative to a criterion; an objective standard was required.
whereby the individual could judge that they had performed as expected and a specific comparison was not required (e.g., a distribution of grades).

Given that these goal orientations were associated with differing views on the nature of intelligence, it also stood to reason that they were associated with an individual's perceptions of his or her own ability. Self-perceptive differences might have had more relevance when considering differences across ethnic and social groups. In some settings the competitive element might have been of paramount importance, or at least perceived as such. Gender and ethnic differences could be exaggerated when performance goals were emphasised (Steele & Aronson, 1995). The data on goal theory and gender with regards to goal preference was ambiguous. Some authors argued that female students were more concerned with social equality and relationships over achievement and competition seen in male students (Landrine, 1992). Others (Craske, 1988) noted that female primary school-aged students were less likely to withdraw from difficult tasks and continued trying in the face of failure, while contradictory findings had been noted where male students were the more resilient (Miller, 1986). Urdan, Midgley, and Anderman (1998) reported self-handicapping among fifth-grade male students, and others (Steinberg & Silverberg, 1986) noted that adolescent female students were more autonomous than their male colleagues. What few studies have investigated as a primary question is whether these potentially contradictory patterns between the sexes are still evident in undergraduate-aged students.

Goal theory also gave an insight into the way in which individual learners viewed the world external to themselves: learners with a mastery orientation would assume that “people can be made more competent, institutions can be made more responsible, the world can be made more just” (Dweck & Legget, 1988, p. 266). A performance-oriented learner had a tendency toward judgement-based goals. The fixed views associated with performance-oriented individuals may have provided the basis for the formation and perpetuation of stereotypes (Erdley & Dweck, 1993), although this has only been proposed in children. The affective domain was the most stark and a performance-oriented learner could be disposed to a derisory evaluation, compared with the mastery-oriented learner who tended toward compassion or empathy (Hoffman, 1978), although this has only been presented in a theoretical model. It is of note that Hoffman’s theories have not been studied in a medical education context where such negative judgements could have profound consequences.

As earlier studies had demonstrated, the learning environment remained a paramount influence on learning and help-seeking behaviour within a goal theory setting (Karabenick, 2004).

**Goal theory and the learning environment.** When social comparison was encouraged in students in the eighth to eleventh grades, students focused on ability and adopted
performance goals, in contrast to learning environments that fostered standards-based learning where students focused on effort (Ames & Archer, 1988). Grades prompted a degree of social comparison but if the grade was accompanied by an opportunity to improve, the connection between outcome and ability was seen to be separated in a large sample of fifth- and sixth-grade students (Maclver, 1987). As a whole, social comparison was difficult to avoid in the classroom; the problems associated with it were primarily seen when such comparison was emphasised (Jagacinski & Nicholls, 1984). When classroom learning tasks were diverse and varied, it was proposed in theoretical models that students had less opportunity or need to engage in social comparison, and outcome differences were less likely to be equated to ability differences (Marshall & Weinstein, 1984). However, in real third-, fourth- and fifth-grade classroom situations the stated environmental goals were inconsistent over time, and the salience of environmental cues could differ from student to student (Brattesani, Weinstein, & Marshall, 1984). When individual and environmental learning goals were aligned in an undergraduate psychology course, students noted lower levels of dissatisfaction (Tabernero & Wood, 1999).

Differences in students’ responses could be from both external and internal sources (Ames & Archer, 1987) and the individual response “depends on how each student constructs the social reality of the classroom for [him or herself]” (p. 260). Interestingly, differences in outcomes based upon student perceptions of the classroom goal environment were based on whether students believed their classroom had high or low mastery goals (and not whether the classroom had high or low performance goals), which suggested that it was the degree of emphasis placed on mastery goal environments that was of greatest importance. However, in their study, Ames and Archer looked specifically at a cohort of gifted children and it was unclear whether this lack of regard for performance goals would be seen in a more heterogeneous student ability group.

Environmental cues could be manipulated by the teacher or institution (in either class- or school-level policies) to have profound effects on the individual, both positive and negative (Kaplan, Middleton, Urdan, & Midgley, 2002). Critics may have called these salient environmental cues ephemeral and lacking in specificity, but research consistently showed a positive correlation between students’ and teachers’ reports of classroom goal structures (Urdan et al., 1998). Indeed, evaluation has been shown to be one of the most salient environmental cues that could influence student motivation (Ames, 1992).

**Expansion of goal theory.** The dual nature of performance goals (to have a favourable demonstration of one’s ability and to avoid negative demonstrations of such) led to a rethink of the binary concept of motivation. The mastery and performance aspects were conceived of as the explicit terms, with the approach/avoid distinction as the valence (Elliot & McGregor, 2001). Thus the original dichotomous model evolved to give a 2 × 2 grid model of mastery–approach
and mastery–avoid, and performance–approach and performance–avoid. Performance–avoid goal examples included learned helplessness. Following the establishment of a belief that valued outcomes were uncontrollable, individuals attributed their helplessness to another cause outside of their own effort (Abramson, Seligman, & Teasdale, 1978; Dweck & Legget, 1988; Elliott & Dweck, 1988); and self-handicapping. When individuals feared failure would demonstrate a lack of ability, they reduced their efforts so that the subsequent failure would be attributed to low effort rather than low ability (Jagacinski & Nicholls, 1990). Since self-handicapping was primarily a response to a measure of social comparison, it stood to reason that it was more common in learning environments where a performance goal was encouraged (Urdan et al., 1998).

Performance–approach goals were often thought of as less inferior to performance–avoid goals, and that the approach valence may have some benefit in relation to short-term strategies; however, the concern with this orientation was that the benefits were fleeting and fragile (Elliott & Harackiewicz, 1996). Performance–approach goals were associated with a high degree of effort and overly complex study strategies to fulfil the objective of demonstrating academic prowess above others (Wolters, Yu, & Pintrich, 1996). The extra attention this provided could help to offset poorer, more superficial, approaches to learning. An experimental study by Roney, Higgins, and Shah (1995) in a small group of undergraduate students noted that a performance–approach goal was associated with greater levels of persistence than the performance–avoid equivalent. However, a caveat of performance–approach orientation was that although it had demonstrated positive associations with performance, it had also been associated with maladaptive processes such as reduced help-seeking behaviour, increased anxiety, self-handicapping, and poor responses to conflict (Karabenick, 2004). Others (Cury, Elliot, Da Fonseca, & Moller, 2006) had suggested that performance–approach goals might mitigate the negative effect of performance goals as a whole; that is, performance–avoid goals alone were associated with much poorer outcomes than performance–approach. This might also explain why earlier research into “performance” goals (as a complete construct) sometimes yielded conflicting results in terms of academic outcome (Barron & Harackiewicz, 2001). Finally, in unpredictable learning environments, performance–approach classroom goals tended to shift students towards a maladaptive performance–avoid orientation (Kaplan et al., 2002).

Mastery–avoid was a condition proposed by Elliot and McGregor (2001) which described the effort to avoid failure in mastery terms; a deterioration of skills or competence (e.g., fearing that one would forget what one had learnt, performing worse than previously, or striving to avoid misunderstanding teaching material). Although thought to be a common motivational construct in older adults or individuals toward the end of their career, it was rarely studied (or looked for) in conventional populations and so its exact nature with regards to outcome was not entirely clear. It was proposed to be associated with positive outcomes such as persistence.
(Pintrich, 2000a). The difficulty with the concept of a mastery–avoid goal was that it was unclear where it sat in terms of outcome: it was assumed that mastery–avoid outcomes were worse than mastery–approach, but better than performance–avoid. How it compared to a performance–approach goal was the most unclear as these goals shared neither definition nor valence. In Elliot and McGregor’s correlational study of undergraduate students, mastery–avoid goals were found to be the least prevalent goal in this population. These goals were thought to arise in the situation where individuals brought “non-optimal motivational dispositions into optimally structured achievement settings that foster intrinsic interest and the pursuit of challenge” (Elliot & McGregor, 2001, p. 516). The reality that these goals were not seen as frequently as one would have expected given this condition suggested that classroom goals were rarely as purely mastery–approach-oriented as once thought.

Other authors have used extrinsic and intrinsic motivation as a surrogate for performance and mastery goals respectively. Comparably, Harter (1981) used a similar dichotomous construct as above with intrinsic and extrinsic motivation at opposite ends of a continuum. Intrinsic motivation referred to engaging in activities for an inherent satisfaction compared with extrinsic motivation where engagement occurred for instrumental reasons. This scale, when used in third- to sixth-grade elementary school students, had shown a specific change in orientation from intrinsic to extrinsic orientations around the time of school transitions (specifically from elementary and middle school to high school). Harter noted that mixed forms of motivation existed, and a mixed approach was more common than a single unitary motivational orientation in a later study of similar-aged students (Harter & Jackson, 1992).

Likewise, while also recognising that a basic dichotomy of goals existed (albeit with increasing complexity), goal theory also allowed for differing goals to exist in the same individual simultaneously (Archer, 1994; Maehr, 1984). One could employ both mastery and performance goal orientations when approaching a task. Wentzel (1991) suggested that students needed to maintain both mastery and performance orientations to succeed. Lemos (1996) noted in a sample of 20 sixth-grade students across multiple classroom environments that effective management of multiple goals allowed a degree of flexibility in attending to the demands of different learning environments.

In a similar vein as McClelland’s approach to enhancing motivation, goal theory also provided a new approach to the question of how to increase the proportion of mastery goals in an individual. The presence of specific dualistic combinations of goals (high/low) was also associated with specific outcomes. Low-mastery/high-performance and low-mastery/low-performance were associated with a negative pattern of outcomes, where the latter had the poorest outcome. The high-mastery/low-performance and high-mastery/high-performance
combinations were associated with a more positive pattern of outcomes; the combination of high mastery and high performance was felt to be more adaptive than having high mastery goals alone as individuals could more easily customise their approach to the task or situation (Pintrich, 2000c). The potential for some form of positive outcome with a performance–approach orientation led some authors (Harackiewicz et al., 2002) to argue for a multiple goals approach so that individuals could benefit from the positive potentials of both mastery–approach and performance–approach goals. However, others (Brophy, 2005) have also argued that the costs of performance orientation in any form outweighs the potential benefit and one should strive for an exclusive mastery orientation in any learning situation. Where multiple, potentially conflicting, goal orientations existed, teachers acted as the final arbiters (Perry & Weinstein, 1998).

Whatever the thoughts on the influence of goal orientation on academic outcome, it was worthy of note that almost all the data accumulated on the tactics individuals used in learning was from self-reports (Winne & Nesbit, 2010). The lack of a coherent experimental control over differing goal orientations’ effects on raising achievement is a promising avenue for future research, especially in the way in which students self-regulated under differing goal orientations (Gano-Overway, 2008). Additionally, the majority of literature in goal orientation has been conducted on younger learners; whether similar results would be seen in older, more savvy learners remains less clear.

Deci et al. (1991) criticised goal theory for failing to attempt to understand why particular outcomes were desired: “[goal theory] fails to address the issue of energisation of behaviour” (p. 327). The major complaint with the 2 × 2 model of motivation was that performance orientation was proposed to be non-autonomous. Goal theory required the concept of intention: motivation was acquainted with intentional behaviour; amotivation with non-intentional behaviour. These behaviours were ultimately controlled by an intrapersonal or interpersonal force and the outcome was one of compliance (approach) or defiance (avoid).

**Self-Determination Theory**

Deci and Ryan (1985) proffered that a basic individual need was the need for competence, and this was the rationale behind individuals who sought stimulation and challenging activities. A true autonomous motivation was volitional and the outcome was one of choice (Deci et al., 1991). The idea of choice related to the notion of control—the extent to which individuals believed they could influence their environment to attain desired outcomes (Skinner, 1996). This concept allowed for a spectrum of motivation from wholly controlled to wholly self-determined. When a behaviour was self-determined (i.e., autonomous) the *raison d’être* was intrinsic to the learner; when it was controlled this was largely extrinsic (although it should be noted that the hypothetical situation may exist where a external reward is personally important...
to the individual—in which case the motivation would be said to be well-internalised extrinsic motivation). This concept recognises the difference between a locus of control and a locus of causality. A locus of control reflects the degree to which an individual is able to influence a situation to attain a desired outcome. Thus, for example, achievement of an external reward through increased effort still has an internal locus of control. Locus of causality more accurately reflects self-determination theory; in the example above although control may be internal, the causality is external to the individual.

According to self-determination theory (Deci & Ryan, 1985), intrinsic motivation was the most self-determined motivation, which arose fully from the self. It affirmed a behaviour that was undertaken purely for interest or enjoyment without the need for inducement or reward (e.g., a student reading around a topic because it interested him or her). Extrinsic motivation behaviours on the other hand were not performed solely for enjoyment, and were performed to help advance the cause of a consequence or outcome. Deci and Ryan proposed a model of motivation that contained five aspects which went from completely extrinsic to completely intrinsic. Within extrinsic motivation there existed a spectrum of behaviours that varied based upon the degree of self-determination (see Figure 1). The differing degrees of internalisation (i.e., self-determination) were the basis for self-determination theory.

External regulation was the least self-determined form of extrinsic motivation. It referred to the condition where an individual's behaviours were controlled solely by external factors (e.g., students studied because of the offer of a reward, or the threat of punishment). The locus of causality for the behaviour was entirely external to the self, even where the locus of control (e.g., the student studying) was internal.

Introjected regulation occurred where individuals had internalised a formerly external source of motivation, but had not yet truly integrated this into their sense of self (e.g., students studied because they did not want to feel guilty about not doing so, not because they wanted to). Ego involvement was prominent in this form of motivation. Deci et al. (1991) noted that "although introjected regulation is internal to the person, it bears more resemblance to external control ... because it involves coercion or seduction and does not entail true choice" (p. 329).

The next form of extrinsic motivation was identified regulation, where individuals had chosen to perform an activity having weighed its value and importance to themselves (e.g., students studied because they recognised the advantages in doing so). Having identified this value, the motivation had become more internalised. However identified regulation was still a form of extrinsic motivation because an activity was performed for a measurable outcome (e.g., improving performance, succeeding at future tasks) rather than for personal enjoyment. For instance, when the value of an activity was internalised, individuals did not necessarily become
more intrinsically motivated towards the task, but they might be willing to complete the task because of its personal value, even if there was recognition of the task being non-pleasurable.

Integrated regulation described the most self-determined form of extrinsic motivation. In this orientation, the motivational behaviours had been incorporated with the learner’s other goals and desires (e.g., the learner's need to be a good student and a reliable employee at his or her part-time job might have conflicting goal structures; once the learner had merged these structures, they were said to have integrated regulation). Upon achieving integrated regulation, the behaviours were a reflection of what was valued and important to the learner. Although this regulation bore some similarity to intrinsic motivation, it was on this point that they differed. Integrated regulation consisted of a task being important to the individual; intrinsic motivation suggested the individual was interested in the task in and of itself. Integrated regulation was difficult to measure and to date no scale (e.g., Academic Self-Regulation Questionnaire, Academic Motivation Scale) has been developed to do so (Ryan & Connell, 1989; Ten Cate, Kusurkar, & Williams, 2011; Vallerand, Blais, Brière, & Pelletier, 1989). Specifically, the Academic Motivation Scale does not measure integrated regulation because pilot data revealed integrated regulation did not identify as a perceived reason for participating in education activities, and factor analyses failed to distinguish this construct from identified regulation (Vallerand et al., 1989).

Self-determination theory also posited the existence of amotivation occurring outside of the extrinsic–intrinsic model where individuals perceived that whatever they did it would amount to nothing (Deci & Ryan, 1985).

![Figure 1. Continuum classification of motivations based upon their degree of self-determination.](image)

One could foresee that self-determination theory allowed extrinsic-type orientations that were under a degree of volitional control. One actively chose to learn in this manner (compared with some of the types of self-handicapping which might be considered unconscious; e.g., staying up late in order to impair performance). Control itself was not a latent psychological construct; a sense of control emerged as a by-product of thought and action within undergraduate students (Shell & Husman, 2008). It could therefore be thought of as synonymous with self-determination orientations. High feelings of control (i.e., an internal sense of being in command of one's own learning) were associated with more autonomous constructs.

It is worth noting that although self-determination theory was presented as a continuum (as per Figure 1), it was not proposed to be developmental; that is, individuals did not need to
progress through the stages, one could make the cognitive leap from external regulation to intrinsic motivation in the right setting (Ryan & Deci, 2002). This had important consequences when one considered “bad” motivational behaviours; it was not sufficient to suppose that a uniform scale existed where external regulation was as much worse than introjected regulation, as this was to identified regulation, and so on. It was probably more appropriate to refer to self-determination theory constructs as contiguous rather than continuous (Chemolli & Gagné, 2014).

Schafer (1968) described the process of internalisation whereby an originally external motivator was transformed into an internal state. Self-determination theory proposed that individuals could move within this construct; the natural state of motivation tended to move an individual towards internalised states (Deci & Ryan, 1985). Deci and Ryan also alluded to the importance of the wider social and learning environment: “the extent to which the process of internalisation and integration proceeds effectively is a function of the social context” (Deci et al., 1991, p. 329). In a study of consecutive responses of eighth-, ninth- and tenth-grade students, individuals were more likely to “internalise and integrate the regulation of behaviours that are socially valued” (Otis, Grouzet, & Pelletier, 2005, p. 171). However, in the same manner environmental cues could undermine this process and promote non-self-determined motivation when individuals’ needs for competence (e.g., feedback, challenging tasks), autonomy, and relatedness⁵ (e.g., parental involvement, peer acceptance) were not supported (Otis et al., 2005).

This triad of support (competence, autonomy, and relatedness) was noted in Ryan’s earlier work. Self-determination theory did not exist in a vacuum and relied heavily on social context (Ryan, 1982). The pillars of competency, autonomy, and relatedness required a “majority effect” to influence motivation. If only one pillar was supported in a social context (e.g., feedback was given but not in a manner to support autonomy or relatedness; for instance praising the individual for what they were told to do) then overall motivation would increase, but not differentially in identified regulation or intrinsic motivation in middle-school aged children (Grolnick & Ryan, 1989). Grolnick and Ryan’s qualitative study investigated parental and teacher involvement and showed that individuals with more involvement from these groups were more motivated and self-determined.

It has been shown in numerous studies and meta-analyses that the greater the degree of self-determination in one’s motivation array, the better the observed academic outcome (Pintrich & De Groot, 1990; Ratelle, Guay, Vallerand, Larose, & Senécal, 2007). These forms of self-determined motivation were also associated with greater degrees of persistence (Daoust, Vallerand, & Blais, 1988). The converse was seen with externally regulated behaviours where these were associated with negative patterns of outcome (Urdan, Ryan, Anderman, & Gheen,

---

⁵ Relatedness was maximised in situations where individuals felt an affiliation with significant adults (Ryan & Lynch, 1986).
Interestingly, when the entire gamut of self-determination behaviour was correlated to outcome across a three-year study in high school students (Otis et al., 2005), only an increase in intrinsic motivation and identified regulation were related to positive consequences. Even where introjected and external regulations were positively associated with educational consequences, increases in these forms of motivation were not associated with statistically significant increases in achievement. To date this is the only study that has reviewed longitudinal changes in self-determination. Whether similar findings would be seen in older, college-aged cohorts has not been investigated.

Self-determination by its very nature was an ideal theory for study among older learners as it required a degree of maturity for more self-determined constructs to have evolved (Ratelle et al., 2007). Additionally, as noted by Pintrich (2003): "beliefs about motivation become more differentiated over time, with more complex meanings and understandings of ability, effort, intelligence, interest, and value emerging with age” (p. 680).

**Self-determination theory and the learning environment.** In a similar fashion to the theories on classroom goal structures, self-determination theory also noted an influence of the classroom, and also agreed that the overarching classroom structure could be modulated somewhat by the teacher’s interpersonal style, especially around the language used in describing tasks and feedback (Deci et al., 1991). Importantly, this autonomy-promoting style could be taught to teachers and thus mitigate the influence of an otherwise non-autonomous environment (DeCharms, 1976), which would ordinarily have reinforced non-autonomous teaching methods (Flink, Boggiano, & Barrett, 1990). A study of college school students by Benware and Deci (1984) asked students to learn a specific set of material for either an upcoming test, or to simply learn the material (with no mention of a test). The results showed that in the testing condition, students’ short-term recall was increased (although this effect was lost after one week), but they showed poorer conceptual understanding and less enjoyment than their no-test peers. This short-term gain but longer term disadvantage was similar to the theories about the fleeting benefits of performance-approach goals, and one could visualise how goal theory orientations (performance-approach and -avoid, mastery-approach and -avoid) might overlap with a self-determination spectrum.

The act of acknowledgment by a teacher, either of an unpleasant task, or having to complete a task in a manner not preferred by the individual (e.g., “you may not enjoy doing this but it is important for your career”), served as a buffer to the otherwise negative influence, and helped to internalise the behaviour and maintained intrinsic motivation in undergraduate students across a number of universities (Ciani, Summers, Easter, & Sheldon, 2008; Koestner, Ryan, Bernieri, & Holt, 1984).
External events and rewards (e.g., deadlines, goals, and competition) are well-intentioned, but in a study by Vallerand, Gauvin, and Halliwell (1986), a small group of day camp fifth- and sixth-grade male students showed that these events, designed to motivate individuals, actually decreased their motivation. Numerous studies (Deci, 1971; Deci, Betley, Kahle, Abrams, & Porac, 1981; Lepper, Greene, & Nisbett, 1973) have also shown that external tangible rewards for undertaking, completing, winning, or excelling at learning tasks undermined intrinsic motivation for the task itself and prevented integration of behaviours within a self-determination construct; unexpected rewards or non-contingent rewards had no effect on motivation. Only positive, relevant feedback has been shown to enhance intrinsic motivation (Deci, Koestner, & Ryan, 1999). However, in reference to the work on uninteresting tasks of Koestner et al. (1984), Deci and colleagues found that tangible rewards had no effect on the motivation towards boring learning tasks.

**Self-determination theory and goal theory.** The relationship between self-determination theory and goal theory has been explored extensively (Duda, Chi, Newton, Walling, & Catley, 1995; Elliot & McGregor, 2001), with similarities noted and statistically significant positive correlations found between intrinsic motivation and mastery goal orientations, and negative relationships between these measures and performance goal approaches. Barkoukis, Ntoumanis, and Nikitaras (2007) confirmed the positive learning aspects of identified regulation by ascertaining statistically significant correlations between this measure and mastery-approach goals. In a study that investigated whether goal theory set the cognitive stage for self-determination theory or was predicated upon it. Ciani, Sheldon, Hilpert, and Easter (2011) noted:

> Students that understand the importance a class may have on their future, or just the interest and fun involved in a particular class, may be more likely to adopt learning goals and less likely to be concerned about appearing competent or incompetent. (p. 237)

However, these findings were based upon self-report measures only, which may have increased bias. Furthermore, all the participants were from a teacher-preparatory class. Like medical students, teacher students have defined career paths following graduation that might allow some similarities in results.

In concert with the findings of multiple orientations with goal theory, research in self-determination theory has also found that multiple motivational profiles can exist in a single individual (Ratelle et al., 2007). Given that self-determination theory was initially posited as a spectrum, it is no surprise that correlational analyses have suggested that adjacent motivations (i.e., external and introjected regulation, introjected and identified regulation, and so on) have stronger correlations than distant (i.e., external regulation and intrinsic) motivations (Ryan, Plant, & O’Malley, 1995). In their study of over 4,000 high school-aged students, Ratelle et al.
In theory, integrated regulation would also sit within an “autonomous” construct.
little choice in their specific courses of study), the delivery of a preclinical and clinical curriculum (and the unique choices by universities in the method of doing so), and the selection procedures evident in admission to medical school.

The following section of the literature review will seek to address the ways in which medical education differs from general education theories presented thus far. This section will focus specifically on the relationship of motivation with regards to selection, curriculum delivery, the unique learning environment, and lifelong learning.

**Motivation Theory as Applied to Medical Education**

A common public perception is that studying medicine is meant to be hard. This belief is not only useful in itself, but as noted by Clough (2012), has the added benefit of being true. With the demands of an extended curriculum, faith can be assuaged that the next medical practitioner one meets is both knowledgeable and professional. Students within professional courses have been thought to sometimes engage with learning in a qualitatively different way (Mattick & Knight, 2009); observations have been made that academic motivation and motivation towards a medical career might be distinct (Sobral, 2004). Mattick and Knight recognised that this difference was due to the importance of vocation for medical student learning. Medical students' commitment is not to a finite course of study; it is a resolution to lifelong learning and development.

Medicine as a profession has been present since times of antiquity. In a dual role the first physician was also the first physician teacher. The first students of Socrates were the physicians and teachers of classical times in much the same way as the present day where the students of William Osler,7 Ron Harden,8 and Phillippa Poole9 are the physicians and teachers of today. Modern medical education was borne out of the Flexner report (Flexner, 1910), a report commissioned by the Council of Medical Education, a derivative of the American Medical Association. Until the beginning of the 20th century, the education of doctors was regarded as outside of the education of typical college students. In his publication, Flexner's recommendations included that the minimum period of training of medical professionals be six years (made up of an initial two years primarily devoted to basic science); that medical schools should be part of a larger university structure, and that they should have responsibility for

---

7 Canadian physician (1849–1919); frequently referred to as “the father of modern medicine” for his role in the development of clinical teaching.
8 Scottish physician (1936–); current Professor of Medical Education at the University of Dundee, who developed the Objective Structured Clinical Examination (OSCE).
9 New Zealand physician (1959–); inaugural Head of the Medical Education Division at the University of Auckland and pioneer in workforce planning in New Zealand.
clinical instruction of students within hospitals; and that potential physicians be trained using the scientific method with a participating faculty fully engaged in research endeavours. In recent times, the full recommendations of the Flexner report have fallen out of favour, especially in light of the realisation that intense lecture-based curricula (roughly double the credit hours of typical undergraduate curricula) might not optimise learning (Patrick & Williams, 2009). Marton and Säljö (1976) benchmarked the investigation of student learning and studying and combined an awareness of what drove medical students to engage with learning (their motivation) and what they were trying to achieve through their study (their intention).

Undergraduate students of all degree streams “arrive at postsecondary institutions lacking the skills and dispositions necessary for engaging in sustained autonomous study” (Thomas, Bol, & Warkentin, 1991, p. 275). Medical students specifically were thought to start medical school with dualistic views of knowledge (e.g., fixed beliefs, concrete assumptions, clear and unchanging facts) and their approach to study was consistent with this view (Lonka et al., 2008). Over time these students might develop more relativistic views, but similar to motivation, could have a combination of dualistic and relativistic views to call upon as the circumstances dictated. Medical students have also been referred to as more compliant, accommodating and socially orientated, and have been shown to have unique motivations and intentions for learning compared with other undergraduate students (Baxter, Mattick, & Kuyken, 2013; Burnstein et al., 1980).

In a study of the responses of first-year medical students to the Short Inventory of Approaches to Learning, Chessell (1986) showed that medical students had higher scores on “meaning”, “versatile approach”, and “comprehension learning” elements compared with normative data from pooled science, arts, and social sciences students. Medical students also scored higher on “reproducing” subscales (rote-learning, memorisation, and being influenced by lure of qualifications) compared with social science and arts students, indicating a superficial approach to learning, but perhaps also an appreciation by students that not all the curriculum was tailored to this learning approach (as suggested by the higher scores in the “meaning” subscale). Medical students have also been shown by Mattick, Dennis, and Bligh (2004) to have higher scores for deep approaches to learning compared with first-year biology and engineering students (i.e., “science” students).

In spite of the differences seen in the pooled data presented earlier, medicine is often included within the science domain (the basis of studying science is to pose questions, and subsequently investigate and evaluate possible answers). In a study of eighth-grade students, Patrick and Yoon (2004) showed that scientific investigations promoted the revision of misconceptions, and it was assumed that these activities aroused and sustained motivation. In a medical school setting, Mann (1999) showed that the need to solve problems relevant to
everyday life was motivating to medical students, as was a desire for proficiency, and to close the
gap between their current level of ability and their desired level. Recognition of this dissonance
could lead to students’ motivations being adversely affected if they felt that institutional goals
differed from their own.

Given Mattick and Knight’s earlier assertions that medical students approached learning in qualitatively different ways, this raises the question of where exactly these differences emerge. Given that many of these differences are present at the start of medical school, it is difficult to make the assertion that it is the medical school environment acting upon a motivationally naïve student which is responsible. While later sections will discuss how the environment attenuates these differences, the literature (Gough & Hall, 1975; Rhoads, Gallemore Jr., Gianturco, & Osterhout, 1974; Violato & Donnon, 2005) would suggest that selection processes are responsible for assembling this motivated cohort in the first instance. The following section seeks to investigate this further, including looking at the effects of selection on motivation in graduate and minority students.

Selection of Medical Students

Much of the early work around motivation in medical education was directed towards motivation as a criterion for selection. A by-product of a rigorous selection process (over lottery-based, or solely GPA-determined systems) was that selected medical students tended to be highly motivated from the outset (Hulsman et al., 2007; Prideaux et al., 2011), suggesting a link between self-efficacy beliefs and identity formation, and an awareness of having been chosen through a demanding selection process (Kusurkar, Ten Cate, et al., 2011). One of the particular dilemmas of medical school selection was that a cohort is selected for the intention of a role that is most often four to six years distant. As one tried to predict the outcome so many years hence, the certainty of an outcome was less and less. Secondary education GPA was recognised as a good indicator of medical school performance but lost predictive strength once students entered the clinical years (Gough & Hall, 1975; Violato & Donnon, 2005). It was noted that it was easier to select for a student who would do well in the basic science curriculum, than the student who would excel in a clinical curriculum (Rhoads et al., 1974). Rhoads and colleagues also noted that in spite of the uniformity of experience that students go through in an undergraduate curriculum, there was a vast difference in the outcome of these same students, suggesting individual factors such as motivation had a role in influencing the outcome. In a contemporaneous paper, Jason (1972) stated: “the evidence is that our selection is primarily directed at finding individuals who merely are likely to survive the first year of medical school ... where few of the characteristics of the effective physician are required for success (p. 663).” Jason also noted that it was easier to
select students who had the ability to become self-regulated learners (i.e., an autonomous motivation to learn), rather than reshape individuals who lacked this potential.

In the Netherlands, Dutch law allowed up to half of the places in medical school to be allocated based upon local selection procedures (consisting of an essay, an examination after a day of medical education, and an objective, structured video examination on social skills). The students deemed suitable but not selected through this procedure were entered into a lottery system and were selected from this lottery as a separate cohort. Applicants with a pre-university GPA of greater than or equal to eight (1 = poor, 10 = excellent) were guaranteed entry (Hulsman et al., 2007). Since 2001, the University of Amsterdam has selected 10% of its quota with local selection procedures. The expectation was that local selection (SP) students would be more motivated than direct access (DA) or random selection (RS) students. Hulsman and colleagues administered the Strength of Motivation for Medical School (SMMS) questionnaire and Vermunt’s motivation scale of the Inventory Learning Style to first- and second-year students. Three times as many reminders were sent to the SP and DA groups compared with the RS students to oversample these smaller cohorts (10 and 9% respectively), which may have led to a degree of response bias. The GPA of the three groups was statistically significantly different but the “academic efficiency” (number of students who passed all examinations) was not. The raw score of the SMMS was statistically significantly different across the three groups; however, subscale analyses revealed no statistically significant differences for intrinsic motivation, although only three items on the scale addressed this facet. Motivation did not have a statistically significant relationship with academic achievement in any student group. Additionally, study habits had differing outcomes depending on the selection cohort. “Study hours” had a weak positive statistically significant relationship with academic achievement for RS students, a moderate negative statistically significant relationship for DA students, and no statistically significant relationship for SP students. In summary, this study showed that selection procedure was not related to intrinsic motivation levels in any appreciable manner, although raw scores for total motivation were higher amongst students selected for in a purposeful manner.

As Wilson (2009) noted “no selection procedure is perfect and it is possible that unsuitable candidates may be selected or that highly suitable students may develop apathetic and unsuccessful attitudes and strategies as they progress through medical school” (p. 217). In Wilson’s study at the University of the West Indies (where admission is based upon academic merit alone), the mean score of respondents for the SMSS questionnaire was 63.0 (SD 9.0), which indicated a strong desire to study medicine. The score also had moderate positive statistically significant correlations with strategic and deep learning approaches, and a moderate negative statistically significant correlation with a surface approach. This indicated that if one had a strong desire to study medicine, one also adopted appropriate study approaches which achieved this end. Models for surface, deep, and strategic learners created by Wilson all showed that the
variables of “achieving” and “prestige” featured in a statistically significant fashion, which suggested an element of social comparison. “Fear of failure” featured statistically significantly in the model for surface learners alone, which suggested a commonality between surface learning and a performance goal orientation.

Kusurkar, Croiset, Kruitwagen, and Ten Cate (2011) also found correlations between SMMS questionnaire scores and motivation as assessed using the Academic Motivation Scale in Dutch medical students. Using self-determination theory to document the quality of the motivation, SMMS scores had moderate positive statistically significant correlations with intrinsic motivation measures and identified regulation, and non-statistically significant correlations with introjected regulation and external regulation, which additionally justified the earlier proposition for the grouping of controlled motivation (external and introjected regulation) and autonomous motivation (identified regulation and intrinsic motivation).

Medicine as a course of study in the United States is a graduate programme. In the United Kingdom and Australia there are increasing numbers of graduate-entry only medical schools with shortened curricula. Pintrich (2003) earlier noted that motivation beliefs (i.e., orientations) became more differentiated over time. Given that the medical school entry cohort is already highly motivated, this would seem to suggest that graduate students may be more motivated than their younger, school leaver colleagues.

**Graduate students.** Prior undergraduate study might influence the “default” learning style of students at the start of the medical curriculum. Older students were found to differ in their approaches to study from those who entered straight from secondary school (Chessell, 1986). Mature entry students had statistically significantly higher scores on deep learning strategies and lower achievement orientation scores than their school leaver colleagues, especially in those with a previous nursing, allied health, or paramedical background (Kronqvist, Makinen, Ranne, Kaapa, & Vainio, 2007; Mattick et al., 2004). Mattick and colleagues noted that “older and/or graduate students are more willing or better prepared to use learning strategies that might be perceived as involving more effort” (p. 541). These findings supported those of Perrott, Deloney, Hastings, Savell, and Savidge (2001) who noted that older students (>24 years) were statistically significantly more likely to be mastery orientated in a cohort of professional health undergraduate courses (medicine, nursing, pharmacy).

The common theme to these studies was a methodology focused on motivation at the point of entry into medical school. What had not been studied was an investigation of continued motivation differences between graduate and school leaver students over the course of the medical curriculum.

A final arm of selection methods is that of affirmative action selection policies where minority students are afforded an equal opportunity for selection. In spite of the number of
affirmative action entry policies worldwide, and although earlier alluded to in the work of Hulsman and colleagues, little was known about the effect of preferential entry schemes on the motivation of students selected in this manner, more specifically, the effect of ethnic minority selection procedures on subsequent motivation.

**Ethnic minorities in medicine.** The following literature outlines several papers that have noted a relationship between affirmative action selection and motivation in the general education literature. Arguments for the reasons for differences in educational outcomes among minority students are many (Ogbu, 1978), but include a failure of ethnic minorities to make vocationally aware choices and orientations during study. Ogbu argued that this was due to minorities adopting an oppositional position to the majority culture. Expanding on this claim, other authors (Philips, 1976; Trueba, 1988) noted that minority students received their education in a learning environment that might be different from their home; such conflict led to difficulties and delays in the acquisition of the style of learning that was required to master particular curricula. With minority learners the "conditions for effective learning are created when the role of culture is recognized and used in the activity settings during the actual learning process" (Trueba, 1988, p. 282). In much the same way as the integration of motivational beliefs is needed to achieve full self-determination, Trueba noted that effective learning for minorities was contingent upon integration of the mainstream cultural values embedded in learning environments.

However, in a contrary viewpoint, a study of three international indigenous groups (including Aboriginal Australians) by McInerney, Roche, McInerney, and Marsh (1997) noted that the motivational orientations of First Nations and Western cultural majority school-aged children were more similar than they were different.

The New Zealand perspective is unique. The presence of indigenous minority (Māori) and immigrant minority (both Pacific and Asian) populations provides a novel situation in which motivation differences in these two minority populations could be assessed against the mainstream cultural majority.

After acknowledging that medical students are generally highly motivated individuals, attention must turn to ways in which this can be maintained or enhanced during the course of their studies. The obvious candidate is the curriculum, which as noted by Kusurkar, Ten Cate, et al. (2011), is unique to a medical school in terms of delivery, content, the hidden curriculum, and clinical transitions. The following section details these areas of interest and their relationship with motivation.
Curriculum Delivery Methods

It has been previously noted that “medical training is becoming more student centred, with an emphasis on active learning rather than on the passive acquisition of knowledge” (Jones, Higgs, de Angelis, & Prideaux, 2001, p. 699). The publication of the 1993 report by the General Medical Council (1993), Tomorrow’s Doctors, provided an impetus for change by advocating for an approach to medicine that is self-critical (i.e., a more fully internalised form of motivation). This was most commonly manifested through the delivery of the medical curriculum which has largely changed from a didactically-delivered process to one of active learning with problem-based emphases.

Problem-based learning curricula. Newble and Entwistle (1986) hypothesised that medical schools with problem-based learning (PBL) curricula (where medical students work together in small groups to solve real clinical problems, rather than attending didactic lectures on those topics) encouraged more advantageous learning practices compared with traditional curriculum medical schools. A modified Lancaster Approaches to Studying Inventory (LASI) was administered to first-, third- and fifth-year students at the University of Adelaide (which had a traditional curriculum) and the University of Newcastle (which had a problem-based curriculum). Students from the University of Newcastle rated themselves higher on a deep approach to learning than students from the University of Adelaide, although only statistically significantly so in the first- and third-year students. The lack of a difference in fifth-year students suggested a natural progression in deep learning strategies over time irrespective of the preclinical learning environment attributes. The lack of a statistically significant difference in fifth-year students might be also explained by the observation that students in this year had a much more apprentice-like role on the ward and spent little time in the university setting, and were therefore less influenced by those environmental cues. Learning approaches were less applicable in clinical learning environments where the hidden curriculum was proposed to play an outsized influence: “unstated or hidden goals may be more powerful motivators for learners than explicit institutional goals” (Mann, 1999, p. 238), and also that “observational studies of ward teaching have revealed that much of the teacher-student interaction rarely rises above a request for factual information or an exercise in gamesmanship” (Newble & Entwistle, 1986, p. 172). These findings suggested a poorer and less supportive learning environment that would encourage de-integration of motivation toward introjected or external regulation.

However, like Vu and Galofre (1983), Newble and Entwistle felt that examinations were primarily responsible for this difference over the curriculum and the learning environment. The rationale for this assumption was principally because of previous evidence (Newble & Jaeger, 1983) that changes in examinations produced changes in student learning, in contradiction to
changes in learning advanced by teachers. This altered the concept of the teacher’s learning style trumping the classroom environment; examinations appeared to be the ultimate arbiter.

To further clarify the situation, White (2007) conducted semi-structured interviews with 36 students from a PBL curriculum school and a traditional curriculum school. At medical school entry, irrespective of their medical school, both groups self-reported learning behaviours that could be attributed to extrinsic motivation, a result referenced as “the indisputable value of grades in admissions processes in most medical schools” (White, 2007, p. 286). Interestingly, PBL students described an initial struggle to adapt their learning strategies to manage the PBL curriculum. These difficulties were largely sorted out within the first semester, after which time students were noted to have developed a sense of control over their own learning, having acclimatised to the PBL environment. In contrast, traditional curriculum students noted that the strategies used in their undergraduate premedical years served them well during their medical studies. The learning focus in the PBL curriculum was that evaluations were facilitative rather than punitive; an absence of competition for grades led to greater focus on achieving self-selected learning goals. This could be easily distinguished from the conclusions of the traditional curriculum students who had external learning objectives. They relied on the school to tell them what they needed to know. While PBL students would focus on learning, traditional students would focus on the only item in their learning sphere that they felt they could control: grades. As noted by White (2007):

> When learners rely on others for their learning they look for cues about what to learn and how to learn it; they focus on trying to figure out what teachers want from them, and on what they will be assessed. This is poor preparation for independent, lifelong learning.

(p. 295)

Both sets of students reflected on the transition to clinical studies. Whereas PBL students had initial struggles following their pedagogical shift in their first year at medical school, they had an easier transition in later years to clinical studies, contrasted with their traditional curriculum student colleagues who struggled at this transition.

In a study of awareness of PBL curricula, Popovic (2010) asked first-year medical students whether they knew that some medical schools used a PBL curriculum and others used a traditional curriculum. There was no statistically significant correlation between students’ knowledge about the curriculum of their university and their subsequent choice of university. However, there was a statistically significant but weak correlation between knowledge of the curriculum and social affluence, such that the more affluent a student was the greater their awareness was. This finding had specific implications in admissions policies, where a well-diversified (both ethnically and socioeconomically) student population was desirable (Mitchell, Shulruf, & Poole, 2010). Less affluent students ran the risk of becoming less astute in selecting
As an extension of PBL curricula, Woltering, Herrler, Spitzer, and Spreckelsen (2009), using a group of third-year students, compared classic PBL learning to blended learning (BL), which was described as a combination of face-to-face classes and e-learning modules. The stated aim was to apply “the idea of BL to PBL in a way that preserves the benefits of PBL and reduces some of its problems” (p. 726). Classic PBL consisted of two tutored sessions around a period of self-study. BL consisted of an initial meeting of the group without a tutor, a period of individual study with online learning collaboration, and a final tutored session in common with classic PBL. At a later date students completed a questionnaire designed by the authors asking about motivation, satisfaction, and subjective learning gains. This was supplemented with qualitative data collection. Students rated BL statistically significantly higher in motivation and satisfaction. Tutor quality was rated statistically significantly higher in the BL group even though the tutors were the same in both groups. Students in the BL group were able to review tutor comments in their self-study period and had perhaps used this feedback as an additional source of learning that was not available to their classic PBL colleagues. This was potentially supported by a trend toward a statistically significant finding of tutors committing more time to the BL group. When medical students rated tutors as autonomy supportive, these medical students became more autonomous with respect to their learning, and felt more competent (Williams & Deci, 1996). However, Woltering and colleagues noted no statistically significant difference in outcome measures of the two cohorts. Having said that, the outcome data consisted of only two multiple-choice questions in the final examination for the module in which the experimental condition was studied. The risk of a Type II error in this situation was particularly pertinent. The authors acknowledged that further comparative assessment of learning outcomes was required in the future.

Tomorrow’s Doctors strongly encouraged the continued adoption of learner-centred and problem-oriented approaches to curriculum delivery, and noted medical schools were already reducing their reliance on didactic delivery of material (General Medical Council, 1993). The following subsection will explore the effects of changes in curriculum learning goals on motivation.

**Changes in curriculum learning goals, delivery, and grading.** Formerly, the Southern Illinois University School of Medicine had an objectives-based mastery curriculum that included specific educational objectives defining learning needs and assessments, compared with the Saint Louis University School of Medicine which had a traditional curriculum and no such learning objectives. Approximately 150 students from both universities were administered an Inventory of Learning Processes (ILP) questionnaire (Vu & Galofre, 1983). There were no statistically
significant differences between the cohorts with respect to their Medical College Admissions Test (MCAT) scores or GPA. The ILP scores from the objectives-based mastery curriculum were statistically significantly different from those with a traditional curriculum. Univariate analyses showed statistically significantly higher scores on synthesis analysis, elaborative processing, and study methods for the objectives-based mastery curriculum students. The traditional approach of Saint Louis University School of Medicine led to deleterious effects on development. Students at this institution were more likely to convert facts into rules of thumb and tended to memorise materials given in class notes rather than seek to understand the principles. However, neither set of medical students, irrespective of their curriculum, adhered to study techniques that conventional wisdom deemed to be conducive to learning. Students did not read beyond what was assigned in class and preferred to read a summary of an article rather than the entire original. Furthermore, in spite of advice against this, they would cram for exams. Vu and Galofre (1983) conceived that these findings suggested that students in the first two years of medical school did not possess appropriate study habits and neither did they develop these over the course of the early curriculum, in spite of differences in ILP scores. The reason that an underlying difference in motivation did not produce sufficient study abilities was not completely explored, but the authors singled out assessment as one potential raison d’être for this lack of change: “The structure and frequency of examinations in medical curricula may inhibit even the most self-confident student from learning in his own way” (p. 609).

During the past decade, the University of Otago in New Zealand has changed from a normative-referenced grading system where students are given letter grades and percentages (tacitly allowing comparisons amongst students) to a criterion-referenced system where students are compared against an explicit standard of “fail”, “pass”, and “distinction” (Wells, Wells, & Bushnell, 2007). Criterion-based assessment is considered as important as a mastery-based teaching programme, where feelings of having been in control of one’s own time allow and support more efficient cognitive processing, more positive affective responses, and more persevering behaviour (Tan & Thanaraj, 1993). Wilkinson and colleagues sampled all students from years two through five prior to, and two years after, the introduction of the new grading system. By the nature of the design and the cohort sampled, a number of the sample in the second data collection were repeated measures, although this was not explicitly sought by the authors. Respondents were asked to diarise their learning activities over a random three-day period and note each hour of study activity and the reason and motivation for doing so (students were also asked to indicate if they were doing this because they wanted to or because they had to). Respondents also completed questionnaires which measured motives and strategies of surface, deep, and achieving learning styles.

---

10 Keeping the “study activity” interpretation sufficiently broad allowed the authors to overcome the criticism of the earlier definition of homework from Thomas et al. (1991).
A weakly negative statistically significant correlation was seen between deep learning motives and increasing year level in the normative-referenced cohort, with a similar weakly negative statistically significant correlation in competitiveness with increasing year level. No statistically significant change in the deep learning motive was seen in the cohort following the change to criterion referencing, although the negative correlation as year level increased was attenuated. The correlation in the normative-referenced cohort may have indicated a lassitude in these students over time to deep motive study methods, although the continued comparison to one another was not the obvious culprit, as evidenced by the lack of a competitive element, and perhaps this finding represented an internal weariness which approximated a mastery–avoid orientation. This conclusion was supported by the additional finding of a statistically significant interaction between total time spent studying and year group. Students in the second and third year spent more time studying than those in the fourth year (although this finding was only documented for the criterion-referenced students; no statistically significant differences in total time spent on study existed between the two cohorts). No causal attribution could be easily made. Although assessment change was certainly a major shift in the students’ learning environment, the Hawthorne effect (Wickström & Bendix, 2000) describes the situation where an intervention captures the attention of students and teachers alike, and it is the attention itself, notwithstanding the value of the intervention, that has the beneficial effect. Therefore, the increased scrutiny on students’ studying habits themselves may have been responsible for the changes noted.

In spite of the outcome and subsequent changes in curriculum prompted by Tomorrow’s Doctors, Albano et al. (1996) has shown that medical students in different countries and different curricula show startlingly similar outcome scores at the end of medical school. Ten Cate et al. (2011) commented that, instead, the energy invested in curriculum development might be better spent in the discovery of ways to stimulate autonomous motivation. Additionally, the feelings of medical students about differences in, and changes to, curriculum delivery have not been explored previously.

An additional factor in curriculum delivery is the hidden curriculum which as noted by Hafferty (1998) has failed to be reformed in the way the tradition curriculum has. This is in part due to the pervasive nature of the hidden curriculum, which remains an unchecked “learning environment” through which motivation is shaped.

The hidden curriculum. The hidden curriculum has been recognised since the 1950s as an alternative process at work within medical education settings, and one that has a large influence on the development of professional values, motivation, and approaches to study. The effect has often been described as having a “more powerful influence … than explicit content knowledge” (Christianson, McBride, Vari, Olson, & Wilson, 2007, p. 1080). The hidden
The hidden curriculum might not only affect the way that medical students interact with patients, but the way they themselves are viewed by their colleagues, which could reinforce negative thoughts about themselves. In the House of God (Shem, 1979), one of the Laws of the House of God (i.e., the hospital) states: "show me a medical student who only triples my work and I will kiss his feet". Hafler et al. (2011) noted that feedback and evaluation can influence student behaviour, outside of the formal curriculum intention. If feedback and evaluation in the formal curriculum seek to improve motivation and integration of knowledge, the intention of hidden curriculum feedback and evaluation introduces an unknown into this relationship, and in a similar fashion to Crandall and Marion’s assertions, may undermine these processes.

Transitions from the preclinical to clinical curriculum. The change from the preclinical to the clinical curriculum in medical school could be difficult on students in their attempts to bridge the gap between the theoretical and clinical phase of the curriculum (Prince, Van de Wiel, Scherbier, Van der Vleuten, & Boshuizen, 2000). Prince and colleagues noted that changes in curriculum design over the past 50 years have been largely restricted to the preclinical curriculum, while the clinical curriculum has maintained a largely intact apprentice-shaped model. These authors demonstrated that the transition could affect learning progress through a finding of a marked decrease in final year students’ ability to apply biomedical knowledge in the clerkship period. This was felt to reflect a crisis or block in their learning rather than forgetting previously learnt material. In a clerkship setting students were asked to synthesise material in a way that may not have previously been asked of them. Methods for mitigation of these difficulties have been suggested through increasing clinical contact before the transition, which has previously been shown to increase levels of motivation (Van de Wiel, Schaper, Scherbier, Van der Vleuten, & Boshuizen, 1999). That is, motivation acts to inoculate students against crises in learning.

In Prince et al. (2000), 20 final-year students were interviewed regarding their views on the transition from theory to practice. Although this was a small sample of the total class numbers, their progress test results were of a similar distribution to their remaining 130 class members and the authors felt this indicated a representative sample. Additionally, independent focus groups tended to agree with one another, which reflected a saturation of opinion. The overwhelming initial comment of the students reflected their feeling that their own level of

---

11 As a training or practising physician, teaching medical students forms an integral part of the job description, and this can lead to significant demands on the physician’s time in addition to that of his or her clinical workload.
knowledge was insufficient, especially in regard to anatomy, pharmacology, and interpretation of laboratory tests. Although the authors did not specifically reference students’ motivation changes as a result of these difficulties, it was noted that students corrected this insufficiency with learning in the clerkship period that was “driven by curiosity and exploration” (p. 114) (i.e., intrinsic motivational behaviours). Therefore intrinsic motivation acted as both a prevention and a cure when it came to transition periods.

The disciplines that respondents in Prince and colleagues’ study noted to be insufficient had indeed been covered in the preclinical curriculum, but students had paid little attention to them because they had not seemed interesting at the time, and the relevance of these disciplines had been unclear. A paradigm shift in learning was noted. Students felt that the preclinical curriculum reflected an evolution from theory to practice; however, in the clinical curriculum it was felt that one worked from practice to theory: “It is totally reversed, now I have to think from symptoms, whereas I used to study from diagnoses” (Prince et al., 2000, p. 112). Prince and colleagues noted that contrary to expectations, the PBL curriculum failed to bring about the integration of basic and clinical sciences. This lack of integration alluded to a more extrinsic form of motivation in the preclinical years, and suggested that an intrinsic motivation to learn was somewhat contingent upon patient exposure, whether this was in an actual clinical setting, or as in the case of the student response above, in a new approach to learning.

Chessell (1986) reflected that some information in the early curriculum was not “valued highly by the students in isolation from its wider clinical context and is, therefore, processed superficially in order to pass the necessary exams” (p. 129), which also mirrored the assessment of Newble and Entwistle (1986) that “a learning task perceived to be irrelevant … reinforced the use of the surface approach and, indeed actually induced those students whose preference was to use the deep approach to adopt the surface approach [emphasis added]” (p. 170). Thus not only the environment of the teaching, but the wider context of how that teaching fits into the educational and professional development of the student, was relevant.

Historically, Mattick and Knight (2009) noted that the transition from a preclinical to a clinical curriculum was sharply demarcated on the basis of learning around real patients. Patients in clinical settings were noted by other authors to provide a context for basic science knowledge (formal knowledge of illness/schemas plus experiential knowledge based on prior experience) and allowed development of clinical reasoning (Mann, 1994; Norman, 2006). An additional study by Diemers, Dolmans, Verwijnen, Heineman, and Scherbier (2008) investigated the degree of “patient exposure” (from a paper-based fictitious PBL patient to real patients) required to bring about motivational change using a purposive-sampled, qualitative study with three focus groups of eight students. This method had an inherent bias in weighting groups with motivated and eager respondents and potentially produced more extreme viewpoints. In the
focus groups, students reported that real patient contact over simulated patients motivated them to study, created understanding of the effect of illness on patients’ lives (i.e., aided in the development of empathy), promoted professional socialisation, and stimulated memory processes. Diemers and colleagues noted that respondents mentioned a strong desire to prepare for an interaction if they knew a patient was going to be involved, to avoid looking like a failure in front of the patient. This indicated that patients, as well as being a positive learning experience, could also potentially orient learners to a mastery–avoid orientation. *Tomorrow’s Doctors* encouraged the earlier integration of real patient narratives into medical curricula. However, as yet there has been little research on the effect of this on more junior medical students.

The development of expertise was noted by Perrott et al. (2001) as a factor that was required in professional studies. An internal locus of control and metacognitive strategies (being cognisant of one’s own learning processes, which Sobral (2004) had previously shown to be moderately statistically significantly correlated with autonomous motivation) were vital in this transitory period.

Even more impermanent than the curriculum as an influence on motivation is the effect of the “learning environment”: the goals, structure (the workload, mode of assessment), and culture of an organisation (how the environment encourages students to behave towards one another).

**The Learning Environment**

Newble and Entwistle (1986) discussed the concept of the teaching-learning process. Although the authors recognised that medical student learning characteristics were relatively stable and reflected a preferred approach to learning, an influence existed from teaching and departmental characteristics that might cause students to vary their approach to learning in response to these influences. Although the authors noted terms such as “deep approach” and “surface approach”, these could easily be synonymous with intrinsic and extrinsic motivation respectively. For instance, the deep approach was defined as “the intention of actively seeking out the author’s meaning … [students] related the new ideas to their previous knowledge and personal experiences” (Newble & Entwistle, 1986, p. 164), which parallels an integrated motivational approach.

Although not empirically tested, Newble and Entwistle referenced a theoretical “onion model” first proposed by Curry (1983), where student motivations were more concrete and fixed the more internalised they were. The innermost layer was concerned with cognitive personality style, the middle layer with information-processing style, and the outermost layer with
instructional preference. Newble and Entwistle asserted that the educational environment had the greatest effect on the outermost layer, and virtually none on the innermost. In addition to the environment, assessment could produce changes in learning in direct contravention of the learning style (i.e., motivation) promoted by the teacher, reinforcing the earlier view that assessment trumped the teacher and learning environment. The change in the student's learning style might be temporary in response to an immediate threat such as an exam or assignment, or could be incorporated into a new steady state for the student (Newble & Hejka, 1991). The subtle yet real bond between teaching and assessment in fostering a coherent and coordinated learning style was noted: “A failure to provide an appropriate assessment scheme would undermine any attempt to introduce change through reform of the curriculum or teaching methods” (Newble & Entwistle, 1986, p. 171). This was nicely reflected in a keynote speech from Ian Hart at the Association for Medical Education in Europe conference where he stated that “students don't learn what you expect, they learn what you inspect” (Hart, 1998). Additionally, controlled learning environments, which are typical of health professional programmes, rely on superficial strategies (i.e., extrinsic motivation orientations) when students were under pressure to attain certain grades (Perrott et al., 2001). Perrot and colleagues sampled first year medical students using a modified version of the Achievement Goals Survey (Archer, 1994) and noted a paradoxical finding of a higher degree of an internal locus of control in performance learners, which on the face of it, would suggest that intelligence in these students was not necessarily seen as a fixed trait. However, this discrepancy probably reflected the influence of assessment on the individuals' native learning style.

Student motivation toward learning and epistemology does not develop in a vacuum, but in an ongoing relationship between the student and the learning environment. Once one postulated that the teaching and assessment environments were shaping and transforming motivation orientation, it became incumbent upon teachers to address failing students (Lonka et al., 2008). Baldwin et al. (2012) noted that one of the tenets of self-determination theory was that medical students needed opportunities to make decisions and learn from mistakes within a supportive environment.

With respect to the undergraduate experience as a whole, Dubin and Taveggia (1968) analysed 91 comparative studies and found no statistically significant difference in examination performance between independent study groups, lecture groups, and discussion groups. These authors concluded that the power of learning elements common to all students (i.e., the environment) eclipsed the influence of the contribution of other more individual or small group approaches. Given the methodology of their study, and the established link between motivation

---

12 Learning that is sequential and subjects must be completed in a particular, dictated sequence in order to progress. This is compared with typical undergraduate studies where subjects are relatively isolated from one another and progression is not as contingent on earlier success.
and the learning environment (Deci et al., 1991), it is not unreasonable to assume that Dubin and Taveggia’s findings can be extrapolated to a more contemporaneous setting.

Inasmuch as the learning environment has an influence on the motivation of individuals, so too do other external environments, including the family. In a study (Amin, Tani, Eng, Samarasekara, & Huak, 2009) of second- to fifth-year medical students at the National University of Singapore, it was noted that not losing face was a deeply-ingrained trait among Singaporean Chinese populations. In response to a questionnaire developed by the authors, “Family expectations” was second only to “Finding an interesting and challenging job” as a motivation for attending medical school, both of which are controlled motivations. Respondents felt it was important to compare their own knowledge with peers, and perform well in class tests and exercises (although it is unclear whether this goal was for students to be able to rank themselves against their peers). Only 20% of students felt comfortable asking questions in the classroom (compared with 44% who did not feel comfortable), although the majority felt that asking questions in class was unnecessary to get better grades, and was associated with a risk of looking foolish in front of peers. The perception of risk indicated that not only did students perceive a performance environment, but more specifically a performance-avoid distinction. In spite of these thoughts, respondents felt the most important factor that a future employer valued was an “ability to think on my own feet”. This reflected a cognitive dissonance between student behaviours in medical school and the desired outcome.

In a study at the Birmingham Medical School, Popovic (2010) surveyed 436 students and investigated why ethnic minority students (British Pakistani and British Indian) were overrepresented in a failing cohort. Among the questions asked were those pertaining to motivation for medical school. There was a statistically significant difference for ethnicity in response to the question “Other people have persuaded me to study medicine”, where Pakistani and Indian students were more likely to strongly agree or agree with this statement. Additionally, “I have chosen to study medicine because I want to be respected” had a similarly statistically significant difference where Pakistani and Indian students agreed more strongly than their non-Pakistani and non-Indian colleagues. These findings suggested a relationship between an over-representation in a failing cohort, and an external source of motivation for medicine.

These two studies in non-European populations noted the influence of the learning environment, but also noted that additional influences beyond the university campus could also play outsized roles in the motivational influence of ethnic minority medical students, influences that have never been explored in ethnic indigenous minority medical students.

The effect of the learning environment as an abstract concept is certainly real, but study after study demonstrated to date in this review has shown that this imperceptible influence is
often trumped by harder and more permanent fixtures of the environment: workload, studying, and examinations; and ultimately, academic outcome.

**Workload, studying, examinations, and academic outcome.** Thomas et al. (1991) noted a triumvirate of influences on students’ study activities: demands of the course (standards, criterion requirements, tasks), supports (aids that served to prompt or sustain motivation, and engagement in demand-responsive study activities), and compensations (features of the course that acted to reduce the effects of the demands, e.g., review sessions, exam preparation sessions). Additionally, the notion of workload was a function of the amount of coursework, relative difficulty of this coursework, and the pace at which the coursework was delivered. The relationship between workload and particular study activities was not well determined. Increases in workload were associated with statistically significant non-linear increases in students’ reported engagement in autonomous study (i.e., higher order motivation), although a saturation point existed where further increases in workload were not associated with increases in autonomous study. In one particular measure, modest correlations existed between time spent doing homework and academic achievement. However, in other studies (Keith, 1982), this was reduced to only a weak correlation when ethnicity and ability were controlled for. Contrary to both Thomas and colleagues’ and Keith’s studies, Schuman, Walsh, Olson, and Etheridge (1985) have criticised the term of “time spent doing homework” as a poor measure of independent study, which did not incorporate other concepts such as revision or reading around a topic.

Newble and Entwistle (1986) noted that medical students were not failing for a “lack of intelligence, laziness, and psychological or social disturbance” (p. 334) but that they approached studying in an unusual or unproductive way and expended considerable effort even in the face of evidence that this approach was not working. Lonka et al. (2008) concurred and reflected that in the same way that positive coping strategies beget positive outcomes, task-avoidant strategies became self-fulfilling prophecies.

Examinations also provided a focus for motivation in a similar way to homework, studying, and revision. Assessment influenced cognitive aspects (the what and how) as well as operant aspects (the when and how much) of learning around examinations (Cohen-Schotanus, 1999). These terms were similar to the specific motivation orientation of students (the “what”), as well as their strength of motivation (the “how much”). Undergraduate students who expected a free recall examination (i.e., essay-type questions) allocated and used more study time, and performed better than those who expected and prepared for a recognition examination (i.e., multiple-choice questions), regardless of the actual test they received (D’Ydewalle, Swerts, & De Corte, 1983). A corollary of this finding was that students who expected an essay-type examination were observed to take a greater number of lecture notes on ideas of “higher
structural importance”, that is, more abstract and general statements, than their multiple-choice expectation colleagues (Rickards & Friedman, 1978, p. 141; Thomas et al., 1991).

Hoschl and Kozeny (1997) reflected that different personal attributes were probably required to succeed at different stages of study, yet the concept of motivation orientation as a dependent variable in approaches to study has not been explored widely in the literature.

In one study, third-year students noted that academic success in the form of class rankings was not a measure of success but rather “an indication of unselective memorisation and ability to take tests” (Robbins, Robbins, Katz, Geliebeter, & Stern, 1983, p. 853), an endorsement of a controlled approach to learning. These same students noted a discrepancy existed between the qualities necessary for one to perform in academic tests and those required for successful physician practice. Twenty percent of the students in Robbins and colleagues’ study believed that the work necessary to attain a high academic ranking was incompatible with having an active social life (which again suggested that students felt that integrated regulation was impossible for students of high academic ranking).

Medical students’ emotional maturity was seen to evolve throughout the curriculum, although the specific causes of this were not so clearly defined (Powell, Boakes, & Slater, 1987). First-year students were demonstrated to have a strong tendency towards prestige, money, and success (i.e., external rewards) using repertory grids with bipolar constructs13. Two years later students recognised a more egalitarian approach in their attitudes towards their work, taking into consideration the needs of society at large (which might not necessarily be associated with intrinsic motivation, but certainly reflected a more fully internalised approach to studying). These changes continued to develop into their fifth year, where the authors described that “for this group of students on the threshold of their careers, materialism has yielded to idealism” (Powell et al., 1987, p. 182).

Williams and Deci (1996) noted that the application of self-determination theory principles to medical education could facilitate students’ subsequent acquisition and use of medical knowledge, but also their understanding, professional development, and use of a style more conducive to later enhancement of patients’ own motivation. Williams and Deci conducted a study in second-year medical students at biomedical and biopsychosocial curriculum schools. The degree to which medical students were more autonomous with regards to their notions of causality related to more positive attitudes about the biopsychosocial model. An autonomy-supportive environment also led students to adopt more biopsychosocial attitudes and orientations, even in a biomedical curriculum school. An autonomy-supportive environment may therefore temper students who would otherwise be more inclined to a biomedical orientation. In

13 Constructs are the building blocks of one’s experiences. They were a perception which enabled one to discriminate between objects or situations based upon the degree or strength of a reaction (e.g., emotionally taxing/not taxing).
A follow-up study Williams, Saizow, Ross, & Deci (1997) completed a similar study in older, fourth-year medical students and found that an autonomy-supportive environment was associated with increased interest, and promoted perceived competence.

An additional study using a self-determination theory framework in medical education was conducted by Sobral (2004), who, in a Latin American population, measured consecutive second-year medical students over four years, and recruited a fresh sample every year. Autonomous motivation was statistically significantly correlated with an intention to continue studies. A weak statistically significant correlation was also seen with academic outcome. What this study failed to take advantage of was the opportunity for a repeated measures design where cohorts could be followed and serially sampled. Although this study might reflect valid findings related to the motivation orientation of medical students at the beginning of medical school, it makes no suggestion of what happened to these same students over time and whether or not their predominant motivation orientation continued.

Baxter et al. (2013) wished to develop an inventory of approaches to learning among health care students. Baxter and colleagues conducted an exploratory qualitative study of 18 students across a number of disciplines, which showed two major themes: intention and motivation. Intentions were practical aspects of what students wanted to achieve through their studies (e.g., to make links between theory and practice, to be competent to practice). Motivations were the reasons underlying their involvement with learning. One of the motivations was a sense of vocation. An internal locus of causality (i.e., an autonomous motivation) in undergraduate students has been associated with “career development activities” (Trice, Haire, & Elliott, 1989, p. 555).

**Vocational learning in medical students.** Mattick et al. (2009) sought to explore an alternative orientation paradigm in medical students with a vocational model, where the predominant intention of learning was to acquire “vocationally-relevant” information: “the realisation that the content of the course was needed for their future careers motivated learning for these participants” (p. 634). Medical students from two “contemporary”14 medical schools were administered the Approaches to Learning and Studying Inventory (ALSI) at the beginning of their first and second years. Those students who demonstrated a statistically significant change on their ALSI profile were invited to participate in the study, reasoning that an altered profile meant they were ideal candidates to discuss the reasons for their change. A purposive sampling method was used but the authors defended this method, recognising that they were not after a representative sample of students, but one that could give the most insight into the topic under examination. The vocational approach in medical students consisted of a combination of

---

14 Schools with a constructive alignment of curriculum design, teaching, and assessment (Biggs, 1996).
intention and motivation to acquire information to be a good doctor, justification of what to learn and in what depth (as determined by the student's perception of relevance), the ability to apply and communicate relevant knowledge to peers and patients, and to avoid harming patients. In addition, the authors also found that medical students wished to be useful in the clinical setting and make a positive contribution to patient care. This was termed “workplace utility” and was conceived of as a subtheme of the vocational approach. However, one needed to also be wary of over-interpreting the conclusions of participants who by their very inclusion had demonstrated a change in their approach to learning. Nevertheless, the question remained as to where a vocational approach fitted in regards to known theories, scales, and continua of learning. How vocational approaches would correlate with academic achievement was also unknown at this stage, especially given the increased integration of patient-centred learning earlier and earlier in the medical curriculum.

Studying medicine is not simply a commitment to a finite course of study, it is a commitment to continued learning throughout one’s practising lifetime, an act that requires a foundation of autonomous motivation to manage the competing demands of self-regulation, professional standards, and regulatory requirements. It is incumbent upon the medical school to equip their graduates with these abilities.

Lifelong Learning

Medical education was described as a continuum by Krowka and Peck (1979), a process that began with premedical studies and continued during a doctor’s practising lifetime as continuing medical education (CME); or as White (2007) remarked, “medical school is both an academic and a developmental path toward a professional life that demands independent … self-education” (p. 279). White’s comment firmly centred CME as an intrinsically motivated behaviour: continued learning for learning’s sake. A report from the Association of American Medical Colleges recommended that “a general professional education should prepare medical students to learn throughout their professional lives rather than simply to master the current information and techniques” (Muller, 1984, p. 11), which was a tacit endorsement for the development of an intrinsic motivation orientation in, and beyond, medical school.

Krowka and colleagues hypothesised that students were potentially pliable and that if they could be made to recognise the value of CME it might alter their engagement with the medical education and motivation orientation during their preclinical studies. In spite of the authors’ hypothesis, one-third of respondents failed to recognise that continued learning was a process and stated that physicians should simply be “motivated” to participate, as if this were an on-off state. In a similar disposition, 27% felt that CME was not for the purpose of improving patient care, suggesting that they viewed CME as a perfunctory activity, or as “part of the job”
(i.e., an external requirement). A majority recognised that CME was desirable, with patient care rated as being the more important reason for participation in CME rather than the acquisition of new knowledge per se. The outcomes of this paper were difficult to place in context; students recognised the need for CME but did not necessarily see it as especially relevant to them. This dichotomy might be because they failed to see themselves as physicians, or were merely repeating back what they believed they should be saying without believing it themselves. However, it did show that students were cognisant that their learning would be lifelong, whether or not they felt that it particularly applied to them at this stage. Students also failed to recognise autonomous motivational reasons for CME with many describing external and introjected reasons for why doctors should participate in CME.

To test the theory of when medical students developed strategies for lifelong learning, Newble, Hejka, and Whelan (1990) compared the results of the learning inventory questionnaires administered to medical students to modified versions administered to a random selection of training physicians (typically a minimum of five years post-graduation) and practising physicians. With respect to students, trainee and practising physicians had lower surface approaches and greater deeper approaches to learning (i.e., more autonomous motivation). The level of clinical experience did not affect this relationship (i.e., there was no appreciable difference between trainee and practising physicians, although practising physicians with postgraduate academic training had the lowest surface learning approaches of any cohort). This suggested that the foundation of a motivation orientation towards lifelong learning was laid during medical school. In another study (Wakeford, 1989), mature-age medical students were noted to be more likely to have a doctoral or equivalent research degree, which suggested that the difference in physicians with postgraduate academic training might also begin at this early stage.

Concerns about the discord between what students should learn and how they should learn (especially around the development of lifelong learning habits) were addressed by Vu and Galofre (1983): "the ever-increasing development of scientific discovery, the need for medical students to become effective learners and be able to continue their own education beyond their formal training becomes indisputable" (p. 601). Vu and Galofre described three modes of learning: a principle mode (accepting information because it demonstrated a fundamental scientific principle), converger mode (the use of abstract conceptualisation and deductive reasoning to solve problems), and field independent mode (relying primarily on external referents in processing information). Principle mode was akin to surface learning, converger to deep learning, and field independent was closest to strategic learning. The authors found that students had a mix of all modes of learning, and that little difference existed between cohorts in objectives-based mastery curriculum medical schools and traditional curriculum medical schools. They also concluded that the mix of styles described by their results would not be
conducive to lifelong learning, and seemed more oriented to dealing with frequent examinations. This is a recurring problem noted by Neame and Powis (1981) to “inhibit even the most self-confident and independent student from learning in his own way” (p. 889).

Zimmerman (2000) described three components to a cyclical process of self-regulation in learning that could set the foundation for lifelong learning: forethought (feelings, thoughts, and plans prior to undertaking a learning task), performance/control (specific actions taken while engaging in a learning task), and self-reflection (feelings, thoughts, and actions undertaken subsequent to the task). Zimmerman commented on a positive feedback loop with information acquired during self-reflection influencing later tasks’ forethought and performance/control. Additionally the author felt that a student could not truly partake in self-reflective learning without having possessed an underlying intrinsic motivation. White (2007) associated intrinsic motivation with feeling in control of one’s own learning outcomes which in turn exerted pressure on expectations around future outcomes.

This was particularly important when one considered the concept of lifelong learning, especially in medical schools, like the University of Auckland, with a strong vertically-integrated curriculum, where clinical experience was integrated within a basic sciences curriculum (Dent & Harden, 2001), which supported feelings of autonomy and competence (Ten Cate et al., 2011).

Until now, this review has observed that the majority of the literature on motivation has used an approach where a construct from a laboratory setting has been validated using psychometric testing in the classroom. Middleton and Toluk (1999) criticised this approach and noted such processes risked limiting the range of goals investigated, simplifying the structure of these same goals, and failing to scrutinise interactions between goals. As commented by Dowson and McInerney (2003): “quantitative investigations of students’ goals may misrepresent both the complexity and dynamism of students’ motivational goals” (p. 92). Dowson and McInerney also noted a difference between goals theoretically proposed in the literature, and those that were actually conspicuous in a learning environment. A context could be ascribed with qualitative data, which the following section will seek to outline.

### Qualitative Research in Motivation Including Medical Education

A sizeable minority of researchers in the education literature recognises that quantitative and qualitative methodologies are complementary and enable consolidation and clarification of data that might be incompletely described when using a single methodology alone (Glesne & Peshkin, 1992; Patton, 1990); “there is a need for research employing methodologies other than quantitative, survey-based methods that can capture the complexities of motivation” (Van Etten, Pressley, McInerney, & Liem, 2008, p. 812). Within a qualitative approach, a consistent definition
of motivation does not exist, as the definitions and themes of an individuals’ motivation only become apparent during data analysis (Shedivy, 2004). The advantages of a qualitative approach over traditional self-report studies is the ability to interpret and integrate multiple factors that influence motivation, where motivation could be regarded as a process rather than a solid state (Dörnyei, 2004).

Multiple goal orientations were noted by earlier researchers (Lemos, 1996; Pintrich, 2000c; Wentzel, 1991), although this primarily related to one-dimensional goal combinations. Dowson and McInerney (2003) showed that multiple-dimensional goal combinations are also present, and interacted with immediacy rather than causality as previously assumed (i.e., a behavioural goal influenced a cognitive goal which influenced a social goal). These authors used an inductive approach, without an *a priori* hypothesis, on learning goals in children in their early teenage years. A thorough saturation of qualitative methods was used to ensure the emergence of a robust model, and they noted a modifying set of goals (behavioural, social, and cognitive) that overlaid the traditional mastery and performance orientation dynamic. This qualitative study allowed the accurate delineation between academic and social goals: an academic goal relied on an academic purpose for achieving in an academic setting, whereas a social goal relied on a *social* purpose for achieving in an *academic* setting, not a social setting as previously supposed by others (Dodge, Asher, & Parkhurst, 1989). In the multiple-dimensional model, all goals were referenced simultaneously and without precedence: “I don’t care (affect) whether I understand or not. I just know (cognition) that I’ll get a good mark if I copy everything (behaviour) the teacher writes up” (p. 108).

Qualitative studies were also useful with longitudinal, serial data where a narrative could be established. Goals were shown to be dynamic constructs that changed over time. In an interview study of secondary school students, only 17% of students kept a consistent goal orientation over a three-year period (Järvelä & Salovaara, 2004). Other students were divided into “slight change” and “apparent change” groups. These groups reflected students who held multiple goals, sometimes in parallel and other times in succession. Fifty percent of respondents experienced all three types of goals measured (mastery, performance–approach, and performance–avoid) at some point during the study. At times when students demonstrated performance–avoid goals, they noted statistically significantly fewer learning strategies than when performance–avoid goals were not expressed. The corollary was seen with mastery goals. When these were expressed, students had a statistically significantly greater number of learning strategies at their disposal. Interestingly, the actual calibre of the strategy was not related to their underlying goal, only the diversity of the strategies used (i.e., even performance–avoid goal holders used deeper learning strategies, just *fewer* of them).
It is an oft mentioned maxim that grades are of paramount importance to college students in the United States (Horowitz, 1987). In an inductive, ethnographic study by Van Etten et al. (2008), the motivations of undergraduate senior students were studied. The authors confirmed that seniors had two distal goals: grades and graduation. Grades were even more important in situations where they were deemed to be particularly pertinent (e.g., in students who intended applying for graduate school). Pleasingly, students also reported greater motivation towards grades when they were graded based upon personal improvement rather than class comparison. However, the motivation towards grades could be undermined if the course was too hard (i.e., the prospect of getting a good grade was deemed to be not worth the effort expended), or if the course was too easy such that a good grade was not a discriminating feature—both examples of which returned to the earlier work of Atkinson (1957). Proximal influences were also noted. These were broadly classified as internal or external factors. Internal factors were students’ characteristics, and students’ thinking. External factors included academic factors, social factors, course and assignment characteristics, the college environment, and extracurricular participation. All of these factors potentially interacted in concert and modified the student’s motivation towards these distal goals.

Moving to the medical education literature it is worthy to note that the literature base for qualitative research in motivation specifically in medical education is thin. The study cited below was the only one that could be located that used a qualitative methodology. A study of 18 penultimate- and final-year medical students investigated their perceptions about progression through medical school (Todres, Tsimtsiou, Sidhu, Stephenson, & Jones, 2012). One of the themes to emerge was the concept of reflecting on learning and experiences. Reflection has been proposed by Cruess and Cruess (2006) as an essential element for the development of professionalism, and is an essential component of autonomous motivation. Higher achieving students were noted to change their approach to learning tasks through reflective practices, whereas their lower achieving colleagues used the same approach they had always employed and only changed if and when reflection took place as a result of failing. Additionally, lower achieving students noted a difficulty in approaching peers and lacked a resilient social network that could help them in dealing with difficulties. The differences in coping mechanisms between the two groups of students were also noted. Lower achieving students tended to catastrophise setbacks. On the other hand, higher achieving students with their social networks tended to brush off setbacks and continued:

I also have quite a positive way of seeing things so if something really bad happens I don’t collapse and go woe is me, I tend to think okay something worse is going to happen in the future so it’s good this had happened now. (p. e327)

---

15 The author interrogated PsycINFO, ERIC and Google Scholar databases with broad search terms.
Although phenomenological research has traditionally not been used for broad-sweeping claims, some authors (Yeung, 2004) have suggested that it could be generalised beyond the participants alone if one employed rigorous methodology which included saturation of themes during data collection, and obtaining of multifaceted findings. However, in the paper by Todres and colleagues, difficulties in participant recruitment, and an over-representation of minority students in their lower achieving group, did indeed prevent a more extensive generalisation.

The final section of this literature review relates to the second psychological construct assessed in this research. Anxiety is an inescapable quality, and the literature would suggest that it is particularly prevalent in medical students (Firth, 1986; Lloyd & Gatrell, 1984). In spite of the reports of high levels of anxiety and psychiatric morbidity within medical students, and affirmations that medical school is more stressful than other learning environments, studies have not investigated the clear effects of anxiety on outcome measures in these typically high-functioning adults. Additionally, the link between anxiety and motivation orientation has not been fully entertained in the medical school context.

### Anxiety and Motivation Theory

Among undergraduate junior psychology students, anxiety has been shown to have varied effects on academic outcome that can be modified depending on the classroom learning environment (Dowaliby & Schumer, 1973). In Dowaliby and Schumer’s study it was shown that in teacher-centred classrooms (i.e., the teacher did most of the talking, and student-initiated responses were discouraged), students with high levels of anxiety fared better than low anxiety students on the assumption that a disciplined structure was well regarded by high anxiety learners. Low anxiety students preferred student-centred classrooms with their consequent lack of a formal structure.

In an extension of this study with a 2 × 2 design of classroom structure and classroom participation, Peterson (1977) tested the academic outcome of students with an additional 2 × 2 grid of anxiety and ability. High anxiety/high ability students were the most resilient and performed well in any combination of structure and participation aside from low structure/low participation classrooms. This was thought to be due to a lack of clear direction which caused these students to go off on impulsive tangents with a subsequent decline in performance. Low anxiety/high ability students had a graded response to the classroom environment. They performed best in low structure/low participation environments, less well in high structure/low participation classrooms, and worst in low structure/high participation classrooms. Low ability students (regardless of their degree of anxiety) preferred low participation classrooms. The reasons for this were not entirely clear. They might relate to a wish not to have to display their self-perceived lack of ability, suggesting that all of these students possessed a performance-avoid
orientation (although the possibility of an entire student group holding the same goal orientation based on ability alone runs contrary to the tenets of goal theory). However, as stated earlier, these learners’ preference for structure was modulated based upon their anxiety levels. Somewhat unexpectedly given the findings of Dowaliby and Schumer (1973), high anxiety students in Peterson's study preferred low structure and vice versa. In highly structured environments, high anxiety students might be frustrated by being told what they should be learning and doing, and may have faced difficulty in reconciling these expectations with their ability. Peterson (1977) reasoned that highly anxious primary school-aged students did better academically in situations where they could remain inconspicuous. In a medical school environment, remaining inconspicuous was preferred by students who neither excelled at, nor failed examinations (Radcliffe & Lester, 2003). In this setting anonymity was a strategy for the average, rather than the anxious, student.

The interaction between anxiety and outcome has not been found to be exclusive to early schooling. College students have frequently mentioned grades as a major source of anxiety in their lives (Moreland et al., 1981). One method for dealing with this anxiety is to monitor one’s own academic progress. However, as noted earlier in the review, poorer achieving students may make inaccurate estimates about what they could achieve; this could compound such that an unanticipated poor result may enhance the anxiety about forthcoming learning tasks. Moreland and colleagues noted that during examination time a general “sharpening” of anxiety levels across all students disproportionately affected poorer performing students because of this inaccurate estimate leading to increased anxiety feedback loop.

Wicklund (1975) noted that such self-evaluation itself was an anxiety-inducing event. This phenomenon, coupled with the notion that high anxiety was correlated with performance impairment in college students as demonstrated by Benjamin et al. (1981), only served to exacerbate the situation. Anxiety was thought to interfere with performance by producing task-irrelevant responses, which coupled with error tendencies, interrupted task-relevant responses and subsequent good performance. However, Benjamin and colleagues noted that although high anxiety students fared poorly in essay and short answer questions, they performed well on multiple-choice questions. This supports the “retrieval-deficit hypothesis” which proffered that tasks requiring limited retrieval (i.e., multiple-choice questions) were not as prone to influence by anxiety. This finding was further supported by Naveh-Benjamin, McKeachie, and Lin (1987) who recorded that high anxiety students had poorer cognitive organisation of learning concepts, and thus their anxiety towards assessments was not solely a personality trait, but also reflected a cognitive discrepancy between them and other less-anxious students. Reflecting on the claims of Wicklund, Tobias (1985) noted that increased anxiety around examinations in poorly-performing students was an indication of their metacognitive awareness of their inadequate
grasp of material. What Wicklund and Tobias both failed to reconcile was the outcome, or metacognitive awareness, of the high anxiety yet capable student.

The concept of high anxiety being divorced from cognitive and study ability has been seen in non-evaluative situations where highly anxious students with good study habits have performed well, whereas highly anxious students with poor study skills performed poorly in non-evaluative and evaluative situations (Covington & Omelich, 1987; Naveh-Benjamin et al., 1987). Additionally, programmes aimed at reducing anxiety have not necessarily led to a contrasting increase in cognitive performance (even if the programmes led to increased subsequent test performance). The negative effects of anxiety on academic outcome have not been restricted to objective scores; subjective scores of medical students during their clinical rotations have also been influenced by anxiety and stress (Spiegel, Smolen, & Hopfensperger, 1986). Additionally, anxiety has been shown to play a particular role in tempering learning in a clinical environment. Schultz and Dangel (1972) noted that the anxiety of being called upon to answer questions in front of others could facilitate learning in some individuals and debilitate it in others.

Self-awareness is crucial for the development of autonomous motivation, but in association with high and unrealistic standards and constant self-criticism, can lead to a state of quixotic perfectionism through constant self-evaluation and self-appraisal (Blatt, 1995). Rice, Leever, Christopher, and Porter (2006) proposed that two types of perfectionists existed: maladaptive and adaptive. The maladaptive form tended to be stable over time (compared with adaptive forms which tended to peak around times of particular stress; e.g., end of semester). In spite of the proposed stability, maladaptive perfectionism was prone to worsening of the emotional facets of this behaviour (e.g., excessive concerns about making mistakes, self-doubt). However, others (Flett & Hewitt, 2002) have argued that this is the great contrivance of perfectionism: facets that might seem positive or healthy only appear so when stress is low; at times of high stress these same facets are revealed to be dysfunctional. Rice et al. (2006) also noted a relationship between perfectionism and social connectedness. Maladaptive perfectionist students had less of a social network; this might go some way to explaining their apparent detriment at times of stress.

The association between anxiety and mastery and performance-approach orientations has been poorly characterised (Pintrich, 2000b; Wolters et al., 1996). However, performance-avoid goals have been shown to be positively related to anxiety (Elliot & McGregor, 1999). This relationship somewhat explains the previously described interaction between anxiety and outcome, where goal orientation has been shown to mediate this interaction. In a study by Pekrun, Elliot, and Maier (2009) with undergraduate students, it was confirmed that performance-avoid goals were a positive predictor of anxiety, and anxiety was a negative
Levels of Stress and Anxiety in Medical Students

Benchmark studies have confirmed a high rate of psychiatric morbidity in medical students in the United States (Lloyd & Gatrell, 1984), where up to one-fifth of students met diagnostic criteria. In a contemporaneous British study which used a comparative population of unemployed youth, psychiatric morbidity was three times more prevalent in medical students (Firth, 1986). At the more severe end of the scale (scores greater than 10 out of 15 on the Stress Incident Record), medical students were over 10 times more likely to report worrying levels of stress than the comparative population. More recently, Dahlin, Joneborg, and Runeson (2005) performed a matched study with an age- and gender-matched sample (although not educational level-matched), which suggested less sharply delineated, but still statistically significant, differences in self-reported depression (12.9% in medical students compared with 7.8% in the matched population).

Although Firth (1986) had a high response rate across a number of different universities (both urban and rural), there were statistically significant differences in the levels of stress across the sample sites, which was not unexpected given that the extracurricular stressors in provincial areas were different to those in urban settings, but did limit the reliability of the results. Reassuringly, the number of students with pathologically high levels of stress did not differ between university sites. This might suggest that particularly high levels of stress were a curricular, rather than extracurricular phenomenon. This finding provided a potential avenue for stress management. Coping efforts that used engagement strategies (problem-solving, cognitive restructuring, social support networks, and expressing emotions) were negatively correlated with symptoms of depression (Mosely et al., 1994).

Interestingly, male students have reported statistically significantly fewer stressful events than their female colleagues (Firth, 1986). These findings have been replicated in other
studies where higher rates of stress and depression have been reported in female medical students (Dahlin et al., 2005).

Dahlin and colleagues also showed that measures of stress and anxiety have typically shown higher levels in the first year of medical school compared with later years, although the specific factors and items on anxiety scales have differed depending on the stage of the student.

**Changes in Stress Across the Medical School Journey**

A drop off in psychological morbidity between the first and second year was also seen in a study by Sreeramareddy et al. (2007) and was attributed to a gradual adaptation of students to the demands of medical school. These authors used a well-validated measure in a sufficiently large sample to suggest sufficiently wide applicability of their findings. The only caveat would be the ethnic makeup of their participants; given the location at a Nepalese medical school, the participants were largely from the Indian subcontinent.

There have been suggestions that the clinical years are more stressful than the preclinical years (Spiegel, Smolen, & Jonas, 1986), although Firth (1986) argued that it was the total exposure of stress that was important (and as a consequence of the longer medical degree, more relevant). Additionally, the best predictor for later psychological morbidity during clinical years has been shown to be the presence of similar morbidity in the first year (Guthrie et al., 1998).

Sreeramareddy and colleagues noted an increase in psychological morbidity during the clinical years as the curriculum progressed (although the levels never reached the height of stress at the outset of medical school). Regardless, the clinical years were a time of particular interpersonal stressors. Spiegel and colleagues noted that the intensity of interpersonal stress in the clinical environment was negatively correlated with students’ satisfaction with their clinical training. However, these findings were tempered by the fact that non-responders to the questionnaires in the study were noted to have statistically significantly lower academic performance to their responding colleagues. Given the aforementioned relationships between stress and academic outcome, this would lend credence to the idea that the non-responders were also more stressed, a supposition supported by other studies (Vernon, Roberts, & Lees, 1984). Particular stressors during the clinical years included the process of socialisation into medicine; a lack of guidance; and clinical transitions both from the preclinical to the clinical years, and into the workforce after graduation (Radcliffe & Lester, 2003). The major limitation of the Radcliffe and Lester study was that it used a qualitative methodology and noted students’ self-reports of stress through semi-structured interviews and not through validated scales which stratified stress. The opportunity exists for a study to use a mixed methods approach to circumvent these
Certainly, such a study design with repeated measures would be well-placed to comment upon evolution of and potential mitigation of anxiety within medical students.

Opportunities for Further Research

The review has highlighted a number of potential gaps in the literature that could be addressed with further study. These related to a number of specific areas. One area that had received little attention, in part because of the uniqueness of the indigenous population of New Zealand, was the motivation, anxiety, and academic outcome effects of these two constructs in Māori medical students. As McInerney et al. (1997) have shown, First Nations people are distinctive, and assumptions about one group cannot be readily applied to another. New Zealand also provides an opportunity to study these same measures in both indigenous minority and immigrant minority students (e.g., Pacific and Asian students). Covington (2000) noted that “the values of a dominant white middle class ... are not the only pathways to personal excellence” (p. 191), and suggested that unexplored inputs from other cultures could be equally effective and motivating.

Secondly, the presence of attenuated admission entry schemes that are also unique to New Zealand (not simply for the scheme that addresses ethnic inequalities, but additionally because of the presence of another scheme that addresses rural inequalities) also provides an opportunity for novel investigations.

Thirdly, it has been noted that graduate and older students are generally more intrinsically motivated than school leaver and younger students (Chessell, 1986; Kronqvist et al., 2007; Perrott et al., 2001). What has not been investigated is whether these continued motivation differences persist over the course of the medical curriculum. Furthermore, many of the earlier studies which investigated motivation and anxiety did so at single points in time, or with serial cohorts. The potential exists for a repeated measures design to track the changes in both motivation and anxiety within a single cohort of medical students.

Finally, qualitative studies in motivation in medical education are limited. This alone provides an opportunity to increase knowledge in this area and has the potential to provide novel avenues for further investigation in this early expanding field.

The five research questions that formed the basis for the current research were designed to contribute new knowledge to these areas of motivation and anxiety in medical students. The first hypothesis was that medical students would display differing amounts of extrinsic and intrinsic motivation, and that between groups of students based on demographic data, additional differences would be seen. Study 1, discussed in Chapter 3, was designed to assess student
motivation at multiple, discrete points in time, and determine whether students were more likely to be intrinsically motivated, and whether differences existed between groups of students.

The second hypothesis was that student motivation would change over time and become more fully internalised, as suggested by Deci et al. (1991). This is also addressed in Study 1, which was designed with repeated measurements to track changes in individuals’ motivation and that of groups of individuals.

An earlier study showed that as well as being highly motivated individuals, medical students were also more stressed than their non-medical colleagues (Guthrie et al., 1998). The third hypothesis of this research was that anxiety, in a similar fashion to motivation, would differ among the various demographic groups (e.g., age, sex, mode of entry, and ethnicity). It was proposed that at times of higher anxiety, these states would bring about motivational change. Study 1 was also designed to answer this hypothesis through serial measurements of the original questionnaires.

The fourth hypothesis to be addressed by this research was related to the relationship that motivation, motivation change, and anxiety had on academic outcome. The hypothesis was that more fully internalised states of motivation, or movement towards such a state were more likely to be associated with a positive academic outcome in terms of grades and satisfaction (e.g., Harackiewicz et al., 2002), and that higher levels of anxiety would be associated with poorer outcomes in these domains (e.g., Benjamin et al., 1981). Study 2, discussed in Chapter 4, was designed to answer this hypothesis by using the questionnaire data from Study 1 and comparing this against academic outcome data from the study participants.

The final question addressed by this research used a qualitative methodology to explore and define the various influences on medical students’ motivation. Study 3, discussed in Chapter 5, was designed to answer this question through multiple qualitative methods (e.g., free text boxes, individual interviews, and focus groups).
Chapter 3

Study 1: Motivation and Anxiety: A Two-Year Study of Change in Medical Students

“Power, time, gravity, love. The forces that really kick ass are all invisible.”

– David Mitchell, *Cloud Atlas*

Study 1 was designed to investigate how medical students’ motivation orientation and anxiety levels changed over the course of their two-year preclinical undergraduate curriculum, following a high stakes admissions procedure. To address the first two hypotheses of the research, the current study sought to examine the differing baseline levels of motivation and their rates of change between different age groups, sexes, ethnicities, admission schemes, and modes of entry into medical school. The study did so by gaining serial quantitative data from participants through questionnaires investigating their dominant motivation based upon self-determination theory (Deci & Ryan, 1985). The questionnaires asked participants to identify demographic data in line with the study hypotheses.

This study also addressed the third hypothesis of the research by measuring anxiety levels through serial responses to a questionnaire on test anxiety. In addition to the quantitative data gathered from this questionnaire, qualitative data were obtained from free text responses of participants in order to provide additional insight into the different anxieties experienced by medical students. In line with the third hypothesis, this study also scrutinised the relationship between motivation, motivation change, and anxiety.

Previous studies had postulated a continuous change in motivation until a steady state was achieved (Otis et al., 2005; Weiner, 1990). Others had shown that baseline differences in motivation were seen between younger and older cohorts (Kronqvist et al., 2007; Newble & Entwistle, 1986; Perrott et al., 2001). Others still had shown differences between the sexes where female students had more evolved approaches to learning than their male counterparts (Inglehart, 1987; Perrott et al., 2001). Similar differences were once thought to have existed in minority students (Ogbu, 1978), but this has more recently been attributed to a lack of recognition of differing cultural influences such as group orientation, stereotype threat, and self-handicapping (Andriessen, Phalet, & Lens, 2006; McInerney et al., 1997; Trueba, 1988). It was hypothesised that similar results in the baseline data of age, sex, and ethnicity would be seen. However, the current study ventured beyond the existing literature by using serial measurements.
Accordingly, this study addressed several previously unanswered questions: firstly, whether motivation and anxiety in medical students differed at their time of entry to medical school; secondly, whether changes in motivation and anxiety were seen over time; thirdly, if specific differences in these changes existed between different demographic groups; and finally, the relationship between motivation change and anxiety.

Method

Participants

The study population were medical students enrolled in the Bachelor of Medicine/Bachelor of Surgery (MBChB) programme at the University of Auckland. The participants were the 194 of the 213 (91.1%) students enrolled in MBChB2 in 2011 who were approached and completed the questionnaires. This cohort was longitudinally sampled at five time points during the next two academic years. At the conclusion of the study, at the end of the second semester in 2012, 210 of the original 213 students remained enrolled in the programme (an attrition rate of 1.4%).

This second-year group was deliberately sampled to reflect a student population that was fledgling in its motivational development, having come through a widely disseminated and established competitive selection procedure (Faculty of Medical and Health Sciences, 2014). The faculty provides attenuated schemes for the prospective medical school cohort to redress ethnic and societal imbalances in the medical school cohort. The first is the Rural Origin Medical Preferential Entry Scheme (ROMPE) which provides an avenue for students from regional or rural New Zealand with a view to potentially redressing workforce shortages in these areas. The Māori and Pacific Admission Scheme (MAPAS) is a second attenuated admission scheme, which resulted from a faculty commitment to the principles of the Te Tiriti o Waitangi (Treaty of Waitangi)\(^\text{16}\), which seeks to increase the number of Māori and Pacific graduates in the health profession.

Although medical school cohorts rarely reflect established population norms for ethnicity and gender (Poole, 2009), no significant differences existed with respect to ethnicity and gender numbers between this cohort and those year cohorts directly preceding and following.

---

\(^{16}\)The founding document of New Zealand signed between representatives of the British Crown and the Māori chiefs of New Zealand on February 6, 1840, through which signatories recognised Māori sovereignty, and obligated Crown entities (i.e., the government) to endorse biculturalism.
Table 1

Demographic Data for the Study Cohort

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>≤ 21 years</td>
<td>144 (74.2)</td>
</tr>
<tr>
<td>22-25 years</td>
<td>34 (17.5)</td>
</tr>
<tr>
<td>25-29 years</td>
<td>7 (3.6)</td>
</tr>
<tr>
<td>≥ 30 years</td>
<td>9 (4.6)</td>
</tr>
<tr>
<td>Ethnicity b</td>
<td></td>
</tr>
<tr>
<td>New Zealand European</td>
<td>80 (41.2)</td>
</tr>
<tr>
<td>Māori</td>
<td>30 (15.5)</td>
</tr>
<tr>
<td>Pacific</td>
<td>11 (5.7)</td>
</tr>
<tr>
<td>Asian</td>
<td>57 (29.4)</td>
</tr>
<tr>
<td>Other</td>
<td>8 (4.1)</td>
</tr>
<tr>
<td>Other European</td>
<td>8 (4.1)</td>
</tr>
<tr>
<td>Mode of entry</td>
<td></td>
</tr>
<tr>
<td>OLY1</td>
<td>151 (77.8)</td>
</tr>
<tr>
<td>Graduate</td>
<td>43 (22.2)</td>
</tr>
<tr>
<td>Admission scheme</td>
<td></td>
</tr>
<tr>
<td>Non-attenuated</td>
<td>135 (69.6)</td>
</tr>
<tr>
<td>MAPAS</td>
<td>40 (20.6)</td>
</tr>
<tr>
<td>ROMPE</td>
<td>18 (9.3)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>83 (42.8)</td>
</tr>
<tr>
<td>Female</td>
<td>111 (57.2)</td>
</tr>
</tbody>
</table>

Note. OLY1 = Overlapping Year 1; MAPAS = Māori and Pacific Admission Scheme; ROMPE = Rural Origin Medical Preferential Entry.

a n = 194.

b Coded according to University of Auckland guidelines.

Settings

The participants were sampled on three occasions in 2011 (28 February, 2011, at the beginning of semester one; 19 May, 2011, just prior to semester one examinations; 13 October, 2011, midway through semester two at a time of no particular examination or assignment burden), and on two occasions in 2012 (27 February, 2012, at the beginning of semester one; 12 September, 2012, midway through semester two, at a time where students had been increasingly exposed to the clinical environment). These times were chosen specifically to coincide with expected times of higher or lower stress. A sampling time of high stress was deliberately sought to examine the effects of stress on motivation orientation, with the hypothesis that higher levels of anxiety would have detrimental effects on motivation (Mosely et al., 1994). For example, the second sampling time was before semester one examinations; this was postulated to be a time of particularly high stress for the respondents and was chosen accordingly. The questionnaires were initially distributed in paper form for the sampling times in 2011, and an online option was
also available for the third sampling time in 2011. For subsequent sampling in 2012, the questionnaires were only delivered online (see Table 11 for response rates). Sampling was identified by a brief presentation given by the author to the class at the beginning of a lecture deliberately chosen to reflect one that would typically have high attendance, such as those on examination tips, recapitulate lectures, or those given by lecturers who consistently received teaching awards for excellence17. Potential participants were strongly advised to complete the questionnaires thoughtfully in their own time so as not to disrupt their learning, or the teaching of the lecturer who followed the author’s brief presentation. This introduction was followed up with two reminders: an email to the entire class through a bulk email message system, and a notice on the students’ shared class portal (CECIL). Both of these reminders were facilitated through third parties (a class representative, and a faculty staff member respectively) so that at no time other than the presentations did the author personally approach potential participants to complete the questionnaire.

Once the questionnaires had been delivered to the class—either physically, electronically as a Portable Document Format (PDF) version to their shared class portal, or later with an invitation to a survey website (http://www.surveymonkey.com)—sampling remained open for two weeks to allow time for the participants to complete this in their own time. With physical questionnaires participants were asked to leave these in specifically labelled drop boxes outside their lecture theatre or in a secure box in the Student Centre on the Grafton Campus of the University of Auckland. The author regularly cleared these sites. Once the questionnaire moved to an online version, completed questionnaires were stored electronically and downloaded once the sampling time had closed.

Ethical Approval

Ethical approval was obtained for this study from the University of Auckland Human Participants Ethics Committee (reference 2011/041) on 22 February, 2011, for the duration of the study (not exceeding three years).

Materials

The questionnaires were delivered either as a single, double-sided piece of A4 paper, or through a questionnaire on a webpage. Paper versions of the questionnaires can be found in Appendix A.

17 This information was publically available.
**Academic Motivation Scale.** On five occasions over 2011 (MBChB2) and 2012 (MBChB3), participants were invited to complete the college version of the Academic Motivation Scale (AMS; Valerand et al., 1992). Participants answered each question based on a five-point Likert scale. The gradations were as follows: 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree. Participants did not have to answer every question, and when the questionnaire moved to online delivery, participants could complete and finalise the questionnaire with an incomplete response.

The wording of several questions was changed to more closely reflect a medical school curriculum and a New Zealand setting (e.g., “Because with only a high-school degree I would not find a high-paying job later on” was changed to “Because with NCEA I would not find a high-paying job later on”).

At the beginning of the questionnaire, participants were asked to enter their unique University of Auckland student identification number so that their serial results could be tracked over time. If this was not completed in the paper format the responses were not accepted; in the online format, this box had to be completed to allow the entire response to be submitted. On the initial sampling time, participants were also asked to indicate their current age, sex, ethnicity, and their mode of entry into medical school. If these fields were incomplete, the author obtained this information in an anonymised fashion from the Medical Programme Directorate based on their unique student identification number.

The preamble to each question was the same: “Why I chose to come to medical school…” The purpose of the questionnaire was to determine the motivation orientation of the participants on the self-determination theory spectrum as proposed by Deci and Ryan (1985). The questionnaire was made up of 27 questions with four questions corresponding to each of amotivation (e.g., “Honestly, I don’t know; I really feel that I am wasting my time in medical school”), external motivation (“In order to obtain a more prestigious job later on”), introjected motivation (“To prove to myself that I am capable of completing my medical degree”), and identified motivation (“Because I think that a university education will help me better prepare for the career I have chosen”). Eleven questions corresponded to intrinsic motivation (“Because I experience pleasure and satisfaction while learning new things”). Reliability coefficients are noted in Table 10.

---

18The National Certificate of Educational Achievement; the New Zealand qualification for school leavers.

19Ethnicity was identified by the participant in a free text space but was sorted by the author into University of Auckland standard codes (New Zealand European, Māori, Pacific, Asian, Other European, and Other). Where multiple ethnicities existed, the author used the first ethnicity indicated by the participant; for example, “Māori and South African” was coded as Māori.
**Exploratory factor analysis.** The original description of this scale by Vallerand and colleagues suggested satisfactory levels of internal consistency (mean alpha value = .81), and stability (re-test correlation = .79). A seven-factor structure was proposed with sub-scales for amotivation, external regulation, introjected regulation, identified regulation, intrinsic motivation to know, intrinsic motivation towards accomplishments, and intrinsic motivation to experience stimulation. This has more recently been reinvestigated for construct validity (Fairchild, Horst, Finney, & Barron, 2005) and the original structure has again been supported. *A priori* predictions of relationships between scores were also supported. In line with the view that self-determination theory was not so much continuous as contiguous, a specific finding was highlighted in Fairchild and colleagues’ work which showed a lack of support for an inter-subscale simplex pattern, which the authors reflected as “a limitation in its [the AMS] theoretical foundations [of a motivation continuum]” (p. 354).

Intrinsic motivation to know describes a pleasure or satisfaction while learning or trying to understand something new; intrinsic motivation towards accomplishments describes the pleasure or satisfaction when one attempts to accomplish or create something; and intrinsic motivation to experience stimulation describes the sensation from the act of engagement in an activity (e.g., flow).

The AMS was reinvestigated for the current study using exploratory factor analysis. However, it should be noted that there are fewer responses than the 300 that would be typically required for a robust factor analysis; correlation coefficients fluctuate more so in small samples than in large ones (Field, 2009). A principal components analysis was used because the primary purpose was to identify and compute composite scores for the factors underlying the AMS. A correlation matrix was analysed for each question in the AMS to ensure that cases of major multicollinearity and singularity were not present. The determinant of the $R$-matrix was $1.73 \times 10^{-6}$. The Kaiser-Meyer-Olkin measure was .665 (above the commonly recommended value of .60). Bartlett’s test of sphericity was significant ($\chi^2 (351) = 1050.15, p < .001$); this was a measure of the null hypothesis and a significant result indicated that the $R$-matrix was not an identity matrix. Given these overall indicators, factor analysis was deemed to be suitable with all 27 items. No items were removed. The average of the communalities was .547, which fell outside of the Kaiser criterion and justified the use of the scree plot to determine the number of factors (Field, 2009).

A scree plot showed a leveling off of eigenvalues after five factors. There were eight factors with eigenvalues of greater than 1.0. However a five-factor structure was preferred because of the aforementioned leveling off on the scree plot, an insufficient number of primary loadings for the subsequent three factors, and a difficulty theoretically interpreting the sixth, seventh, and eighth factors. Initial eigenvalues indicated that the first five factors explained 20%,
14%, 8%, 7%, and 6% of the variance respectively, for a cumulative explanation of variance of 55%.

An oblique rotation ($\delta = 0$) was used to optimise the factor structure which allowed the relative importance of the five factors to be equalised. An oblique rotation was used because of the belief that factors should be correlated to one another (Field, 2009). The pattern matrix is shown in Table 2.
Table 2

Five-Factor Pattern Matrix of the Academic Motivation Scale for the Current Study

<table>
<thead>
<tr>
<th>Original AMS descriptor</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
<th>Factor 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic motivation to experience stimulation (Q17)</td>
<td>.738</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation to know (Q15)</td>
<td>.690</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation towards accomplishments (Q19)</td>
<td>.687</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation to know (Q2)</td>
<td>.653</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation to know (Q9)</td>
<td>.608</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation toward accomplishments (Q26)</td>
<td>.461</td>
<td></td>
<td>−.422</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation toward accomplishments (Q12)</td>
<td>.427</td>
<td></td>
<td>−.484</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation toward accomplishments (Q6)</td>
<td>.380</td>
<td></td>
<td>−.552</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amotivation (Q25)</td>
<td></td>
<td>.907</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amotivation (Q18)</td>
<td></td>
<td></td>
<td>.830</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amotivation (Q11)</td>
<td></td>
<td></td>
<td></td>
<td>.811</td>
<td></td>
</tr>
<tr>
<td>Amotivation (Q5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.808</td>
</tr>
<tr>
<td>External (Q21)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−.881</td>
</tr>
<tr>
<td>External (Q14)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−.806</td>
</tr>
<tr>
<td>External (Q8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−.638</td>
</tr>
<tr>
<td>External (Q1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−.534</td>
</tr>
<tr>
<td>Introjected (Q7)</td>
<td>−.382</td>
<td>−.614</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introjected (Q27)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−.862</td>
</tr>
<tr>
<td>Introjected (Q20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−.802</td>
</tr>
<tr>
<td>Introjected (Q13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−.316</td>
</tr>
<tr>
<td>Identified (Q23)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.709</td>
</tr>
<tr>
<td>Identified (Q3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.675</td>
</tr>
<tr>
<td>Identified (Q16)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.495</td>
</tr>
<tr>
<td>Identified (Q10)</td>
<td>−.493</td>
<td></td>
<td></td>
<td></td>
<td>.401</td>
</tr>
<tr>
<td>Intrinsic motivation to experience stimulation (Q4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.361</td>
</tr>
</tbody>
</table>

*Note. Factor 1 = Intrinsic motivation; factor 2 = Amotivation; factor 3 = External regulation; factor 4 = Introjected regulation; factor 5 = Identified regulation.*

With the exception of question 19, all other intrinsic motivation towards accomplishments cross loaded on an intrinsic motivation factor (1) and an introjected regulation factor (4). Intrinsic motivation toward accomplishments refers to the desire to perform an activity for the *satisfaction* that one receives from accomplishing or creating new things. Deci
and colleagues have noted that introjected regulation involves “coercion or seduction [emphasis added] and does not entail true choice” (Deci et al., 1991, p. 329). The similarity between satisfaction and seduction may underlie this relationship. Fairchild et al. (2005) also found that the relationship between intrinsic motivation toward accomplishments and introjected regulation was of similar magnitude to the relationships between intrinsic motivation toward accomplishments and the other intrinsic subscale measures. Therefore, even though two of the four questions pertaining to this subscale had stronger loading with introjected regulation, it was felt appropriate to keep the entire subscale under the intrinsic motivation banner.

The author felt this pattern matrix, in spite of the one intrinsic motivation to experience stimulation question (question 4) which aligned with an albeit adjacent subscale, justified the decision to condense the intrinsic motivation subscales into a single “intrinsic motivation” descriptor. All other subscales remained the same as those originally described by Vallerand and colleagues.

External, introjected, and identified motivation all formed a spectrum of “extrinsic motivation” with external as the least enlightened, introjected in the middle, and identified as the most enlightened form. These different forms represented the degree of internalisation of the extrinsic motivation (Deci et al., 1991). The author felt that a combination of these factors into an umbrella term of extrinsic motivation was appropriate to allow this measure to be subsequently compared with wholly intrinsic motivation. There was a theoretical precedent for this decision: Cokley, Bernard, Cunningham, and Motoike (2001) had investigated seven-, five-, three-, two- and one-factor models for the AMS previously. Cokley and colleagues’ three-factor model consisted of amotivation, a combined extrinsic motivation, and a combined intrinsic motivation factor. They found that identified regulation had less reliable scores than other subscales.

A principal components factor analysis was performed to investigate the face validity of combining the three extrinsic subscales into a single measure. An orthogonal rotation was used as it was felt that these factors should not correlate with one another20. The determinant value, the Kaiser-Meyer-Olkin measure, and Bartlett’s test of sphericity were unchanged. The results are outlined in Table 3.

---

20 An oblique rotation model ($\delta = 0.4$) was run to determine which model fit better. No significant changes were noted in the factor structure of this rotation compared with an orthogonal model.
Table 3

*Rotated Three-Factor Component Matrix of the Academic Motivation Scale for the Current Study*

<table>
<thead>
<tr>
<th>Original AMS descriptor</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic motivation toward accomplishments (Q19)</td>
<td>.728</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation to experience stimulation (Q17)</td>
<td>.706</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation to experience stimulation (Q24)</td>
<td>.665</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation toward accomplishments (Q12)</td>
<td>.625</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation toward accomplishment s(Q26)</td>
<td>.617</td>
<td>.326</td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation to know (Q2)</td>
<td>.609</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation to know (Q9)</td>
<td>.570</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation to know (Q22)</td>
<td>.530</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation to know (Q15)</td>
<td>.518</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic motivation to experience stimulation (Q4)</td>
<td>.487</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amotivation (Q25)</td>
<td></td>
<td>.872</td>
<td></td>
</tr>
<tr>
<td>Amotivation (Q11)</td>
<td></td>
<td>.834</td>
<td></td>
</tr>
<tr>
<td>Amotivation (Q5)</td>
<td></td>
<td>.804</td>
<td></td>
</tr>
<tr>
<td>Amotivation (Q18)</td>
<td></td>
<td>.772</td>
<td></td>
</tr>
<tr>
<td>Identified (Q10)</td>
<td></td>
<td></td>
<td>-.509</td>
</tr>
<tr>
<td>Introjected (Q20)</td>
<td>.347</td>
<td>.658</td>
<td></td>
</tr>
<tr>
<td>External (Q8)</td>
<td></td>
<td></td>
<td>.658</td>
</tr>
<tr>
<td>External (Q14)</td>
<td></td>
<td></td>
<td>.643</td>
</tr>
<tr>
<td>Introjected (Q13)</td>
<td></td>
<td></td>
<td>.598</td>
</tr>
<tr>
<td>External (Q21)</td>
<td></td>
<td></td>
<td>.582</td>
</tr>
<tr>
<td>Introjected (Q27)</td>
<td>.378</td>
<td>.582</td>
<td></td>
</tr>
<tr>
<td>Introjected (Q7)</td>
<td></td>
<td></td>
<td>.553</td>
</tr>
<tr>
<td>External (Q1)</td>
<td></td>
<td></td>
<td>.463</td>
</tr>
<tr>
<td>Identified (Q3)</td>
<td></td>
<td></td>
<td>-.364</td>
</tr>
<tr>
<td>Identified (Q23)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identified (Q16)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Factor 1 = Intrinsic motivation; factor 2 = Extrinsic motivation; factor 3 = Amotivation.

External and introjected regulation loaded well into an extrinsic motivation factor. Identified regulation either loaded into this factor, the amotivation factor, or not at all. This result was consistent with Cokley and colleagues’ findings. This justified the author’s decision to combine the extrinsic motivations into a combined extrinsic motivation measure.
**Confirmatory factor analysis.** A confirmatory factor analysis (CFA) was performed to compare the ability of different theoretical models to explain the relationships among the aforementioned subscales of the AMS. A sample size of 200 is often quoted for a minimum for structural equation modeling (SEM) and CFA (MacCallum, Widaman, Zhang, & Hong, 1999). The sample sizes for these analyses were smaller, which can lead to a failure to reject an *inappropriate* model, and means that the relationships and structures described from these CFA models must be interpreted with caution. In the current study, a total of three competing models were specified to explain the relationships among responses to the 27 AMS items. The alternative models employed included a seven-factor model based upon the original work of Vallerand et al. (1992); a five-factor model corresponding to self-determination theory as defined by Deci and Ryan (1985); and a three-factor model consisting of an amotivation factor, a general extrinsic motivation factor, and a general intrinsic motivation factor. Theoretical justification and precedent for a five-factor model was supported by Fairchild et al. (2005) who noted: "The three different types of intrinsic motivation are simply subtypes [emphasis added] of intrinsic motivation and do not follow a continuum" (p. 346).

The data was analysed using *R for Mac OS X* version 3.1.3 (The R Foundation for Statistical Computing, 2014). Goodness-of-fit analyses are shown in Table 4.

<table>
<thead>
<tr>
<th>Model</th>
<th>df</th>
<th>$\chi^2$</th>
<th>Change in $\chi^2$</th>
<th>CFI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seven-factor</td>
<td>278</td>
<td>531.94**</td>
<td></td>
<td>.865</td>
<td>.079 (.069)</td>
</tr>
<tr>
<td>Five-factor</td>
<td>314</td>
<td>646.40**</td>
<td>114.46**</td>
<td>.836</td>
<td>.085 (.076)</td>
</tr>
<tr>
<td>Three-factor</td>
<td>321</td>
<td>889.16**</td>
<td></td>
<td>.719</td>
<td>.110 (.101)</td>
</tr>
</tbody>
</table>

*Note. CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation. CFI values range from 0 to 1, with larger values indicating better fit; a CFI value of >.90 is generally considered to indicate acceptable model fit. The RMSEA values range from 0 to 1 (the lower value for the 90% confidence interval is shown in brackets), with smaller values indicating a better model fit. A value of ≤.06 is indicative of acceptable model fit (Hu & Bentler, 1999). * $p < .05$, ** $p < .01$.|

If one were to assume an orthogonal rotation to the CFA (i.e., a model that constrains factors to be uncorrelated), then the five-factor model has a better goodness-of-fit than the seven-factor model ($\chi^2 (324) = 801.27, p < .001$, CFI = .764, RMSEA = .100 (.091), and $\chi^2 (299) = 841.86, p < .001$, CFI = .771, RMSEA = .111 (.102) respectively; change in $\chi^2 = -40.59, p < .001$). Correlation matrices for the various proposed models are shown in Tables 5–7.
Table 5

Correlation Matrix for the CFA of the Seven-Factor AMS model (n = 147)

<table>
<thead>
<tr>
<th>Observed variable</th>
<th>Amotivation</th>
<th>EXTRN</th>
<th>INTRO</th>
<th>IDENT</th>
<th>INTTK</th>
<th>INTTA</th>
<th>INTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amotivation</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXTRN</td>
<td>0.072</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRO</td>
<td>0.118</td>
<td>0.500</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDENT</td>
<td>-0.550</td>
<td>0.255</td>
<td>0.098</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTTK</td>
<td>-0.449</td>
<td>0.233</td>
<td>0.371</td>
<td>0.362</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTTA</td>
<td>-0.306</td>
<td>0.364</td>
<td>0.609</td>
<td>0.214</td>
<td>0.813</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>INTES</td>
<td>-0.216</td>
<td>0.255</td>
<td>0.476</td>
<td>0.173</td>
<td>0.803</td>
<td>0.770</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Note. EXTRN = External regulation; INTRO = Introjected regulation; IDENT = Identified regulation; INTTK = Intrinsic motivation to know; INTTA = Intrinsic motivation toward accomplishments; INTES = Intrinsic motivation to experience stimulation.

The correlations between the subtypes of intrinsic motivation (.77–.81) are similar to those from Fairchild et al. (2005) who found values of between .71 and .87. It was noted in that article that the values described were greater than those found by Vallerand et al. (1992) in the seminal article on the AMS (58–.62). The high degree of correlation in the current study potentially justified the condensing of these subtypes into a single factor.

Multiple AMS validation studies (Barkoukis, Tsorbatzoudis, Grouios, & Sideridis, 2008; Cokley et al., 2001; Fairchild et al., 2005) have all shown intrinsic motivation subtypes correlated more positively with introjected regulation than with identified regulation. Additionally, these studies also found that introjected regulation correlated positively with numerous other motivation factors, where self-determination theory would predict that this correlation should be closer to zero or negative. Additionally, in the validation study by Vallerand and colleagues, introjected motivation correlated positively with some adaptive criteria as it does so in the current study. In light of this consistent finding 20 years after introduction of the AMS it was not unreasonable to continue to use the same factor structure for the extrinsically-motivated subscales.
Table 6

*Correlation Matrix for the CFA of the Five-Factor AMS model (n = 147)*

<table>
<thead>
<tr>
<th>Observed variable</th>
<th>Amotivation</th>
<th>EXTRN</th>
<th>INTRO</th>
<th>IDENT</th>
<th>Intrinsic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amotivation</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXTRN</td>
<td>0.072</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRO</td>
<td>0.118</td>
<td>0.502</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDENT</td>
<td>−0.548</td>
<td>0.255</td>
<td>0.099</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Intrinsic</td>
<td>−0.332</td>
<td>0.359</td>
<td>0.605</td>
<td>0.253</td>
<td>1.000</td>
</tr>
</tbody>
</table>

*Note.* EXTRN = External regulation; INTRO = Introjected regulation; IDENT = Identified regulation.

Table 7

*Correlation Matrix for the CFA of the Three-Factor AMS model (n = 147)*

<table>
<thead>
<tr>
<th>Observed variable</th>
<th>Amotivation</th>
<th>Extrinsic</th>
<th>Intrinsic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amotivation</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extrinsic</td>
<td>0.101</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Intrinsic</td>
<td>−0.332</td>
<td>0.624</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Although unexpected covariances were seen between non-adjacent structures in the self-determination spectrum (e.g., introjected regulation and intrinsic motivation towards accomplishment), the covariances tended to be highest for the motivation types that lie closest on the spectrum to one another (see Table 8).

Table 8

*Covariance Matrix for the CFA of the Seven-Factor AMS model (n = 147)*

<table>
<thead>
<tr>
<th>Observed variable</th>
<th>Amotivation</th>
<th>EXTRN</th>
<th>INTRO</th>
<th>IDENT</th>
<th>INTTK</th>
<th>INTTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXTRN</td>
<td>0.030</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRO</td>
<td>0.059</td>
<td>0.295</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDENT</td>
<td>−0.158</td>
<td>0.087</td>
<td>0.040</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTTK</td>
<td>−0.104</td>
<td>0.064</td>
<td>0.122</td>
<td>0.068</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTTA</td>
<td>−0.151</td>
<td>0.213</td>
<td>0.428</td>
<td>0.087</td>
<td>0.265</td>
<td></td>
</tr>
<tr>
<td>INTES</td>
<td>−0.062</td>
<td>0.086</td>
<td>0.194</td>
<td>0.041</td>
<td>0.152</td>
<td>0.310</td>
</tr>
</tbody>
</table>

*Note.* EXTRN = External regulation; INTRO = Introjected regulation; IDENT = Identified regulation; INTTK = Intrinsic motivation to know; INTTA = Intrinsic motivation toward accomplishments; INTES = Intrinsic motivation to experience stimulation.
More recently, Guay, Morin, Litalien, Valois, and Vallerand (2014) noted that:

A measurement instrument may have many cross-loadings (although much weaker than main loading) that are coherent with the underlying theory ... allowing small cross-loadings to be incorporated in a model provides some control for the fact that items are imperfect indicators of a construct. (p. 52)

These authors used exploratory structural equation modeling (ESEM) which combined features of CFA, SEM, and EFA in a single framework. The authors found ESEM provided a better fit and more substantively meaningful correlation coefficients when compared to prior CFA model estimates.

An ESEM was beyond the scope of the current study, even in light of the smaller sample size. However, the current study EFA and CFA have shown broadly similar results to other studies which suggested the use of the AMS was appropriate for the assessment of motivation. The condensing of subscales into higher-order factors did not demonstrate a better fit than the seven-factor model, but it should be noted that in earlier analyses the goodness-of-fit data for the AMS (Cokley et al., 2001; Vallerand et al., 1992) has never been shown to be close to the acceptable limits described by Hu and Bentler (1999). This determination, in conjunction with the smaller sample size of the current study, meant that condensed-factor models were not entirely empirically supported, but were neither without precedent, nor theoretical underpinnings. Nevertheless, the subsequent results using the five- and three-factor models must be interpreted with caution in the absence of precise and robust statistitical solutions for these models.

**Westside Test Anxiety Scale.** The Westside Test Anxiety Scale (WTAS; Driscoll, 2007) was used to assess test anxiety in medical students. The WTAS was chosen over other questionnaire measures based on ease of administration, and ease of integration with the AMS (see Table 9).

<table>
<thead>
<tr>
<th>Scale</th>
<th>Acceptable validity scores</th>
<th>Fewer items</th>
<th>Measured test anxiety</th>
<th>Used 5-point Likert scale</th>
<th>Robust use in literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTAS</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>±</td>
</tr>
<tr>
<td>GAD-7</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>CATS</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>MSLQ</td>
<td>✓</td>
<td>X</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Note.* WTAS = Westside Test Anxiety Scale; GAD-7 = Generalised Anxiety Disorder 7-item Scale; CATS = Cognitive Test Anxiety Scale; MSLQ = Motivated Strategies for Learning Questionnaire.
**Exploratory factor analysis.** The original article for the WTAS described a two-factor structure of worry and impairment. The questionnaire contained 10 items: four of which pertained to worry (e.g., "When I study, I worry that I will not remember the material on the exam"), and six to impairment ("The closer I am to a major exam, the harder it is for me to concentrate on the material"). However a reinvestigation for the current study failed to replicate these findings. A correlation matrix showed that all questions were statistically significantly highly correlated with one another, suggesting a singularity (variables that are perfectly correlated). Additionally, the determinant was .055, that is, greater than .00001 which suggested multicollinearity. A single factor explained 40% of the variance in responses, and the scree plot showed a sharp leveling out after this factor. Therefore the author decided to treat the WTAS as a single-factor scale (i.e., "anxiety").

Items for the WTAS were appended to the AMS (although these items remained separate for analysis purposes). These 10 questions were preceded by a preamble: "Below are some statements about stress and anxiety that you may experience around exam times. Please read each statement carefully and then circle the number that corresponds with how you feel about the statement." The scoring was a five-point Likert scale with the same responses as those for the AMS, which allowed continuity with the entire questionnaire. Again, participants were not required to answer these questions in order to submit the questionnaire. Reliability coefficients are displayed in Table 10.

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Subscale</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMS</td>
<td>External regulation</td>
<td>.86</td>
</tr>
<tr>
<td></td>
<td>Introjected regulation</td>
<td>.94</td>
</tr>
<tr>
<td></td>
<td>Identified regulation</td>
<td>.81</td>
</tr>
<tr>
<td></td>
<td>Intrinsic motivation</td>
<td>.94</td>
</tr>
<tr>
<td>WTAS</td>
<td>Anxiety</td>
<td>.97</td>
</tr>
</tbody>
</table>

*Note. Cronbach’s alpha for “extrinsic motivation” (external + introjected + identified) = .92.*

**Free text box for further comments.** At the conclusion of the questionnaire, a free text box was included where students were asked to "Please reflect on the last few weeks and tell me about any major events or stressors in your life." Any comments made were collated and coded. Participants did not have to complete this section to submit the questionnaires. By their nature, the responses in the free text box appended to the AMS and WTAS questionnaires were
anonymous and only linked to the preceding questionnaire responses by a unique identification number.

**Missing data.** Missing and incomplete data were coded as such. As discussed later in this chapter, acceptable minimums were achieved with response rates such that missing or incomplete data did not affect the statistical analyses (missing data were excluded on an analysis by analysis basis). It was difficult to accurately assess attrition in the study as participants opted in and out between one sampling time and the next. Forty students (21%) participated in all five questionnaire sampling times; 134 (69%) participated in at least three.

**Procedure**

Once the Assistant Dean for Undergraduate Medicine and the coordinator of Phase I of the medical programme (MBChB2 and MBChB3 years) had given permission, the 2011 MBChB2 class was approached and given a brief presentation at an orientation session to the MBChB2 programme on the first day of semester one in February 2011. At this time a participant information sheet, consent form, and AMS and WTAS questionnaires were handed out to each student as a bundle. Copies of the participant information sheets and consent forms used in this study can be found in Appendix B. Participants were given the opportunity to approach the author by email if they had any questions about the study. Additionally, at the brief in-person reminder to the class prior to each sampling time, participants were given the opportunity to ask questions directly of the author, and his email address was displayed prominently for individual approaches by potential participants. In all communications through the class portal, participants were encouraged to approach the author if they had any questions or concerns about the study. Participants were reminded on every occasion that their participation was voluntary. In order to increase response rates beyond those described by Baruch (1999), the author offered three NZD$50 book vouchers from Medical Books21, and later, USD$50 Amazon.com vouchers (after Medical Books closed) at each sampling time. Those who completed the questionnaire would go into a draw for these, to be announced after the sampling time had closed. This process was suggested by a Faculty of Education advisor to the author and was deemed to be neither coercive nor unethical.

Consent forms were only handed out with the AMS and WTAS questionnaires at the first sampling time. At subsequent sampling times if a student wished to complete the questionnaire and therefore avail themselves of the study, they were asked to complete a consent form which was available for download from the class portal, or in hard copy at the site of questionnaire completion.

---

21 A local bookstore adjacent to the Grafton campus where medical students bought the vast majority of their textbooks. Medical Books was also heavily involved in sponsorship of student activities and generated a great deal of goodwill amongst students.
returns. In spite of this, several participants did not complete consent forms. The author made numerous approaches to the study body as a whole and explained the ethical concerns around the project and made a plea for these to be completed. In discussion with a member of the University of Auckland Human Participants Ethics Committee, it was felt that this constituted a sufficient effort on the author’s part to complete a consent form, and that participants were well informed of the risks of being involved in the study. It was therefore felt that later completion of a questionnaire, in the absence of a prior consent form, was tacit consent in and of itself.

At no time did a participant approach the author requesting to be removed from the study. If at any stage during the data collection a unique identification number could not be verified through the Medical Programme Directorate as belonging to a bona fide medical student, these results were not used in the analyses.

The changeover to an online delivery of the questionnaire was explained to the class by email. The response rate, while lower for the first online iteration (the third sampling time), recovered with subsequent sampling, suggesting that participants had no difficulty in adopting this change. This was in contravention to Nulty (2008) who suggested that online surveys showed much lower response rates than paper-based approaches. The difference with Nulty’s research, however, was that although the questionnaires in this study were eventually delivered electronically, they were still associated with a face-to-face introduction. Dillman (2000) discussed acceptable minimal response rates to questionnaires based on class size. Nulty (2008) expanded upon Dillman’s work further by discussing conditions in the setting of a survey and whether “liberal conditions” (accepting a 10% sampling error and an 80% confidence level) or “stringent conditions” (a 3% sampling error and 95% confidence level) were met. Based on Dillman and Nulty’s formulae in a class size of 200 students, minimum response rates of 12% (liberal conditions) and 77% (stringent conditions) were considered permissible.

Table 11

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3\footnote{a}{Change to online format.}</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{n}</td>
<td>149</td>
<td>132</td>
<td>78</td>
<td>92</td>
<td>149</td>
</tr>
<tr>
<td>Percent</td>
<td>70</td>
<td>62</td>
<td>37</td>
<td>44\footnote{b}{Change in denominator to 210.}</td>
<td>71</td>
</tr>
</tbody>
</table>

\footnote{This would become relevant when discussing the results of the individual interviews where participants talked about the case of a student who had been masquerading as a medical student for two years after being unsuccessful in the admissions procedure, and is discussed further in Chapter 5.}
Statistical Analysis

The analyses of the research questions for this study were addressed using repeated measures analyses of variance (ANOVA) with post hoc tests (post hoc polynomial comparisons and the Tukey HSD test (reported as independent samples t-tests) which is the most appropriate post hoc test in cases of equal sample size and population variance; Field, 2009), two-way mixed ANOVA, paired and independent samples t-tests, and bivariate Pearson correlation and partial correlation testing. Analyses of variance were used to measure motivation orientation constructs and anxiety scores with differing demographic data as the independent variable.

Given the low individual sample numbers for the three age brackets of students aged 22–25 years, 26–29 years and ≥ 30 years, these groups were combined to form a single group termed “> 21 years”. However, to measure whether changes continued to be seen between these relatively old, older, and oldest students, additional analyses between these groups alone were performed with the recognition that because of the smaller sample size, any results would potentially be prone to a Type II error, that is, a conclusion that there was no effect when in fact there was.

Similarly, data for ethnicity showed small sample sizes in the Pacific, Other European and Other subsets. Individual analyses comparing Pacific and Māori students across multiple domains showed no statistically significant differences between these two groups, which justified the author’s decision to study these groups as either “Māori” (with Māori students alone) or “Māori and Pacific” (with Māori and Pacific students combined). By the same token, Other European and Other groups also showed no statistically significant differences and were combined to form a more inclusive “Other” group.

For the free text box data quantitative and qualitative analyses were undertaken. If participants responded with any text comment, this was identified as a positive integer that allowed standard statistical analyses to be performed. Independent samples t-tests were used to determine differences between groups of students who responded and those who did not. Qualitative analyses were performed using thematic analysis as described by Braun and Clarke (2006). A contextualist methodology was used where participants ascribed their own interpretation of their experiences, and the ways in which the environment (e.g., medical school) influenced these interpretations (Willig, 1999). It was assumed that a unidirectional relationship existed between meaning, experience, and language. The data were collated and coded; following this subthemes and themes emerged in an inductive, bottom-up manner. This inductive approach shared some similarities with grounded theory where data were coded without fitting them into pre-existing themes. Truth value, or credibility, of the data was obtained based upon agreement between individual, independent respondents (Lincoln & Guba, 1985). This degree of agreement conceded that the data was consistent, and given this
consistency, a repeated sampling design allowed that the data was also triangulated (Krefting, 1991). A negative case analysis was undertaken to ensure the trustworthiness of the data; the data was reviewed with preliminary themes to ensure that these were not contradicted by the data (Bowen, 2008). Themes were reviewed and redefined where necessary to ensure the best fit for the data before a final thematic map was constructed and named.

The qualitative data had inherent biases and assumptions. The nature of questionnaire responses relied on invested individuals, and as such, the questionnaires without free text responses, or those not filled in at all, were potentially more interesting but unattainable. Thus qualitative data from this study presented a biased view of the medical school learning environment. However, the combined use of qualitative and quantitative methods in samples with sufficient participant numbers (i.e., to ensure a representativeness of cases) supported the limited use of generalisations (Seale & Silverman, 1997).

All quantitative analyses were performed using Statistical Package for the Social Sciences (SPSS) version 22.0.0.0 (IBM, 2013). A Bonferroni adjustment of significance as less than “0.05/number of comparisons” for multiple comparisons was applied to control the familywise error rate (Field, 2009). Where necessary, this value was ascribed within the text. Qualitative analysis support was provided by NVivo version 10.0.4 (QSR International, 2014).

Results

For each motivation construct, four items in the questionnaire (11 for intrinsic motivation) were designed to measure a corresponding form of motivation and engender a more extreme Likert response (e.g., a 1 or 5). As external, introjected, and identified motivations were all considered extrinsically-orientated motivations, an average extrinsic score (the sum of all extrinsically-oriented questions, divided by 12) was also calculated to directly compare with an average intrinsic score (the sum of all extrinsically-oriented questions, divided by 11). In order to allow comparisons between each of the four proposed motivation orientations as a function of the total motivation construct, an additional measure was created: relative motivation orientation scores, which were obtained according to the formula below:

\[
\text{relative external score} = \frac{\text{external}_1 + \text{external}_2 + \cdots + \text{external}_n}{\sum \text{motivation scores}}
\]

Average anxiety scores were also calculated for each sampling time point.

In calculating change in motivation scores, regression analysis measuring residuals (standardised, studentised, and deleted residual values) was performed. However, these residual
values rarely exceeded 0.001. On two occasions—the change in average intrinsic motivation from entry to the end of MBChB2, and from entry to the beginning of MBChB3—the deleted residual values were −0.003 and −0.002 respectively. Neither did the standardised DFBeta exceed 1.0\textsuperscript{23}. In an effort to have meaningful values to measure (as the values for the relative scores were not whole number integers), the absolute difference was used instead.

**Motivation Scores Across the Study Participants**

Tables 12 and 13 show higher absolute scores for average intrinsic motivation at all sampling times compared with the average extrinsic scores (although the scores were only statistically significantly different at sampling times one and two: \( t(148) = -8.60, p < .001, d = .58 \); and \( t(131) = -2.54, p = .012, d = .22 \) respectively), which reflected a greater initial extent of agreement of the respondents with the intrinsic motivation-biased questions from the AMS. Skewness measures the clustering of items around opposite ends of a scale; values of > 2.1 suggest a departure from normality (West, Finch, & Curran, 1995). Kurtosis measures the slope of the central tendency; values of > 7.1 suggest a departure from normality (West et al., 1995).

Repeated measures analysis of variance showed that average extrinsic scores were unchanged over the five sampling times; \( F(3.15, 125.81)\textsuperscript{24} = 1.21, p = .31 \). However, average intrinsic scores changed statistically significantly over the sampling times; \( F(4, 152) = 7.84, p < .001, \eta^2 = .17 \). Further pairwise comparisons suggested that sampling time one was higher than sampling times three and five (\( p = .001 \) and \( .001 \) respectively; Bonferroni adjustment of \( 0.05/4 = .0125 \)), and a trend toward a similar significantly lower score at time four (\( p = .019 \)). There were no statistically significant differences between any other sampling time comparisons.

<table>
<thead>
<tr>
<th>Table 12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Extrinsic Motivation Scores across the Five Sampling Times</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>( n )</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>( SD )</td>
</tr>
<tr>
<td>Kurtosis</td>
</tr>
<tr>
<td>Skewness</td>
</tr>
</tbody>
</table>

\textsuperscript{23} A DFBeta value > 1 indicates substantial influence of a variable on model parameters (Field, 2009).

\textsuperscript{24} Mauchly’s test indicated that the assumption of sphericity had been violated for this measure; \( \chi^2(9) = 24.07, p = .004 \). Therefore degrees of freedom and the \( F \) statistic were corrected using Greenhouse-Geisser estimates of sphericity; \( \varepsilon = .79 \).
The lack of statistically significant differences in extrinsic motivation scores might reflect a more internalised form of extrinsic motivation; that is, the combination of external, introjected, and identified motivation might be different but gave a similar overall averaged extrinsic score (see Table 14).

One-way repeated measures analyses of variance were conducted for each of the relative extrinsic motivation orientations. This showed no statistically significant differences within the relative external and relative introjected scores across all sampling times ($F(4, 144) = .836, p = .505; \text{ and } F(4, 144) = 1.26, p = .289$ respectively). However the relative identified scores were statistically significantly different across repeated sampling times ($F(4, 144) = 6.57, p < .001, \eta^2 =$)
post hoc pairwise comparisons revealed statistically significant higher scores in the later sampling times, with principal differences between times one and four \( (p = 0.007) \), and one and five \( (p = 0.006) \), with a Bonferroni adjustment of \( 0.05/4 = 0.0125 \). No other statistically significant differences were seen when other sampling time points were compared. This reflected a late movement of the motivation construct to a more autonomous orientation. As a consequence, identified motivation also increased its contribution to the average extrinsic score and this might serve to explain why the later average extrinsic scores were not statistically significantly different to the intrinsic scores in later iterations: the absolute value of the average score remained similar in spite of an increase in higher order extrinsic orientation.

Amotivation scores were not used in this study because medical students were generally not amotivated. The median value at all sampling time was 1.0, and three of the five sampling times showed skew values > 2.1 (the remaining two had values of 1.9) suggesting a near-uniform departure from normality. This was in keeping with the findings of Kusurkar et al., 2011, who noted that medical students were generally intrinsically motivated, that is, they did not possess the belief that whatever they did it would amount to nothing (Deci & Ryan, 1985).

Motivation scores in different demographic groups. The different demographic groups in the current study were age, sex, ethnicity, and mode of entry and admission scheme. These will each be discussed in turn.

**Age.** The majority of medical students in this sample were aged less than or equal to 21 years on entering MBChB2 \((144/194, 74.2\%; M = 21.03, \text{median} = 20, \text{mode} = 19 \text{years, } SD = 3.89)\). This was a reflection of the principal mode of entry into medical school: OLY1. As a result, the majority of students entering the MBChB2 class had completed a single year of undergraduate study after leaving school and were typically aged between 18 and 20 years. Graduate students were typically applying to enter the medical programme a minimum of three years after leaving secondary school.

Independent samples t-tests with age dichotomised between less than or equal to 21 years and greater than 21 years showed statistically significant differences (see Table 15). When original older age brackets were used \((22–25 \text{ years, } 26–29 \text{ years, } \geq 30 \text{ years})\) and compared using a two-way mixed ANOVA, additional post hoc differences were seen (see Table 16).

---

\( \eta^2 \) values .02, .13, and .26 represent small, medium, and large effects respectively (Field, 2009).
Table 15

<table>
<thead>
<tr>
<th>Measure</th>
<th>Age ≤ 21</th>
<th>Age &gt; 21</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average extrinsic 3</td>
<td>3.70</td>
<td>3.41</td>
<td>76</td>
<td>1.58</td>
<td>.026</td>
<td>.18</td>
</tr>
<tr>
<td>Average extrinsic 5</td>
<td>3.69</td>
<td>3.38</td>
<td>147</td>
<td>3.00</td>
<td>.003</td>
<td>.24</td>
</tr>
<tr>
<td>Average intrinsic 2</td>
<td>3.86</td>
<td>3.66</td>
<td>130</td>
<td>2.01</td>
<td>.046</td>
<td>.17</td>
</tr>
<tr>
<td>Average intrinsic 5</td>
<td>3.75</td>
<td>3.28</td>
<td>44.79</td>
<td>3.62</td>
<td>.001</td>
<td>.48</td>
</tr>
<tr>
<td>Relative introjected 1</td>
<td>0.224</td>
<td>0.206</td>
<td>141</td>
<td>2.45</td>
<td>.016</td>
<td>.20</td>
</tr>
<tr>
<td>Relative introjected 2</td>
<td>0.224</td>
<td>0.197</td>
<td>43.08</td>
<td>3.01</td>
<td>.004</td>
<td>.42</td>
</tr>
<tr>
<td>Relative introjected 4</td>
<td>0.218</td>
<td>0.194</td>
<td>88</td>
<td>2.32</td>
<td>.023</td>
<td>.24</td>
</tr>
<tr>
<td>Relative introjected 5</td>
<td>0.222</td>
<td>0.204</td>
<td>146</td>
<td>2.09</td>
<td>.038</td>
<td>.17</td>
</tr>
<tr>
<td>Relative identified 1</td>
<td>0.281</td>
<td>0.306</td>
<td>141</td>
<td>−4.46</td>
<td>.000</td>
<td>.35</td>
</tr>
<tr>
<td>Relative identified 2</td>
<td>0.287</td>
<td>0.310</td>
<td>128</td>
<td>−3.48</td>
<td>.001</td>
<td>.29</td>
</tr>
<tr>
<td>Relative identified 4</td>
<td>0.295</td>
<td>0.316</td>
<td>88</td>
<td>−2.00</td>
<td>.049</td>
<td>.21</td>
</tr>
<tr>
<td>Relative identified 5</td>
<td>0.294</td>
<td>0.319</td>
<td>42.92</td>
<td>−2.17</td>
<td>.036</td>
<td>.31</td>
</tr>
</tbody>
</table>

*d denotes effect size. A d value of .10, .30, and .50 represented small, medium, and large effects respectively (Cohen, 1988).

*b Indicated statistic where Levene’s test of homogeneity had been violated; Welch F ratios were used in these instances.

A mix of results were seen with age as the independent variable; statistically significant differences in average extrinsic and intrinsic scores were seen at later sampling times in MBChB2 (sampling times two and three), and during the final sampling time in MBChB3 (time five) with older students having higher scores in both of these domains. At the beginning of medical school, older students also had statistically significantly higher introjected motivation scores and lower identified motivation scores, and maintained these differences throughout almost all sampling times. This suggested a fluidity within the components of average extrinsic score and might have explained the relative stability of extrinsic scores seen in Table 14.

A two-way mixed ANOVA was performed on sampling time and age group (in an older population with the participants aged ≤ 21 years excluded—which admittedly left a much smaller sample and a consequent greater risk of a Type I error). For most measures of motivation (all aside from relative external scores), statistically significant results were seen for sampling time, and also statistically significant sampling time × age group interactions. However, statistically significant age group specific results were not seen. The significant interaction implies that the levels of motivation measures of the five sampling times significantly differed in different age groups. Results are displayed in Table 16.
Table 16

Two-Way Mixed ANOVA Results between Students Aged > 21 Years

<table>
<thead>
<tr>
<th>Measure</th>
<th>df</th>
<th>( F )</th>
<th>( p )</th>
<th>( \eta^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average extrinsic ( a )</td>
<td>Time</td>
<td>1.66, 14.9</td>
<td>4.04</td>
<td>.046</td>
</tr>
<tr>
<td>Time × age group</td>
<td>1.66, 14.90</td>
<td>6.29</td>
<td>.014</td>
<td>.41</td>
</tr>
<tr>
<td>Average intrinsic</td>
<td>Time</td>
<td>4, 36</td>
<td>7.77</td>
<td>.000</td>
</tr>
<tr>
<td>Time × age group</td>
<td>4, 36</td>
<td>3.95</td>
<td>.009</td>
<td>.31</td>
</tr>
<tr>
<td>Relative introjected</td>
<td>Time</td>
<td>4, 28</td>
<td>4.88</td>
<td>.004</td>
</tr>
<tr>
<td>Time × age group</td>
<td>4, 28</td>
<td>6.59</td>
<td>.001</td>
<td>.49</td>
</tr>
<tr>
<td>Relative identified</td>
<td>Time</td>
<td>4, 28</td>
<td>13.01</td>
<td>.000</td>
</tr>
<tr>
<td>Time × age group</td>
<td>4, 28</td>
<td>13.40</td>
<td>.000</td>
<td>.66</td>
</tr>
</tbody>
</table>

\( a \) indicated Mauchly’s test that the assumption of sphericity had been violated for this measure; \( \chi^2(9) = 22.29, p = .009 \). Therefore degrees of freedom and the \( F \) statistic were corrected using Greenhouse-Geisser estimates of sphericity; \( \varepsilon = .41 \).

Bonferroni-corrected post hoc tests showed that statistically significant lower average intrinsic scores were seen in later sampling times (\( p \) values between .001 and .049), with concurrent higher relative identified scores across these same sampling times (\( p \) values between .005 and .019). Isolated significant decreases in average extrinsic and relative introjected scores were seen between sampling times 3 and 5 (\( p = .004 \) and \( p = .002 \) respectively).

**Sex.** Continuing an international trend, female students continued to make up greater than half of all students in the medical programme (Dacre & Shepherd, 2010; General Medical Council, 2013). No statistically significant difference existed in motivation orientation at any sampling time aside from a higher average intrinsic score at sampling time four (\( t(89) = -2.19, p = .031, d = .23 \)), where female students had statistically significantly higher scores than their male colleagues.

**Ethnicity.** Few statistically significant differences existed between means when ethnicity was used as an independent variable. Notable differences were seen at sampling time one in relative external and intrinsic scores as outlined in Table 17, which suggested a difference at the outset of the medical programme that was not sustained over later iterations when there were no statistically significant differences by ethnicity.
Table 17

*Post Hoc Contrasts of Motivation with Ethnicity as a Factor*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Contrast</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative external 1</td>
<td>NZ European vs. all</td>
<td>137</td>
<td>-2.11</td>
<td>.037</td>
<td>.18</td>
</tr>
<tr>
<td></td>
<td>NZ European vs. Māori + Pacific</td>
<td>137</td>
<td>-2.39</td>
<td>.018</td>
<td>.20</td>
</tr>
<tr>
<td></td>
<td>NZ European vs. Asian</td>
<td>137</td>
<td>-2.92</td>
<td>.004</td>
<td>.24</td>
</tr>
<tr>
<td>Relative intrinsic 1</td>
<td>NZ European vs. Māori</td>
<td>137</td>
<td>2.19</td>
<td>.030</td>
<td>.18</td>
</tr>
<tr>
<td></td>
<td>NZ European vs. Māori + Pacific</td>
<td>137</td>
<td>2.80</td>
<td>.006</td>
<td>.23</td>
</tr>
<tr>
<td></td>
<td>NZ European vs. Asian</td>
<td>137</td>
<td>2.49</td>
<td>.014</td>
<td>.21</td>
</tr>
<tr>
<td></td>
<td>Māori + Pacific vs. all</td>
<td>137</td>
<td>-2.68</td>
<td>.008</td>
<td>.22</td>
</tr>
</tbody>
</table>

*Note.* New Zealand European students had the lowest scores of relative external motivation, and the highest scores of relative intrinsic motivation of any ethnic group.

Compared with their colleagues, New Zealand European students had lower relative external scores and higher relative intrinsic scores. Stated another way, Māori and Pacific students were more likely to be extrinsically motivated at the start of medical school.

**Mode of entry and admission scheme.** Less than one quarter of the cohort were graduate entrants. This was slightly less than the number of students aged greater than 21 years, implying that some mature-aged students still entered through the OLY1 pathway. The relevance of this observation was that the differences seen with age were not as readily replicated when comparing OLY1 and graduate students, suggesting that the changes in motivation scores that were associated with age were truly a function of years rather than "years studying".

In contrast, post hoc comparisons of the one-way repeated measures ANOVA of admission scheme data that compared MAPAS students with non-attenuated students, showed statistically significant differences at almost all sampling times for relative intrinsic scores (relative intrinsic 1: \(t(140) = 2.09, p = .039, d = .17\); relative intrinsic 2: \(t(127) = 2.12, p = .036, d = .18\); relative intrinsic 3: \(ns\); relative intrinsic 4: \(t(87) = 2.88, p = .005, d = .29\); relative intrinsic 5: \(t(145) = 2.10, p = .038, d = .17\) ). The lack of a statistically significant result at sampling time three might be a by-product of a lower than usual number of returns (\(n = 75\)), which potentially contributed to a Type I error. Students admitted through the MAPAS scheme had a fundamentally different relationship with intrinsic motivation than their colleagues, a relationship that was unchanged over the course of the preclinical curriculum, and gave the impression of an external locus of control that was impervious to environmental cues. The effect size of these differences was small with the exception of sampling time four. This suggested that on the basis of being a MAPAS student *alone*, one would have lower intrinsic scores before any

---

26 There were 50 students aged greater than 21 years but only 43 entered through the graduate entry scheme.
moderating influence of other factors was introduced, and that these differences would persist throughout the course of study.

Changes in motivation scores. The sampling times for repeated measures of the AMS and WTAS questionnaires were deliberately chosen milestones. The first and fourth sampling times were at the beginning of the MBChB2 and MBChB3 academic years respectively. The second sampling time was prior to the end of semester one examinations (a time of assumed high stress). However further analyses revealed that sampling time three was perhaps a more reliable time of high stress (see later in this chapter). The third and fifth sampling times were midway through semesters two of MBChB2 and MBChB3 respectively. Repeated measures analyses of variance were used to determine whether motivation orientation measures changed over time. Bonferroni adjustments for multiple comparisons were applied as described. Specific pairings were examined: sampling time one and three (“effect of stress”); sampling times one and four (“effect of MBChB2”); and sampling times four and five (“effect of MBChB3”).

Average extrinsic scores were unchanged over the five sampling times. However, average intrinsic scores changed over the sampling times with a statistically significant reduction in intrinsic scores at later sampling times (especially the last sampling times in each year). There were no statistically significant differences between any other sampling time comparisons. This implied that the differences seen were primarily due to changes from the initial event with an assumption of a new steady state between sampling times two and three (i.e., during semester two of MBChB2), from which time there were no further statistically significant changes in the average intrinsic score. Such a result inferred that intrinsic motivation orientation fell from its initial height at the start of MBChB2, and that any additional changes seen in the overall motivation orientation were due to changes in other measures. This theory was supported by the findings of relative intrinsic scores which showed statistically significant differences over time ($F(4, 144) = 9.07, p < .001, \eta^2 = .21$), with pairwise comparisons that again showed differences comparing sampling time one to times three, four, and five ($p = .000, .002, .000$ respectively, $d = .41$; Bonferroni adjustment of $0.05/4 = .0125$) without any further statistically significant results when other sampling time points were compared with each other. The effect sizes of these changes were moderate and represented a dramatic shift in motivation orientation.

The main caveat to these findings was that only 37 sets of data (i.e., students) were available to be used in the repeated measures designs, potentially contributing to a Type I error; however post hoc tests were used in addition to pairwise comparisons, which mirrored the noted results. Post hoc tests control for the type I error rate, but at the risk of a decrease in power, that is, increasing the type II error rate (Field, 2009).

Comparing two distinct sampling time points using paired sample $t$-tests showed statistically significant changes in intrinsic and identified motivation measures (i.e., within
autonomous motivation); specifically the effect of stress (sampling times one and three) and the effect of MBChB2 (sampling time one and four) as outlined in Table 18. No statistically significant changes were seen for the effect of MBChB3 (sampling times four and five), which implied that changes in autonomous motivation orientation were potentially stable by this time.

Table 18

<table>
<thead>
<tr>
<th>Measure</th>
<th>Sample times</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative identified</td>
<td>3 → 1</td>
<td>66</td>
<td>0.017</td>
<td>0.04</td>
<td>65</td>
<td>3.76</td>
<td>.000</td>
<td>.42</td>
</tr>
<tr>
<td>Relative intrinsic</td>
<td>3 → 1</td>
<td>66</td>
<td>0.015</td>
<td>0.04</td>
<td>65</td>
<td>−6.25</td>
<td>.000</td>
<td>.61</td>
</tr>
<tr>
<td>Relative identified</td>
<td>4 → 1</td>
<td>70</td>
<td>−0.022</td>
<td>0.03</td>
<td>69</td>
<td>3.01</td>
<td>.004</td>
<td>.34</td>
</tr>
<tr>
<td>Relative intrinsic</td>
<td>4 → 1</td>
<td>70</td>
<td>−0.014</td>
<td>0.03</td>
<td>69</td>
<td>−4.33</td>
<td>.000</td>
<td>.46</td>
</tr>
</tbody>
</table>

The changes seen from sampling times one to three complemented one another. At a time of purported higher stress, students chose, within the autonomous motivation construct, to move away from intrinsic motivation to less internalised forms of motivation. This move reflected a change in the focus of learning from one of interest and enjoyment in the act itself (i.e., intrinsic), to one where the student has identified the learning as more personally important (i.e., identified). The effect sizes of these changes were medium to large, which suggested that even small changes within even autonomous motivation were significant.

Between sampling times one to four, a trend toward significance was seen in average extrinsic score ($t(76) = 1.93, p = .058$). Otherwise the changes between these time points reinforced those of sampling times one and three, albeit with smaller effect sizes (relative identified $d = .34$; relative intrinsic $d = .46$). Of note, no statistically significant differences were seen between times three and four ($p = .344$ and .735 for relative identified and intrinsic respectively) which suggested that the differences seen between sampling times one and four were merely a continuation of those between times one and three.

**Summary of the motivation data.** Several hypotheses were proposed for this study. The first was that medical students would be generally highly motivated (Kusurkar, Ten Cate, et al., 2011), but would differ in the amounts of extrinsic and intrinsic motivation. It was also hypothesised that specific motivation constructs would differ between demographic groups and change over time, with differing rates of change based upon these same demographic groupings. This related to the final hypothesis that motivation orientation would migrate over time to become more fully internalised.

The milieu motivation orientations that any one individual possessed were unique but in general this study noted that medical students identified more strongly with intrinsic approaches
to studying and learning. The findings further indicated that the blend of motivation influences changed over the course of the preclinical curriculum: intrinsic motivation scores fell, but were matched by commensurate changes in the respective combinations of extrinsic motivation orientations were seen with increasing proportions of more fully internalised forms of motivation (i.e., identified motivation), around times of purported stress, reflecting an admission on the individual’s part that the act learning was deemed as personally important (e.g., exams, doing well), rather than for learning’s sake.

New Zealand European students had higher amounts of intrinsic motivation at entry, although this initial advantage tended to wane over the course of the curriculum as other students (with the exception of MAPAS students) matched and maintained pace with these changes. Older students also tended to have higher levels of average intrinsic motivation, especially later in the study, but also lower levels of identified motivation, the other component of autonomous motivation. Within controlled motivation these older students had higher scores for introjected motivation. Upon further analysis of differences within this older cohort, the oldest students (≥ 30 years) had the lowest scores for this orientation.

The current study suggested that New Zealand European students who were aged greater than 30 years and entered medical school in a non-attenuated fashion had the highest level of intrinsic motivation of this cohort, and continued to do so for the duration of the current study through a more fully internalised coalition of motivation orientations.

**Anxiety Scores Across the Study Participants**

The WTAS rated anxiety scores out of five. A score of less than 2.5 indicated low, or low normal anxiety; a score between 2.5 and 2.9 indicated high normal anxiety. Scores greater than or equal to 3 indicated pathological levels of anxiety in a linear relationship (Driscoll, 2007).

Table 19 suggested that anxiety levels were generally non-pathological and that sampling time four had the highest mean and median anxiety score (although this was not statistically significant from other sampling times).
Table 19

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>152</td>
<td>133</td>
<td>78</td>
<td>91</td>
<td>149</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>2.72</td>
<td>2.84</td>
<td>2.84</td>
<td>2.90</td>
<td>2.80</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>2.75</td>
<td>2.80</td>
<td>2.90</td>
<td>3.00</td>
<td>2.80</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>0.616</td>
<td>0.720</td>
<td>0.698</td>
<td>0.673</td>
<td>0.724</td>
</tr>
<tr>
<td><strong>Skewness</strong></td>
<td>−0.31</td>
<td>0.20</td>
<td>−0.61</td>
<td>−0.37</td>
<td>0.12</td>
</tr>
<tr>
<td><strong>Kurtosis</strong></td>
<td>0.48</td>
<td>0.53</td>
<td>0.22</td>
<td>−0.03</td>
<td>−0.05</td>
</tr>
</tbody>
</table>

The similar mean scores for sampling times did not support the author’s hypothesis that sampling time two was the time of highest stress. A paired samples t-test between sampling times two and three anxiety scores showed a trend toward significance difference between the two means ($t(61) = 1.98, p = .052$), suggesting that semester two of MBChB2 appeared almost more stressful. A skew of −0.61 suggested that the distribution of anxiety scores for sampling time three were more towards the pathological anxiety-end of the spectrum (Field, 2009).

In spite of the flatness of the anxiety responses, repeated measures analyses of variance indicated a statistically significant change in anxiety levels over time ($F(4, 160) = 3.03, p = .019, \eta^2 = .07$) with paired samples t-tests showing statistically significant differences between sampling times one and two ($t(108) = -2.42, p = .017, d = .23$) and one and three ($t(69) = -2.69, p = .009, d = .31$) but no other statistically significant relationships, suggesting an initial increase in anxiety before students assumed a new equilibrium of anxiety (see Figure 2).

Figure 2. Mean anxiety scores at all sampling times. Error bars represent the 95% confidence intervals.
Anxiety scores in different demographic groups. The different demographic groups in the current study were age, sex, ethnicity, and mode of entry and admission scheme. These will each be discussed in turn.

Age. In analyses between students aged less than or equal to 21 years and greater than 21 years, statistically significant differences were seen between anxiety scores at sampling times one and two ($t(150) = 2.65, p = .009, d = .21$; and $t(131) = 2.43, p = .016, d = .21$ respectively) where older students noted less anxiety than their younger colleagues. No other statistically significant differences were seen at other sampling times, with analyses showing a coming together of anxiety scores (see Figure 3). Additional analyses between smaller groupings of students aged greater than 21 years did not reveal any further statistically significant differences.

![Figure 3. Mean anxiety scores at all sampling times in dichotomised aged groups. Error bars represent the 95% confidence intervals. * $p < .05$, ** $p < .01$.](image)

Sex. No statistically significant differences were seen in anxiety scores across all sampling times between males and females; a single trend towards significance was seen at sampling time five ($t(147) = -1.97, p = .051$) where female students had higher levels of anxiety than male students. The potentially higher level of anxiety in females at this time might be for a similar reason to that seen for MAPAS students (see below). Sex and anxiety scores at sampling time five were statistically significantly correlated ($r = .16, p = .025$); when ethnicity was controlled for with partial correlation there was no change in this relationship ($r = .16, p = .026$) which suggested that the difference was based upon their gender alone, and not their ethnicity.

Ethnicity. Post hoc comparisons of analyses of variance of ethnicity and anxiety replicated some of the findings outlined from earlier analyses. Statistically significant differences were seen as outlined in Table 20.
Table 20

Post Hoc Comparisons of Anxiety and Ethnicity

<table>
<thead>
<tr>
<th>Sampling time</th>
<th>Comparison</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Māori and Pacific vs. NZ European</td>
<td>73</td>
<td>9.06</td>
<td>.000</td>
<td>.73</td>
</tr>
<tr>
<td>3</td>
<td>Māori and Pacific vs. all</td>
<td>73</td>
<td>2.76</td>
<td>.007</td>
<td>.31</td>
</tr>
<tr>
<td>4</td>
<td>Māori and Pacific vs. all</td>
<td>86</td>
<td>2.99</td>
<td>.004</td>
<td>.31</td>
</tr>
<tr>
<td>5</td>
<td>Māori vs. NZ European</td>
<td>143</td>
<td>2.67</td>
<td>.008</td>
<td>.22</td>
</tr>
</tbody>
</table>

*Note.* At the latter three sampling times, Māori and Pacific students had the highest scores of anxiety of any ethnic group.

The findings of Table 20 allude to a pervasive difference in anxiety between Māori and Pacific students and their colleagues, where Māori and Pacific students had greater levels of anxiety over much of the latter part of the preclinical curriculum, which expanded upon the attenuated admission scheme findings.

**Mode of entry and admission scheme.** No statistically significant differences were seen in anxiety scores between OLY1 and graduate students. Additionally, analyses of variance with admission scheme as the independent variable (MAPAS, ROMPE) also showed no statistically significant differences. However, post hoc comparisons of one-way repeated measures ANOVA of MAPAS and non-attenuated students (i.e., all other students except those admitted through the ROMPE scheme) revealed that MAPAS students had higher anxiety levels than their non-attenuated colleagues at sampling time five ($t(146) = -2.36, p = .020, d = .19$).

**Relationships between motivation and anxiety.** Few statistically significant relationships were found between motivation, motivation change, and anxiety scores. The change in average intrinsic motivation from sampling time one to three had a statistically significant correlation with anxiety scores at both sampling times two and three ($r = -.31, p = .020$; and $r = -.28, p = .021$ respectively) which suggested that sustained anxiety over the course of the year as well as one-off changes in anxiety scores may have contributed to measurable negative changes in intrinsic motivation orientation. Furthermore, the change in average intrinsic motivation from sampling times one to four had a statistically significant correlation with the anxiety score at sampling time point three ($r = -.39, p = .007$), but not two ($r = -.16, p = .228$). This implied that sustained anxiety may have only had such a relation for a defined period. As one progressed further from the initial anxiety-inducing event the apparent strength of the relation to anxiety waned. This was further supported by the fact that effect size scores of anxiety on intrinsic motivation diminished as one moved from the original sampling time ($d = .31$ to $.28$).

**Summary of the anxiety data.** The third hypothesis for this study was that medical students would display appreciable levels of anxiety, and in a similar disposition to motivation...
orientation, would display differences between various demographic groups. It was also proposed that at times of higher anxiety, these anxious states would effect motivational change.

Medical students on average had non-pathological levels of anxiety. Research has suggested that moderate levels of anxiety are beneficial for study, and either a laissez-faire or an overwrought approach were less advantageous (the Yerkes-Dodson law; Yerkes & Dodson, 1908). In the current study, anxiety levels had a proximate effect on changes in the degree of intrinsic motivation but the actual proximity was relevant. The more time that passed from the anxiety-inducing event the less effective the influence.

Older students began the medical programme less anxious than their younger colleagues, as a function of age and not necessarily of previous university experience. This was likely related to life skills and experiences. However this early advantage was later lost, possibly as shared experiences within the medical programme negated these earlier experiences.

MAPAS students (and possibly female students) were shown to develop higher levels of anxiety later in the programme coinciding with increased clinical exposure. The potential explanation was that the ward environment encountered did not reflect the environment (with respect to gender and ethnicity norms) that these students had been exposed to during their classroom experiences.

This study showed that medical students generally handled stress well with high normal, non-pathological levels of anxiety. Older, male, and non-MAPAS students showed lower levels of anxiety at entry, and sustained lower levels at later times.

**Free Text Box Responses**

The qualitative responses to the free text box asked participants to "Please reflect on the last few weeks and tell me about any major events or stressors in your life." This provided an additional viewpoint to address the third hypothesis on anxiety in medical students.

On almost every sampling occasion the percentage of "responders" to "non-responders" of the free text boxes increased (see Table 21).

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>152</td>
<td>133</td>
<td>78</td>
<td>92</td>
<td>149</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>47.4</td>
<td>54.1</td>
<td>78.2</td>
<td>72.8</td>
<td>83.2</td>
</tr>
</tbody>
</table>
During MBChB2 sampling, 70% of participants responded on at least one occasion, and 86.6% did so on at least one occasion during MBChB3 sampling. The act of submitting a comment in response to whether there was any specific stressful event in the preceding weeks may very well have had a cathartic effect. Table 22 showed participants who completed a questionnaire and chose to comment had statistically significant higher average anxiety scores during semester one of MBChB2 and semester two of MBChB3, but had no statistically significant difference in any academic outcome measure, in spite of correlations which suggested a negative relationship between higher anxiety and academic outcome (see Chapter 4). However as the ratio of responders to non-responders increases towards the final sampling time, one must be wary of a potential Type I error.

Table 22

<table>
<thead>
<tr>
<th></th>
<th>Semester 1 MBChB2</th>
<th>Semester 2 MBChB3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>GPA</td>
</tr>
<tr>
<td>Responders</td>
<td>72</td>
<td>6.51</td>
</tr>
<tr>
<td>Non-responders</td>
<td>61</td>
<td>6.72</td>
</tr>
</tbody>
</table>

* $p < .05$.

A thematic analysis methodology was used which allowed concepts to emerge organically from data without superimposing preconceived categories on to the data. Respondents wrote openly about recent stressors in their lives. These were largely negative, likely based on the erroneous belief that all sources of stress are negative (Folkman & Moskowitz, 2000). However, on infrequent occasions, positive stressors were noted. Data were coded as described in the methods section. Originally 46 unique codes were assigned to the 398 individual comments across five questionnaire iterations. These original codes were coalesced in a stepwise fashion into broader and more inclusive parent codes. These were then organised into subthemes where a pair of overarching themes became apparent. Respondents felt that stressful events affecting their studies could be divided into those events that came from "inside medical school" and those that came from "outside medical school".

**Inside medical school.** The "inside medical school" theme had four major subthemes, some of which had further subthemes. The principal factors are outlined in Figure 4.
There were four major stressors from within medical school: academic outcome (both the grade itself, and the process of getting there through assessment), the workload of the programme, students' motivation with respect to the programme, and students' feelings about medical school (including their uncertainty with the programme, and social comparisons within the class).

**Academic outcome.** Medical students, like their general education colleagues, worry about grades (Van Etten, Pressley, Freebern, & Echevarria, 1998). The current study outlined multiple reasons for doing so. For example, students were concerned about passing the course: “Worried about passing medical school (got a bad mark in a few tests),” and “Concerned about failing”; and were anxious if financial supports were dependent on grades, or maintenance of a particular GPA: “Needing a B+ to keep scholarship”, or “No one knows how hard [medical school] is and how hard I should be working. I told them I got a C in a test and they [family] were happy but I nearly cried because I need at least a B– to keep my scholarship.” In qualitative interviews, Van Etten et al. (1998) noted that students’ most salient goal was getting good grades, and avoiding bad ones to the point that getting a good grade was deemed more important than learning for this grade (i.e., there was a disconnect in students’ beliefs about the nature of assessment). Interestingly these stressors noted by participants about grades were confined to responses from sampling times in semester one of MBChB2 only. After this time no such stressors were reported. It would have been naïve to assume that students were no longer concerned about passing or scholarship retention, but perhaps these stressors became less important in the face of other challenges. On the other hand, concerns about assessments (assignments, tests,
examinations, research projects, and so on) were pervasive and were seen at all sampling times, with 189 individual references to assessment worry. In spite of the concern about assessment, it was worthy to note that the stress associated with them did not wane with time. Cohen-Schotanus (1999) noted that planning of examinations and examination rules can have an important influence on study progress: examinations must be high stakes enough that studying is important. Paradoxically, this finding was also reflected in Van Etten et al. (1998), where, in spite of their feelings about assessment and learning, students noted that in the absence of assessment they felt they would do little study at all. Thus, in the current research cohort, the faculty had achieved a delicate balance where students still found studying important (as reflected in its inclusion as a subtheme), without becoming desensitised by the process.

**Workload.** In previous studies (e.g., Dahlin et al., 2005), workload concerns decreased during the medical programme as students adapted to the rigour of the course. Dahlin and colleagues’ study showed statistically significant reductions in perceived workload as one progressed through medical school in first-, third- and sixth-year medical students. Their study also showed statistically significant lower perceived workload in male students compared with female students. These results were mimicked in the current study: the number of coding episodes for workload decreased across the course of the study, from a total of 26 items in MBChB2 (with a peak during sampling time two of 18), to only 5 in MBChB3. The tone of respondents’ concerns also changed during this same time from “Workload challenging”, and “Pressure of learning so much”; to “Generally medical school is sweet as long as you keep up. All this talk about needing to relax more and enjoy other things I feel is bullshit.”

**Motivation.** Motivation in this context described a desire for medicine, or more accurately, a lack of desire: “Have been hitting the third year doldrums and lost quite a bit of motivation”, and “I find I am very demotivated. The amount of work keeps me from committing to activities I would like to do, yet time I spend studying—a lot of it is procrastination because I feel like I don’t care about it much anymore.” Of the 23 comments coded for motivation, 21 came from sampling during MBChB3. At a minimum, students had been studying for three years and described a malaise with regards to medicine: “I'm so sick of medical school. I just want to get to clinical years already and I can't be bothered sitting in a library and studying”; for some students (i.e., graduate entry) the period of studying had been longer: “This is my eighth year at university, and the past week have felt like I'm over the lectures.” The concept of a “preclinical doldrums” has been frequently encountered (Barrows, 2000), especially when students perceived the preclinical years as a difficult and inconsequential obstacle to becoming a doctor; this was reflected in a readiness for the next step in responses: “Getting to the end of third year and wanting to get into clinical learning.” Artino, La Rochelle, and Durning (2010) noted that boredom in medical students had negative implications on examination grades, and that medical students were not so resilient that the effects of negative emotional achievements were
insignificant. For example, a respondent noted: “I feel like I will be able to accomplish the work easily, I just don’t really like doing it most of the time, only because it can be boring.”

**Feelings about medical school.** Medical students had particular feelings about the medical programme: these related largely to uncertainty about the programme and what was expected: “Not knowing what to expect at medical school”; continuation of their course of study: “Thinking of quitting”; and uncertainty about the future: “Not feeling motivated enough to do well since I don’t even know what I’m going to do with my medical degree”, and “Discovered I like doing research a lot more than medical school. Only reason I’m still doing medicine is that being a doctor is supposed to be far better than being a medical student. If not, then research is looking like a good alternate but related career path.” Uncertainty about the expectations of the programme were confined to the first sampling time at the beginning of semester one. The uncertainty about continuation of the programme and the future beyond medical school began appearing at the end of MBChB2 and continued in MBChB3, which largely reflected the motivation data described earlier. Additionally, MBChB3 marked a transition phase in the medical programme from a preclinical to clinical curriculum, a time deemed particularly stressful and prone to burnout (El-Masry, Ghreiz, Helal, Audeh, & Shams, 2013), as noted by one respondent: “Closer and closer to becoming clinical students [and the] reality of becoming a doctor.”

**Outside medical school.** The “outside medical school” theme had three major subthemes, some of which had further subthemes. The principal factors are outlined in Figure 5.

Figure 5. Map of “Outside Medical School” theme and subthemes.
Personal issues. Personal issues dominated the analyses with 192 instances across all five sampling times. The parent codes for the personal issues subtheme were intra-, inter- and extrapersonal issues. Intrapersonal issues were those within the individual, for example, financial and health issues: "I sometimes can’t make rent and don’t know what to do. I’ve considered doing unethical or illegal things for money but as of yet still have not", and "Recently I was diagnosed with depression." Financial pressures were particularly relevant in medical students where the cost of the programme was higher per year, and longer, than other undergraduate degree (Faculty of Medical and Health Sciences, 2014). This was especially pertinent to graduate students who typically incurred higher debt related to their time studying and reported greater stress with regard to financial problems, and often had a concurrent need to work outside of medical school (Harth, Biggs, & Thong, 1990). For example, one student noted difficulty “Maintaining work commitments to have income.”

Interpersonal issues were those between the respondent and others (e.g., family, significant others, friends). Family-specific reports included pressure from families as well as a perceived lack of a support network from families: "I have a lot of pressure from family to do well", and "My family live overseas and have recently moved countries again, so there’s no ‘home’ to go back to.” Although familial pressure has been sporadically studied in medical students, it has previously been reported as the second most important goal for students in their reasons for pursuing a better grade, and the second most common (although not the most deleterious) stressor (Amin et al., 2009; Sreeramareddy et al., 2007). This high degree of prevalence was not seen in the current study. Previous literature has also suggested that students with a robust support network reported less stress compared to those who attempted to tackle problems alone (Mosely et al., 1994; Supe, 1998). Although there was no mention of resilient support networks in this current study (and this was unsurprising given it asked about recent stressors, not stress relievers), one respondent mentioned: “Friends needing support but too busy to deal with it.” Support networks rely on mutual input and maintenance, and students were aware that if they neglected these it might be to their future detriment.

Interpersonal health issues were also seen within families (including a number of bereavements): “My mother was diagnosed with breast cancer a few weeks ago and is currently recovering from surgery in the hospital. I have an exam tomorrow and I can’t seem to remember anything I have studied”, and “My grandmother falling ill then passing away.” Relationship issues were also prominent: “Re-establishing relationship with ex-partner (a previous acrimonious relationship) with family and friends opposed to the reunion”, and planning for specific occasions: “Planning a wedding for December.” Personal life events were equally as relevant as curricular factors in medical student stress and burnout (Dyrbye et al., 2006).
Extrapersonal issues were those that occurred in the wider setting of the individual. Although the experience was personal, many people were affected by the same stressor. In this study only two events rose to such prominence: the repercussions of the Christchurch earthquake of February 22, 2011; and the Rugby World Cup in September and October of 2011. It is unclear whether the latter was a positive or negative stressor.

**Living situation.** Movement and relocation was a stressful life event, and has been found to be more so for adolescents than adults (Raviv, Giora, Abazon, & Raviv, 1990). Notable effects include disruption of social and community ties, and loss of social supports (Manzo, Kleit, & Couch, 2008). The differences in perceived stress in adolescents relates to mobility resources and the ability to marshal these resources to maintain previous social contacts and friendships. The majority of medical students at the Faculty of Medical and Health Sciences came from the greater Auckland and Northland regions; a significant minority attended from the lower North Island and fewer still from the South Island (Mitchell et al., 2010). For those who had to move to Auckland, stressors were noted both from the move itself, and the need to find new accommodation: “Moved to Auckland (had to leave strong support network including my partner), finding a flat in Auckland”, and “Trying to organise flatting for next year which is definitely a stressful process at the moment.”

**Commitments.** Medical students had commitments outside of medical school that competed for time and effort with their studies. Commitments were divided into external commitments (e.g., other organisations, work, and sports): “Other committee obligations”, “I have had to take on more shifts at my job which means late nights and it is hard to make it to 8am lectures feeling refreshed and ready to learn for the day”, and “Important football match coming up”; and maintaining a study–life balance: “Balancing family and medical school.” After personal issues and assessment, a study–life balance was the third most frequently coded item and was ubiquitous across the entire study. Firth (1986) found that aside from having to talk to patients, the next most common source of stress described by students was the effect their medical training was having on their personal life. One respondent noted: “It is hard to balance time. Between study, seeing friends, seeing family, having time for me, doing exercise, seeing girlfriend. There is not enough time I find. At least to do well without compromising most if not all of these.” Previously, medical students had described difficulties in time management, especially in balancing social activities and academic tasks (Miller, 1994), as reflected in one comment: “I did not prepare as well as I could have due to time commitments elsewhere.”

**Discussion**

Study 1 asked the question of how medical students’ motivation orientation changed over the course of two years of the preclinical curriculum and whether disparate changes were seen in
different demographic groups. The study also examined the effect of anxiety on both motivation as a whole, but also on any change in motivation.

The results suggested that medical students generally began the medical programme with a solid foundation of intrinsic more so than extrinsic motivation, albeit present in differing quantities. This supported the previous statements of Mattick and Knight (2009), who intimated that medical students (and other professional degree students) had higher amounts of intrinsic motivation than their non-professional degree colleagues. At the beginning of MBChB2 semester one, medical students’ intrinsic motivation made up a mean of 27% of their motivation construct. In combination with identified motivation, 58% of motivation was in a desirable bracket (i.e., autonomous motivation). Throughout the entirety of the study, the combination of identified and intrinsic motivation never dropped below 55%.

The main findings of the current study showed that while cohort-wide means of autonomous motivation (i.e., intrinsic motivation and identified regulation, see Tables 13 and 14) were generally satisfactory, there were nuanced differences between age groups, ethnic groups, and students admitted through attenuated admission streams. Older students, by virtue of their age and not their entry status as graduate students, had a higher level of intrinsic motivation than their younger colleagues at the time of entry into the medical programme, and continued to do so throughout the preclinical years. Goal theory posited that over time learning motivation becomes more highly evolved—that is, there is a movement from extrinsic to intrinsic orientations (Urdan & Maehr, 1995; Veroff & Veroff, 1980)—but also that mature (i.e., older) students tended to begin with more highly evolved orientations than their younger peers (Dweck, 1986). However, the current study differed from the aforementioned studies in that older students continued to improve their intrinsic motivation as a function of their entire motivation outlook, but at pace with both their younger and youngest colleagues, meaning they maintained this motivational advantage at all times. Within controlled motivation, the oldest students had the highest levels of introjected motivation (the more internalised of the two controlled motivations). The results suggested that in spite of a natural maturation of learning motivation over time, a persistent gap remained between younger and older students akin to the metaphorical rising tide lifting all ships. Additionally, the statistically significant findings seen between all students aged greater than 21 years were seen at later sampling times and were isolated to the less internalised extrinsic motivation orientations, which suggested that there was a late move away from these orientations. In contrast to earlier studies which suggested a shorter lag time in the catch up of younger students with their older peers (Heath, 1964; Newble & Entwistle, 1986), these albeit small findings suggested that the catch up perhaps took longer than previously suspected.
New Zealand European students had a higher proportion of intrinsic motivation at the outset of the study compared to Māori, Pacific, and Asian students but this motivational advantage was lost as students of other ethnicities eventually replicated the motivation orientation of their New Zealand European colleagues. The reason for this could be a “backsliding” of motivation in New Zealand European to be more in tune with their colleagues, or an improvement in their colleagues overall approach to motivation orientation. This alignment suggested that the environment of the medical programme was such that the influences on motivation orientation were interpreted in a similar fashion across all ethnicities, in contravention of previous thoughts that some students were more adept at picking cues from the environment than others, demonstrating “augmented achievement strivings” (Weiner, 1990, p. 619).

Interestingly, aside from the one instance above, Māori and Pacific students did not show any difference with respect to intrinsic motivation levels compared with their colleagues, but students admitted through MAPAS entry did. Forty students were admitted through the attenuated scheme (37 as OLY1 and 3 as graduates), yet 41 students across the study participants identified as either Māori or Pacific27. This one student discrepancy was unlikely to account for the difference in results. MAPAS students had lower degrees of relative intrinsic motivation compared with their general admission colleagues throughout the study. No statistically significant difference was seen when comparing the ROMPE students (who only accounted for 18 students) to non-attenuated admission students. No difference in other forms of motivation were seen which implied that MAPAS students did not turn away from more internalised forms of motivation (i.e., there was no negative effect of potential stereotype threat as referenced below), simply that they failed to align their motivation orientation in the same manner as their colleagues. MAPAS students had additional education resources available to them (i.e., a different set of environmental cues) during their medical programme in the form of tutorials, and prior examination templates and answers that were not readily available to other students (Te Kupenga Hauora Māori, 2013). Whether in fact this additional educational contact had negative motivational consequences remains an open question. This self-imposed grouping appeared to lead to the formation of a “MAPAS identity” (Rich & Schachter, 2012), which was distinct from an ethnic identity with its own set of expectations, that potentially explained the discrepancy in results. Identity development is believed to be a by-product of intra- and interpersonal factors, and the effect of social institutions (Cote & Turgeon, 2005). As such identity development appeared to occur in a similar manner to, and likely in concert with, motivation orientation change.

27 Māori and Pacific students are free to apply through non-attenuated channels if they chose to do so.
The Baptist preacher, Charles Haddon Spurgeon, once said: “Our anxiety does not empty tomorrow of its sorrows, but only empties today of its strengths”. At their entry into the medical programme, medical students had an acceptable level of anxiety commensurate with the new expectations and outlines for their studies and ultimately their careers. Older students, again by function of their age and not their previous university experience, had lower levels of anxiety at the outset of the medical programme. However, this advantage was lost at future sampling iterations where statistically significant differences between age cohorts were no longer apparent. The early differences in anxiety were difficult to explain; it might be a simple explanation of older students being more adept at dealing with change and differing expectations. At the outset of the medical programme, students had brought their own suppositions about the programme into the classroom. At later sampling times these suppositions had been replaced with actual influences from the medical programme. Although the effect of these influences was unique to the individual they were common enough to the population and one would have anticipated a “normalisation” of anxiety levels.

This explanation has not considered the statistically significant difference in anxiety levels between sampling times one and two. However, this need not discount the hypotheses of stress and motivation effects. What this continued difference illustrated was that anxiety had a prolonged, but not infinite influence (an “anxiety hangover”). Additional study results revealed that anxiety influenced motivation change, but only for a contained period. The effect scores of anxiety waned the further away one was from the anxiety sampling time.

In spite of the conjecture about normalisation of results, MAPAS students experienced a late increase in anxiety compared with their non-MAPAS colleagues respectively. This difference was worthy of note, especially as sampling time five had not shown statistically significant differences in other analyses. There was also a trend toward a similar experience in female students. The fifth sampling time was deliberately chosen to reflect a time when students were being exposed to clinical environments through hospital ward-based attachments, where they could see their learning put into practice. This may have represented a degree of anxiety on the part of MAPAS students when they reflected on their role in the public health care system as a whole, a system that they were being exposed to by these same ward attachments. This system lacked a comparable number of MAPAS role models because of a general absence of doctors historically admitted through this scheme in senior hospital roles (Jansen, Bacal, & Crengle, 2008). Similarly, although female students have made up more than 50% of class numbers for some years, this trend was not always seen in a hospital setting (Lawrence & Poole, 2001). The legacy of medicine as an exclusive profession of non-minority males is changing dramatically, but this reshaping of the medical workforce has taken time. As such these students may have experienced anxiety about their place in the medical workforce, and exhibited signs of stereotype threat (Steele & Aronson, 1995). Stereotype threat is a “social-psychosocial predicament” (p.
that arises from a widely known stereotype about one’s group (e.g., ethnicity, sex). The predicament occurs because the existence of the stereotype means that any action on the part of the individual that satisfies the stereotype serves to make the stereotype more plausible. This predicament is threatening enough to have disruptive effects on the individual, including fears that others might perceive them in this manner. However, in contrast to Steele and Aronson’s findings, the anxiety induced from the potential to fulfil a negative stereotype was not associated with the decrement towards extrinsically-orientated motivation (or “performance orientation” as Steele and Aronson described it) at this sampling time.

Medical students have been proposed to exist in a state of chronic anxiety (Coburn & Jovaisas, 1975). In a study of first-year medical students (equivalent to MBChB2 students) over one-third of students scored above the threshold of the General Health Questionnaire, indicating probable psychological disturbance (Guthrie et al., 1995). In the current study, the act of sharing their anxieties and worries may have mitigated the negative effect on academic outcome typically associated with anxiety. In the qualitative data obtained from the free text box, responders, in spite of their statistically significant higher anxiety levels, did not have statistically significant differences in academic outcome to non-responders, although a direct causative link cannot be made at this point. Stressors encountered by medical students in this study were broadly divided into those encountered inside medical school and those from outside medical school. Much previous research into stress among medical students has focused on factors within medical school and those that were unique to a medical programme (El-Masry et al., 2013; Firth, 1986; Radcliffe & Lester, 2003). Fewer had investigated external sources of stress; see Sreeramareddy et al. (2007) for an exception.

Stressors were often felt to be negative and the majority of responses to this study were of a negative valence; however, stress can have positive effects including increased motivation, focusing of thoughts, preparation for a stressful career, and enabling students to develop methods for coping with stress (Radcliffe & Lester, 2003). The five most common reported stressors in this study were assessment, interpersonal issues, study–life balance, personal health issues, and financial issues. The “inside medical school” stressors identified amongst this group were the maintenance of an appropriate life balance outside of medical school (which could also be classified as an external stressor), leaving assessment as the only relevant issue truly within medical school. The relationship between assessment and stress was well demarcated (Sarason, 1984), and therefore focusing resources and effort on existing “inside medical school” issues for managing stress levels was a poor endeavour; these efforts should instead be focused on supporting students with external sources of stress and aiding them in appropriately managing the abundance of issues, largely personal, from this arena. This would allow the deleterious effects of anxiety discussed earlier to be ameliorated.
The next study will expand upon the findings of this present study to ask whether the different motivation orientations displayed in the medical student cohort to date are associated with different academic outcomes. It will also investigate the effect of anxiety on these same measures. Self-determination theory proposes that a more fully internalised motivation orientation is associated with greater competence, autonomy, and relatedness. Tangible effects are needed to convince not only teachers, but students that this is the case.
Chapter 4

Study 2: The Relations between Demographics, Motivation, Anxiety, and Academic Outcome

“I try all things, I achieve what I can.”
— Herman Melville, *Moby-Dick; or, The Whale*

Study 2 extended the question of medical student motivation orientation and anxiety, and asked whether these variables had a measureable relationship with academic outcome. This study examined a number of academic outcome measures and determined whether differences in these measures existed between the demographic groups identified from Study 1. It expanded upon the findings of Study 1 and explored the relationship between motivation, subsequent motivation change, and anxiety with respect to academic outcome.

The development and refinement of goal theory occurred in tandem with a consideration of its effects on academic achievement. In Dweck’s (1986) original publication on goal theory, she noted that “although children displaying the different patterns [of learning] do not differ in intellectual ability, these patterns can have profound effects on cognitive performance” (p. 1041). While Dweck’s theories largely dichotomised motivation, self-determination theory suggested more of a spectrum from external regulation to intrinsic motivation (Deci & Ryan, 1985, 2002). A question of whether a mirrored gradation in academic outcome was seen has not been exhaustively addressed in a medical student population.

Grant and Dweck (2003) suggested that higher order motivational constructs were associated with better academic outcomes. It was hypothesised that medical students who displayed more fully internalised levels of motivation would have better outcomes when measured by average coursework scores, examination scores, grades, and grade point average (GPA). The research questions for this study were: is there a statistically significant difference in academic outcome between demographic groups; is there a statistically significant correlation between the different types of motivation described by Deci and Ryan (1985) and academic outcome; and could differing types of motivation predict academic attainment?

Method

Participants

The participants in this study were identical to those who participated in Study 1. The author received assessment data for all students (n = 213 for MBChB2, n = 209 for MBChB3).
difference in the number of students in each year group was a reflection of both student attrition from MBChB2 and students who repeated MBChB3 in 2012, having failed this year in 2011.

**Settings**

The Academic Motivation Scale (AMS) and Westside Test Anxiety Scale (WTAS) questionnaires were administered as per the description from Study 1. Assessments were performed under the guidance of the Faculty of Medical and Health Sciences and were conducted according to dates set out in course materials and the university calendar. The author had no direct or indirect role in writing, delivering, or marking of assessments. Depending on the particulars of the assessment, these were undertaken in students’ own time and completed in their place of choice, or completed at specific times in specific locations (e.g., general practitioner visits). Examinations were undertaken at university facilities, either at the Grafton or Tamaki campuses of the University of Auckland.

**Ethical Approval**

Ethical approval was obtained for this study from the University of Auckland Human Participants Ethics Committee (reference 2011/041) on 22 February, 2011 for the duration of the study (not exceeding three years).

**Materials**

**Questionnaires.** The data from the AMS and WTAS questionnaires for Study 1 were also used in this study. Demographic data obtained from the questionnaires were used in statistical analyses of differences between students. Any changes in motivational constructs were investigated for a corresponding change in academic outcome. Full details about the design and delivery of this questionnaire can be reviewed in Chapter 3. The reader is reminded that the AMS was designed to measure motivation orientation according to the self-determination theory spectrum, and the WTAS measured anxiety scores.

**Assessment data.** Permission was gained from participants for access to their results for MBChB2 and MBChB3. This was electronically delivered to the author in a de-identified fashion in the form of a Microsoft Excel spreadsheet with unique university identification numbers and the letter grade (A+, A, A− etc.) for each of the 12 courses of the two years of the preclinical curriculum. The letter grades were converted into numeric grades (A+ = 9, A = 8, through to C− = 1; with D+, D, and D− equivalent to 0) for the purposes of statistical analyses.
In addition, a comprehensive set of data were obtained for the MBChB2 results. This consisted of separate spreadsheets for the six courses, where each individual assessment was named and tabulated with raw scores. Typical assessments included mid-semester tests, end of semester examinations, practical skills tests (students run a "rat race" with multiple stations where they must answer a question about human anatomy with cadaveric models, or a microscopy slide), clinical skills tests (students complete clinical examinations on actors), clinicopathological correlates (similar to practical skills tests where a clinical case is presented with pathological specimens and questions about this are answered), patient post-mortem investigations (a group presentation where students evaluate the cause of death of their cadaveric model and present evidence for this), and the Human and Early Life Development project (a two-year project where students follow the pregnancy, birth, and first years of life of a child and their family). End of semester examination marks were also displayed as respective multiple-choice question (MCQ) and short answer question (SAQ) totals. The weighting for each assessment varied by course and was at the discretion of the course coordinator. Raw scores for individual assessments were converted into percentage marks based upon the weighting of the assessment (e.g., a score of 63.5 in the practical skills test (total raw score 70) in the Human Anatomy Laboratory in the Musculoskeletal course was scored as 90.7%).

Procedure

Academic outcome data were collated by the Phase 1 coordinator for the MBChB course after the final meeting of the Board of Studies for the Faculty of Medical and Health Sciences medical programme in 2011 and 2012. Coupling to the questionnaire data was achieved using the unique student identification numbers. Where no corresponding questionnaire data existed (i.e., the student had chosen not to participate in the study at any sampling time), the grade and comprehensive data were not used in the analyses described. Of note, there was no statistically significant difference between the GPA of students who participated in the current study and those who chose not to do so ($t(205) = 1.23, p = .220, d = .09$).

Storage of this sensitive data was explained in the participant information sheet, and these processes were adhered to. Copies of the participant information sheets and consent forms used in this study may be found in Appendix B.

Statistical Analysis

The analyses of the research questions for this study were addressed using bivariate, two-tailed Pearson correlation testing, paired and independent samples t-tests, repeated measures analyses of variance (ANOVA) with post hoc tests (Tukey HSD test, which was the most
appropriate post hoc test in cases of equal sample size and population variance; Field, 2009), pairwise comparisons where appropriate, and linear and multiple regression modelling. Results, where statistically significant, are presented in this order in the following sections.

Analyses of variance were used to measure differences in academic outcomes between demographic groups with course grade, semester GPA, and year GPA as the dependent variable; and demographic data as the independent variables. Later, average coursework scores, average MCQ scores, and average SAQ scores were entered as dependent variables; with motivation, motivation change, and anxiety scores as the independent variables.

Simple linear regression was used to measure the amount of variance of models predicting academic outcome (semester GPA, year GPA, average coursework scores, average MCQ scores, and average SAQ scores) explained by the independent variables of demographic data, motivation scores, and anxiety scores. Where nominal data was used as the independent variable, dummy variables were created and used in the analyses. Changes in average and relative motivation orientation scores between sampling times were also used as independent variables to determine whether changes in scores in particular directions (i.e., an increase or decrease in the specific motivation orientation) were associated with better models to explain variances in academic outcome.

The method used for constructing linear regression models and standard multiple regression models was the Enter method. Where hierarchical multiple regression models were constructed, the steps were based on either best guess estimates or previous research. Diagnostic precautions were taken with all regression modelling. Measures of collinearity (variance inflation factor, tolerance, and condition indices) and the Durbin-Watson test were assessed. Unless noted specifically in the text, these measures were all within acceptable parameters: that is, variance inflation factor < 10, tolerance > .01, condition indices < 30, and the Durbin-Watson test approximately equal to 2 (Field, 2009).

All analyses were performed using Statistical Package for the Social Sciences (SPSS) version 22.0.0.0 (IBM, 2013). A Bonferroni adjustment of significance as less than “0.05/number of comparisons” for multiple comparisons was applied to control the familywise error rate (Field, 2009). Where necessary this value was ascribed within the text.

Results

Results for the Entire Study Participants

In semesters one and two of MBChB2, medical students undertook two single semester courses (Musculoskeletal System, and Digestive System; and Cardiorespiratory System, and Genitourinary System respectively) and two courses that spanned the entire year (Principles of
Medicine, and Professional and Clinical Skills). In semesters one and two of MBChB3, students undertook three courses in each semester (Reproduction and Development, Neurosciences, and Medical Humanities in semester one; and Blood, Immunity, and Infection; Regulation of Body Function; and Professional, Clinical, and Communication Skills in semester two). Results were averaged to give a GPA for each semester and each year as a whole. In MBChB2, the year-long courses were combined with the other semester-only courses to give a GPA for the year but the former were excluded from the semester GPA. Grade point averages are displayed in Table 23 and represented interval data (even though grades themselves are presented as ordinal data). In symmetrical data the mean is the most appropriate measure of central tendency; in asymmetric data the median is more appropriate (Field, 2009). Asymmetric data is skewed: skewness measures the clustering of items around opposite ends of a scale; values of > 2.1 suggest a departure from normality (West, Finch, & Curran, 1995). Kurtosis measures the slope of the central tendency; values of > 7.1 suggest a departure from normality (West et al., 1995).

<table>
<thead>
<tr>
<th></th>
<th>MBChB2</th>
<th>MBChB3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Semester 1</td>
<td>Semester 2</td>
</tr>
<tr>
<td>n</td>
<td>190</td>
<td>187</td>
</tr>
<tr>
<td>Mean</td>
<td>6.57</td>
<td>5.72</td>
</tr>
<tr>
<td>Median</td>
<td>7.00</td>
<td>6.00</td>
</tr>
<tr>
<td>SD</td>
<td>1.84</td>
<td>2.04</td>
</tr>
<tr>
<td>Skewness</td>
<td>−0.82</td>
<td>−0.46</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>0.17</td>
<td>−0.39</td>
</tr>
</tbody>
</table>

Paired samples t-testing showed statistically significant differences between MBChB2 semester one and two GPA ($t(188) = −11.50, p < .001, d = .64$), MBChB3 semester one and two GPA ($t(181) = −17.11, p < .001, d = .79$), and also between MBChB2 and MBChB3 GPA ($t(181) = −5.80, p < .001 d = .40$). Each semester and year was different (i.e., functionally independent) from the preceding one, although subsequent semester and year GPA was highly correlated ($r$ ranged from .69 to .86, $p < .001$, which suggested very high inter-grade reliability); therefore although average outcome measures were different in each of the four semesters, previous performance demonstrated a potent influence on subsequent performance.

After confirming that percentage marks were normally distributed, independent samples t-tests were performed using average MCQ and SAQ scores as the two variables to determine whether these measures were independent of one another (see Table 24). MCQ-based
examinations are reliable because their nature allows a breadth of assessment in a shorter time; SAQ-based examinations are more time-cumbersome and hence in an equivalent time frame to an MCQ-based examination could not adequately assess the same scope of knowledge (McCoubrie, 2004). Aside from the Digestive course, all other examples showed statistically significant differences between the two question types, suggesting that although the question types were strongly correlated (Pearson correlation values of \( r \geq .61, p < .001 \) were noted for all pairings), these question types served as different outcome measures.

Table 24

\textit{Independent Samples t-Tests of MCQ and SAQ Scores in End of Semester Examinations} \\

<table>
<thead>
<tr>
<th>Course</th>
<th>n</th>
<th>MCQ scores Mean (SD)</th>
<th>SAQ scores (SD)</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musculoskeletal</td>
<td>189</td>
<td>72.04 (12.29)</td>
<td>84.43 (9.60)</td>
<td>188</td>
<td>−19.54</td>
<td>.000</td>
<td>.82</td>
</tr>
<tr>
<td>Digestive</td>
<td>189</td>
<td>73.64 (11.96)</td>
<td>74.63 (11.10)</td>
<td>188</td>
<td>−1.59</td>
<td>.114</td>
<td>.12</td>
</tr>
<tr>
<td>Cardiorespiratory</td>
<td>187</td>
<td>67.33 (13.66)</td>
<td>70.51 (11.49)</td>
<td>186</td>
<td>−4.65</td>
<td>.000</td>
<td>.32</td>
</tr>
<tr>
<td>Genitourinary</td>
<td>187</td>
<td>73.98 (11.62)</td>
<td>70.16 (11.82)</td>
<td>186</td>
<td>5.51</td>
<td>.000</td>
<td>.37</td>
</tr>
<tr>
<td>Principles of Medicine</td>
<td>188</td>
<td>76.68 (10.32)</td>
<td>57.54 (9.48)</td>
<td>187</td>
<td>29.92</td>
<td>.000</td>
<td>.91</td>
</tr>
</tbody>
</table>

\textit{Note.} The Professional and Clinical Skills examination did not have any multiple-choice questions.

“Coursework” (as defined as work undertaken during semester time that was not a written test or examination) and "examinations" (written tests and end-of-semester examinations) strike a balance between ease of delivery and catering to greater class numbers. Ongoing coursework remained an important assessment tool, especially among weaker students where, in previous research (Van Gaal & De Ridder, 2013), coursework had been shown to provide an additional benefit to examination grades and overall GPA (versus higher achieving students where assessment tasks provided less of a measureable effect on examination performance). Independent samples \( t \)-tests were conducted for coursework and examinations scores, with the results shown in Table 25. Pearson correlation values of \( r \geq .43, p < .001 \) were noted for all pairings.
Table 25

**Independent Samples t-Tests of Coursework and Examination Scores**

<table>
<thead>
<tr>
<th>Course</th>
<th>CW (SD)</th>
<th>EX (SD)</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musculoskeletal</td>
<td>189 71.88 (12.49)</td>
<td>78.61 (9.73)</td>
<td>188</td>
<td>-13.05</td>
<td>.000</td>
<td>.69</td>
</tr>
<tr>
<td>Digestive</td>
<td>189 77.64 (8.69)</td>
<td>76.57 (9.16)</td>
<td>188</td>
<td>2.02</td>
<td>.044</td>
<td>.15</td>
</tr>
<tr>
<td>Cardiorespiratory</td>
<td>188 86.64 (4.25)</td>
<td>68.06 (11.06)</td>
<td>186</td>
<td>27.21</td>
<td>.000</td>
<td>.89</td>
</tr>
<tr>
<td>Genitourinary</td>
<td>188 72.88 (8.33)</td>
<td>72.02 (10.06)</td>
<td>186</td>
<td>1.41</td>
<td>.160</td>
<td>.10</td>
</tr>
<tr>
<td>Principles of Medicine</td>
<td>187 91.96 (4.40)</td>
<td>69.34 (8.76)</td>
<td>186</td>
<td>38.96</td>
<td>.000</td>
<td>.94</td>
</tr>
<tr>
<td>Professional and Clinical Skills</td>
<td>187 78.91 (5.45)</td>
<td>74.09 (8.61)</td>
<td>185</td>
<td>8.31</td>
<td>.000</td>
<td>.52</td>
</tr>
</tbody>
</table>

*Note. CW = Coursework scores; EX = examination scores.*

**Academic Outcome Differences Between Different Demographic Groups**

The different demographic groups in the current study were age, sex, ethnicity, and mode of entry and admission scheme. These will each be discussed in turn.

**Age.** When age was dichotomised (≤ 21 years, > 21 years), independent samples t-tests showed statistically significant higher grades for older students in the Professional and Clinical Skills course in MBChB2 (t(186) = −1.99, p = .048, d = .14) and the Medical Humanities course in MBChB3 (t(180) = −2.84, p = .005, d = .21) compared with their younger peers. No further differences were seen in other courses, semester GPA, or year GPA. Further comparisons which compared old (22–25 years), older (26–29 years) and oldest (≥ 30 years) students showed no additional statistically significant findings, although the numbers of these students were much smaller and the lack of statistically significant findings could have represented a Type II error, that is, when the null hypothesis is false, but fails to be rejected.

Further analyses of MCQ and SAQ scores with age as the independent variable revealed no statistically significant differences. When older students (aged > 21 years) were compared among themselves no additional statistically significant differences were forthcoming.

Simple linear regression modelling showed no significant contribution of age as a predictor of any semester or year GPA, average MCQ scores, or average SAQ scores. There was a trend toward a statistically significant model for older students performing better than their younger colleagues in average coursework scores (β = .137, t(187) = 1.89, R² = .019, F(1, 187) = 3.59, p = .060), which would have accounted for almost 2% of the variance in these scores.

**Sex.** The only statistically significant differences that existed between the sexes were in the Musculoskeletal course grade where male students performed better than female students (t(188) = 2.39, p = .018, d = .17), and the Professional and Clinical Skills course grade where
female students performed better \( (t(186) = -2.88, p = .004, d = .21) \). No statistically significant differences existed for semester or year GPA.

With reference to more detailed results, male students performed statistically significantly better than female students in Musculoskeletal coursework \( (t(187) = 2.59, p = .010, d = .19) \) and Musculoskeletal examinations \( (t(186.18) = 2.63^{28}, p = .017, d = .19) \); but only in the MCQ component \( (t(186.98) = 2.54^{29}, p = .012, d = .18) \), and not the SAQ component \( (t(187) = 1.75, p = .083, d = .13) \).

The results for MCQ data were reinforced in linear regression modelling where it was established that sex could statistically significantly predict MCQ scores as a percentage total score, \( F(1, 187) = 4.89, p = .028 \), and sex accounted for 2.5% of the explained variability in MCQ scores. The unstandardised \( B \) coefficient of -3.35 suggested that male students would score just over 3% higher in MCQ scores than female students; the regression equation was predicted MCQ score = 74.51 - 3.35 \times \text{sex}^{30}.

**Ethnicity.** An analysis of variance of grades for individual courses, semester GPA, and year GPA by ethnicity showed several statistically significant results. In all but Medical Humanities course \( (F(5, 176) = 1.28, p = .273) \) there were statistically significant differences in the GPA of Māori and Pacific students compared with other students. These results are shown in Table 26. When comparing academic outcome measures between Māori and Pacific students exclusively, statistically significant differences were only seen in MBChB2 semester two GPA \( (t(36) = 2.24, p = .031, d = .35) \) and in average SAQ scores \( (t(38) = 2.26, p = .030, d = .34) \), where Māori students had higher scores than their Pacific colleagues. Otherwise the remainder of the outcome measures (including year GPA) for these students were not statistically significantly different.

In post hoc pairwise comparisons and Tukey HSD tests, statistically significant differences were seen across all courses where New Zealand European and Asian students had higher scores than the Māori and Pacific students, allowing for a Bonferroni correction of 0.05/6 = .0083.

The findings from Table 26 were replicated in analyses of variance of coursework scores, MCQ scores, and SAQ scores for MBChB2 with ethnicity as the independent variable. The only exception was Principles of Medicine coursework which was not statistically significantly

---

28 Levene’s test of equality of variances had been violated; corrections for the \( t \) statistic and degrees of freedom were substituted.

29 ibid.

30 Male = 0, female = 1.
different: $F(5, 24.01) = 1.58, p = .205$. Pairwise comparisons and post hoc tests confirmed statistically significant lower average scores on all measures for Māori and Pacific students compared with their New Zealand European, Asian, and Other colleagues.

In MBChB2, aside from the Professional and Clinical Skills course grade ($t(118.31) = -3.47, p = .001, d = .30$) no statistically significant differences were seen between New Zealand European and Asian students in course grade or GPA. However in four out of six courses in MBChB3 statistically significant differences did exist between New Zealand European and Asian students. Results showed that in these instances, New Zealand European students outperformed their Asian colleagues.

No other statistically significant differences in these measures were seen between Asian and New Zealand European students, or between Other and any alternative ethnic group.

---

31 Levene’s test of homogeneity of differences had been violated; Welch corrections for the $F$ ratio and degrees of freedom were substituted.

32 Levene’s test of homogeneity had been violated, and hence $t$ scores and degrees of freedom were calculated not assuming equal variances.
Table 26
Repeated Measures ANOVA of Courses’ Grade, Semester GPA, and Year GPA with Ethnicity as the Independent Variable

<table>
<thead>
<tr>
<th>Course</th>
<th>df</th>
<th>F</th>
<th>p</th>
<th>$\omega^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musculoskeletal</td>
<td>5, 24.52</td>
<td>7.68</td>
<td>.000</td>
<td>.19</td>
</tr>
<tr>
<td>Digestive</td>
<td>5, 24.63</td>
<td>12.03</td>
<td>.000</td>
<td>.41</td>
</tr>
<tr>
<td>Cardiorespiratory</td>
<td>5, 24.19</td>
<td>12.62</td>
<td>.000</td>
<td>.26</td>
</tr>
<tr>
<td>Genitourinary</td>
<td>5, 182</td>
<td>13.61</td>
<td>.000</td>
<td>.25</td>
</tr>
<tr>
<td>Principles of Medicine</td>
<td>5, 183</td>
<td>19.31</td>
<td>.000</td>
<td>.33</td>
</tr>
<tr>
<td>Professional and Clinical Skills</td>
<td>5, 25.13</td>
<td>7.61</td>
<td>.000</td>
<td>.10</td>
</tr>
<tr>
<td>Reproduction and Development</td>
<td>5, 20.18</td>
<td>6.58</td>
<td>.001</td>
<td>.15</td>
</tr>
<tr>
<td>Neurosciences</td>
<td>5, 20.51</td>
<td>3.11</td>
<td>.030</td>
<td>.06</td>
</tr>
<tr>
<td>Blood, Immunity, and Infection</td>
<td>5, 176</td>
<td>7.15</td>
<td>.000</td>
<td>.14</td>
</tr>
<tr>
<td>Regulation of Body Function</td>
<td>5, 176</td>
<td>6.39</td>
<td>.000</td>
<td>.13</td>
</tr>
<tr>
<td>Professional, Clinical, and Communication Skills</td>
<td>5, 176</td>
<td>6.43</td>
<td>.000</td>
<td>.13</td>
</tr>
<tr>
<td>MBChB2 semester 1 GPA</td>
<td>5, 24.55</td>
<td>10.65</td>
<td>.000</td>
<td>.25</td>
</tr>
<tr>
<td>MBChB2 semester 2 GPA</td>
<td>5, 24.50</td>
<td>13.37</td>
<td>.000</td>
<td>.27</td>
</tr>
<tr>
<td>MBChB2 GPA</td>
<td>5, 24.74</td>
<td>13.89</td>
<td>.000</td>
<td>.30</td>
</tr>
<tr>
<td>MBChB3 semester 1 GPA</td>
<td>5, 176</td>
<td>5.15</td>
<td>.000</td>
<td>.10</td>
</tr>
<tr>
<td>MBChB3 semester 2 GPA</td>
<td>5, 175</td>
<td>8.13</td>
<td>.000</td>
<td>.16</td>
</tr>
<tr>
<td>MBChB3 GPA</td>
<td>5, 176</td>
<td>7.06</td>
<td>.000</td>
<td>.14</td>
</tr>
</tbody>
</table>

$\omega^2$ denotes effect size. An $\omega^2$ value of .01, .06, and .14 represented small, medium, and large effects respectively (Field, 2009).

b Indicated violation of Levene’s homogeneity of differences; in these instances Welch corrections for the $F$ ratio and degrees of freedom were substituted.

Simple linear regression modelling established that ethnicity could statistically significantly predict MBChB2 GPA, $F(2, 186) = 21.93, p < .001$, and ethnicity accounted for 26.1% of the explained variability in MBChB2 GPA (see Table 27). The regression equation was $\text{predicted MBChB2 GPA} = 6.67 - 1.91$ for Māori students compared with New Zealand European students, and $\text{predicted MBChB2 GPA} = 6.67 - 3.08$ for Pacific students compared with New Zealand European students. Asian students’ models showed no significant difference in prediction of MBChB2 GPA compared with their New Zealand European colleagues.

For MBChB3 GPA, simple linear regression modelling established that ethnicity could statistically significantly predict MBChB3 GPA, $F(3, 178) = 7.98, p < .001$, and ethnicity accounted for 11.8% of the explained variability in MBChB3 GPA (see Table 27). The regression equation was $\text{predicted MBChB3 GPA} = 6.40 - 1.26$ for Māori students compared with New Zealand.

33 Out of a possible 9 which is equivalent to an A+.
European students, and predicted MBChB3 GPA = 6.67 − 1.61 for Pacific students compared with New Zealand European students. The change across the two models in predicted GPA suggested a closing of the gap between Māori and Pacific students and their colleagues.

Table 27

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBChB2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>6.67</td>
<td>.162</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand European vs. Māori</td>
<td>−1.91</td>
<td>.328</td>
<td>−.386</td>
<td>.000</td>
</tr>
<tr>
<td>New Zealand European vs. Pacific</td>
<td>−3.08</td>
<td>.520</td>
<td>−.382</td>
<td>.000</td>
</tr>
<tr>
<td>New Zealand European vs. Asian</td>
<td>−0.05</td>
<td>.263</td>
<td>−.012</td>
<td>.859</td>
</tr>
<tr>
<td>MBChB3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>6.40</td>
<td>.145</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand European vs. Māori</td>
<td>−1.26</td>
<td>.298</td>
<td>−.313</td>
<td>.000</td>
</tr>
<tr>
<td>New Zealand European vs. Pacific</td>
<td>−1.61</td>
<td>.541</td>
<td>−.213</td>
<td>.003</td>
</tr>
<tr>
<td>New Zealand European vs. Asian</td>
<td>−0.44</td>
<td>.233</td>
<td>−.141</td>
<td>.060</td>
</tr>
</tbody>
</table>

Note. $R^2$ (MBChB2) = .261; $R^2$ (MBChB3) = .118.

Simple linear regression modelling of average coursework scores, MCQ scores, and SAQ scores with ethnicity as the independent variable showed similar results to earlier MBChB2 GPA results (see Table 28). Simple linear regression modelling established that ethnicity could statistically significantly predict coursework scores, $F(3, 185) = 9.96, p < .001$, and ethnicity accounted for 13.9% of the explained variability in coursework scores. The regression equation for Māori students was predicted coursework scores (as a percentage) = 81.03 − 4.18 compared with New Zealand European students. The regression equation for Pacific students was predicted coursework scores = 81.03 − 7.34 compared with New Zealand European students.

Simple linear regression modelling also established that ethnicity could statistically significantly predict MCQ scores, $F(3, 185) = 31.56, p < .001$, and ethnicity accounted for 33.9% of the explained variability in MCQ scores. Additionally, linear regression modelling established that ethnicity could also statistically significantly predict SAQ scores, $F(3, 185) = 17.95, p < .001$, and ethnicity accounted for 22.5% of the explained variability in SAQ scores.

Regression equations showed that Māori and Pacific students scored 12–19% less on MCQ scores, and 8–15% on SAQ scores compared with their New Zealand European colleagues (recalling that SAQ scores were one of the only academic outcome measure to show statistically significant differences between Māori and Pacific students).
Table 28

*Linear Regression Modelling with Ethnicity as the Independent Variable for Coursework, MCQ, and SAQ Scores*

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coursework</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>81.03</td>
<td>.544</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand European vs. Māori</td>
<td>-4.18</td>
<td>1.10</td>
<td>-.273</td>
<td>.000</td>
</tr>
<tr>
<td>New Zealand European vs. Pacific</td>
<td>-7.34</td>
<td>1.75</td>
<td>-.294</td>
<td>.000</td>
</tr>
<tr>
<td>New Zealand European vs. Asian</td>
<td>-0.30</td>
<td>.89</td>
<td>-.025</td>
<td>.732</td>
</tr>
<tr>
<td><strong>MCQ</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>75.22</td>
<td>.889</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand European vs. Māori</td>
<td>-12.46</td>
<td>1.80</td>
<td>-.437</td>
<td>.000</td>
</tr>
<tr>
<td>New Zealand European vs. Pacific</td>
<td>-18.72</td>
<td>2.85</td>
<td>-.402</td>
<td>.000</td>
</tr>
<tr>
<td>New Zealand European vs. Asian</td>
<td>1.21</td>
<td>1.45</td>
<td>.053</td>
<td>.405</td>
</tr>
<tr>
<td><strong>SAQ</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>73.47</td>
<td>.848</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand European vs. Māori</td>
<td>-8.51</td>
<td>1.72</td>
<td>-.338</td>
<td>.000</td>
</tr>
<tr>
<td>New Zealand European vs. Pacific</td>
<td>-15.02</td>
<td>2.72</td>
<td>-.365</td>
<td>.000</td>
</tr>
<tr>
<td>New Zealand European vs. Asian</td>
<td>0.20</td>
<td>1.38</td>
<td>.010</td>
<td>.886</td>
</tr>
</tbody>
</table>

*Note. R² (Coursework) = .139; R² (MCQ) = .339; R² (SAQ) = .225.*

**Mode of entry and admission scheme.** Referencing the results seen with age, graduate students also showed statistically significant differences in Medical Humanities grade (t(180) = 2.03, p = .043) compared with OLY1 students. The correlation between age and Medical Humanities grade was statistically significant (r = .24, p = .001); a partial correlation with age controlling for mode of entry showed a reduction in the Pearson correlation coefficient (r = .19, p = .005) which suggested an influence of graduate status over and above the influence of age alone. Unlike age, no statistically significant differences existed for the Professional and Clinical Skills grade between graduate and OLY1 students (t(186) = 1.48, p = .141). A novel finding of a statistically significant difference in Principles of Medicine (t(187) = 2.34, p = .021) was seen. No statistically significant differences existed in any semester or year GPA. Nor were any statistically significant differences seen for any comprehensive measure (coursework scores, MCQ scores, SAQ scores) when mode of entry was studied as the independent variable.

When non-attenuated and attenuated admission scheme students were compared, statistically significant differences were seen across all domains except for Professional and Clinical Skills ($F(2, 40.76) = 2.27^{34}, p = .116$), Medical Humanities ($F(1, 179) = 1.86, p = .158$), and Professional, Clinical, and Communication Skills grades ($F(2, 179) = 2.29, p = .104$). All other

---

34 Levene’s test of homogeneity of differences had been violated; Welch corrections for the F ratio and degrees of freedom were substituted.
course grades, semester GPA, and year GPA indicated statistically significant differences (all $p < .001$). Pairwise comparisons and post hoc tests showed statistically significant differences when comparing MAPAS and non-attenuated students (all statistically significant for a Bonferroni correction of $0.05/3 = .0167$), which largely replicated the findings of the ethnicity data. Although the number of ROMPE students was small, no statistically significant differences existed in pairwise comparisons or post hoc tests when comparing these students to non-attenuated students.

Statistically significant differences existed between MAPAS students' MBChB2 and MBChB3 GPA where the grade improved in subsequent years (but only when graduate MAPAS students were included in the analysis; exclusion of these students rendered the analysis non-statistically significant: $t(33) = 2.22, p = .033$; versus $t(31) = 1.78, p = .082$ respectively).

Analyses of coursework scores, MCQ scores, and SAQ scores (represented together as "examination" in Table 29) with attenuated admission as the independent variable showed that all measures, aside from Professional and Clinical Skills coursework, exhibited statistically significant differences. Pairwise comparisons and post hoc tests showed that MAPAS students performed below their non-attenuated and ROMPE colleagues.

<table>
<thead>
<tr>
<th>Measure</th>
<th>df</th>
<th>F</th>
<th>$p$</th>
<th>$\omega^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSK coursework</td>
<td>2, 186</td>
<td>13.59</td>
<td>.000</td>
<td>.12</td>
</tr>
<tr>
<td>MSK examination</td>
<td>2, 42.64</td>
<td>17.25a</td>
<td>.000</td>
<td>.19</td>
</tr>
<tr>
<td>DIG coursework</td>
<td>2, 186</td>
<td>8.14</td>
<td>.000</td>
<td>.07</td>
</tr>
<tr>
<td>DIG examination</td>
<td>2, 186</td>
<td>31.46</td>
<td>.000</td>
<td>.24</td>
</tr>
<tr>
<td>CRS coursework</td>
<td>2, 185</td>
<td>5.81</td>
<td>.004</td>
<td>.05</td>
</tr>
<tr>
<td>CRS examination</td>
<td>2, 50.96</td>
<td>24.20a</td>
<td>.000</td>
<td>.21</td>
</tr>
<tr>
<td>GU coursework</td>
<td>2, 185</td>
<td>3.23</td>
<td>.042</td>
<td>.02</td>
</tr>
<tr>
<td>GU examination</td>
<td>2, 184</td>
<td>21.56</td>
<td>.000</td>
<td>.18</td>
</tr>
<tr>
<td>POM coursework</td>
<td>2, 37.75</td>
<td>3.97a</td>
<td>.027</td>
<td>.05</td>
</tr>
<tr>
<td>POM examination</td>
<td>2, 184</td>
<td>34.57</td>
<td>.000</td>
<td>.26</td>
</tr>
<tr>
<td>PCS coursework</td>
<td>2, 183</td>
<td>2.82</td>
<td>.062</td>
<td>.02</td>
</tr>
<tr>
<td>PCS examination</td>
<td>2, 184</td>
<td>4.17</td>
<td>.017</td>
<td>.03</td>
</tr>
</tbody>
</table>

*Note. The difference between MCQ and SAQ scores were not outlined above. Instead “examination” was used as an umbrella term to encompass these measures.

*Indicated statistic where Levene’s test of homogeneity had been violated; Welch F ratios were used in these instances.
It was noted that the $F$ statistics for the MBChB2 second semester courses were lower for coursework than similar statistics in the first semester courses. This finding potentially reflected a comment from editors of the *New Doctor* magazine\(^{35}\), that the first semester of MBChB2 was difficult (Hills & Robins, 2001), but once students adapted their expectations and learning procedures for managing the workload of the medical programme, they settled into a pattern of learning more malleable to the workload.

Simple linear regression modelling established that admission through an attenuated admission scheme could statistically significantly predict MBChB2 GPA, $F(2, 187) = 28.76, p < .001$, and admission through one of the two schemes accounted for 23.5% of the explained variability in MBChB2 GPA. The regression equation was \textit{predicted MBChB2 GPA} = 6.64 − 2.12 for MAPAS students compared with non-attenuated students. The regression equation predicting MBChB2 GPA in ROMPE students was not statistically significantly different from the constant (see Table 30).

Simple linear regression modelling established that admission through the an attenuated admission scheme could statistically significantly predict MBChB3 GPA, $F(2, 179) = 9.42, p < .001$, and admission through one of the two schemes accounted for 9.5% of the explained variability in MBChB3 GPA. The regression equation was \textit{predicted MBChB3 GPA} = 6.22 − 1.16 for MAPAS students with non-attenuated students. The regression equation predicting MBChB3 GPA in ROMPE students was not statistically significantly different from the constant (see Table 30).

Standard multiple regression modelling with ethnicity and attenuated admission schemes as independent variables showed a non-significant $R^2$ change of 0.001 for predicted MBChB2 and MBChB3 GPA ($F(1, 185) = 0.20, p = .656$; and $F(1, 177) = 0.03, p = .867$ respectively). This showed that ethnicity and attenuated admission data explained similar amounts of variance to the models for GPA.

### Table 30

<table>
<thead>
<tr>
<th>Linear Regression Coefficients for MBChB2 and MBChB3 GPA by Attenuated Admission Schemes</th>
<th>B</th>
<th>SE B</th>
<th>$\beta$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBChB2 Constant</td>
<td>6.64</td>
<td>.138</td>
<td>-</td>
<td>.487</td>
</tr>
<tr>
<td>None versus MAPAS</td>
<td>-2.17</td>
<td>.289</td>
<td>-.487</td>
<td>.289</td>
</tr>
<tr>
<td>None versus ROMPE</td>
<td>-0.08</td>
<td>.398</td>
<td>-.012</td>
<td>.398</td>
</tr>
<tr>
<td>MBChB3 Constant</td>
<td>6.22</td>
<td>.122</td>
<td>-</td>
<td>.310</td>
</tr>
<tr>
<td>None versus MAPAS</td>
<td>-1.16</td>
<td>.268</td>
<td>-.310</td>
<td>.268</td>
</tr>
<tr>
<td>None versus ROMPE</td>
<td>-0.06</td>
<td>.350</td>
<td>-.012</td>
<td>.350</td>
</tr>
</tbody>
</table>

\(^{35}\) A University of Auckland monthly publication by medical students.
Summary of the academic outcome differences data. The current findings suggested that medical students as a whole were successful students. The attrition rate from both years of the preclinical programme was less than 3%. Mean grades for this programme ranged between a B and an A− (median scores were slightly better at between a B+ and A−). Nevertheless, differences did exist between students based solely on their demographic group.

Older students performed better in a general education course (Medical Humanities) as a reflection of age more so than previous study. They also performed better in a course designed to shape the behaviour and performance of medical students (Professional and Clinical Skills), with an additional trend towards a statistically significant model in the coursework component of this course.

The most compelling results were revealed in the ethnicity data, and similarly in the attenuated admission data. Māori and Pacific students performed statistically significantly worse compared with their New Zealand European and Asian colleagues across almost all of the domains measured. Coursework scores and examination scores (for both MCQ and SAQ) of all courses were statistically significantly different between the groups, and analyses showed that Māori and Pacific students’ grades were lower than those of their peers. Regression modelling of MBChB2 and MBChB3 GPA showed that ethnicity explained a statistically significant amount of variance, with Māori and Pacific students scoring 1.9–3.1 grade points lower in MBChB2, and 1.3–1.6 grade points lower in MBChB3. These findings were largely replicated in the attenuated admissions data where MAPAS students were predicted to perform disproportionately lower than their ROMPE and non-attenuated colleagues.

Female students statistically significantly outperformed their male colleagues in Professional and Clinical Skills, a course with abstract concepts. There were also statistically significant differences in outcome in the Musculoskeletal course (where a three dimensional concept of the human body was often required) where male students outperformed their female colleagues. Interestingly the Musculoskeletal differences were seen in the coursework component (which included practical skills tests) and MCQ component of the examinations, but not in the SAQ component. These two findings across strikingly different courses with different approaches to learning reinforced to a degree the stereotypes that existed about female and male learners. Females did poorly compared with their male colleagues in mathematics and other science-oriented subjects, and males performed worse than their female colleagues in English-type subjects (Eccles, Jacobs, & Harold, 1990; Swim, 1994).
The Relationships Between Motivation, Anxiety, and Academic Outcome: MBChB2

Correlations between motivation and anxiety. Pearson correlation coefficients were calculated for course grades and semester GPA. Significant correlations are outlined in Table 31. This showed that average *intrinsic* motivation midway through MBChB2 semester one had a diffuse relationship across courses, while an *extrinsic* motivation was correlated with outcome in a single course alone. This may be because the Musculoskeletal course traditionally encouraged a rote and surface learning approach (Al-Shaqsi & Stringer, 2011). An odd finding was that of the Professional and Clinical Skills course which was only statistically significantly correlated with extrinsically-biased motivation, although the direction of the correlation varied based upon the degree of integration of the motivation: a *negative* correlation with external motivation and a *positive* relationship with identified motivation.

Table 31

*Pearson Correlation Coefficients between Elements of the AMS and WTAS Questionnaires and Course Grade and Semester GPA for MBChB2 Semester One Sampling Times*

<table>
<thead>
<tr>
<th>Measure</th>
<th>MSK</th>
<th>DIG</th>
<th>POM</th>
<th>PCS</th>
<th>Semester 1*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average extrinsic 2</td>
<td>.20*</td>
<td></td>
<td></td>
<td></td>
<td>.19*</td>
</tr>
<tr>
<td>Average intrinsic 2</td>
<td>.19*</td>
<td>.22*</td>
<td>.23**</td>
<td></td>
<td>.21*</td>
</tr>
<tr>
<td>Relative external 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.18*</td>
</tr>
<tr>
<td>Relative identified 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.25**</td>
</tr>
<tr>
<td>Anxiety 1</td>
<td>-.31**</td>
<td>-.29**</td>
<td>-.25**</td>
<td></td>
<td>-.31**</td>
</tr>
<tr>
<td>Anxiety 2</td>
<td>-.30**</td>
<td>-.26**</td>
<td>-.23**</td>
<td></td>
<td>-.29**</td>
</tr>
</tbody>
</table>

*Note. MSK = Musculoskeletal; DIG = Digestive; POM = Principles of Medicine; PCS = Professional and Clinical Skills. *p < .05. **p < .01.*

*Semester 1 GPA was an average of the GPA for the Musculoskeletal and Digestive courses only.*

Average intrinsic scores at sampling time two were positively correlated with almost all examination measures as shown in Table 32 and showed small to medium effects. All motivation scores at sampling time three failed to show any statistically significant correlations with course grade, semester GPA, or year GPA.
<table>
<thead>
<tr>
<th>Examination measure</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musculoskeletal MCQ</td>
<td>.18</td>
<td>.039</td>
</tr>
<tr>
<td>Musculoskeletal SAQ</td>
<td>.22</td>
<td>.010</td>
</tr>
<tr>
<td>Digestive MCQ</td>
<td>.19</td>
<td>.028</td>
</tr>
<tr>
<td>Digestive SAQ</td>
<td>.21</td>
<td>.016</td>
</tr>
<tr>
<td>Principles of Medicine SAQ</td>
<td>.18</td>
<td>.040</td>
</tr>
</tbody>
</table>

Anxiety scores at both sampling times in semester one showed a statistically significant negative relationship with all outcomes except for the Professional and Clinical Skills course. Unlike the other measures which showed statistically significant results at either the first or second sampling times exclusively, anxiety was associated with outcomes at both sampling times, which suggested an ongoing relationship with earlier anxiety scores. Anxiety scores at sampling time three had a statistically significant negative correlation with grades for the Cardiorespiratory and Principles of Medicine courses, and the semester two GPA ($r = -.25, p = .029$; $r = -.30, p = .007$; $r = -.27, p = .017$ respectively). Anxiety scores from sampling times one and two (i.e., semester one sampling times) continued to correlate negatively with the semester two GPA ($r = -.23, p = .005$; and $r = -.25, p = .004$ respectively), again reinforcing the finding of earlier anxiety scores correlating with later outcome measures. Anxiety scores in MBChB2 semester two were also negatively correlated with almost every measure of outcome aside from the Genitourinary examination (specifically MCQ scores), Principles of Medicine coursework, and Professional and Clinical Skills coursework and examination (see Table 31 above).

Coursework scores were correlated with specific changes in motivation measures. Table 33 outlines the associations with changes in relative external and relative identified scores from sampling time one to two.
Table 33

Pearson Correlations between Changes in Motivation Scores and Coursework and Examination Scores

<table>
<thead>
<tr>
<th>Measure</th>
<th>Course</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative external change 1 → 2</td>
<td>MSK coursework</td>
<td>.26</td>
<td>.010</td>
</tr>
<tr>
<td></td>
<td>MSK MCQ</td>
<td>.21</td>
<td>.034</td>
</tr>
<tr>
<td></td>
<td>DIG MCQ</td>
<td>.20</td>
<td>.044</td>
</tr>
<tr>
<td></td>
<td>PCS coursework</td>
<td>.27</td>
<td>.007</td>
</tr>
<tr>
<td>Relative identified change 1 → 2</td>
<td>MSK SAQ</td>
<td>−.23</td>
<td>.020</td>
</tr>
<tr>
<td></td>
<td>DIG coursework</td>
<td>−.22</td>
<td>.028</td>
</tr>
<tr>
<td></td>
<td>DIG SAQ</td>
<td>−.24</td>
<td>.017</td>
</tr>
<tr>
<td></td>
<td>POM coursework</td>
<td>−.20</td>
<td>.047</td>
</tr>
</tbody>
</table>

Note. From sampling time one to two, both motivation measures increased their relative contributions to total motivation.

Increases in relative external scores from sampling time one to three (i.e., across MBChB2) were positively correlated with outcome in MCQ components of the Genitourinary examination \((r = .33, p = .007)\). No additional measure of outcome exclusively in the second semester (i.e., not the Principles of Medicine or Professional and Clinical Skills courses) were correlated with any changes in motivation scores which suggested that in the second semester students had modified their learning approach, and the influence of changes in motivation were less conspicuous than their effect in the first semester.

**Linear regression modelling.** Simple linear regression modelling of MBChB2 semester one GPA with motivation orientation measures as the independent variable found no statistically significant relations between sampling time one measures and an explanation of variance in GPA. However, similar measures at sampling time two were statistically significant (see Table 34).

Simple linear regression modelling established that average extrinsic scores could statistically significantly predict MBChB2 semester one GPA, \(F(1, 131) = 4.92, p = .028\), and average extrinsic scores accounted for 3.6% of the explained variability in MBChB2 semester one GPA. Simple linear regression modelling also established that average intrinsic scores could statistically significantly predict MBChB2 semester one GPA, \(F(1, 130) = 6.18, p = .014\), and average intrinsic scores accounted for 4.5% of the explained variability in MBChB2 semester one GPA. The regression equations were predicted MBChB2 semester one GPA = 4.47 + 0.62 × average extrinsic scores; and predicted MBChB2 semester one GPA = 3.87 + 0.76 × average intrinsic scores.
Hierarchical multiple regression modelling was used to assess the ability of average extrinsic motivation at sampling time two to predict MBChB2 semester one GPA, after controlling for the influence of average intrinsic motivation at the same sampling time. Preliminary analyses were conducted to ensure a lack of violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity. Intrinsic motivation scores were entered at step one, explaining 4.5% of the variance in GPA. Entry of extrinsic motivation at step two led to a non-statistically significant change in the total variance explained by the model, $R^2$ change = .01, $F(1, 129) = 1.41, p = .237$. However, partial correlation analyses showed a trend towards significance which suggested that these measures may have shared some commonality (simple correlation of intrinsic scores and MBChB2 semester one GPA: $r = .21, p = .007$; paired correlation with extrinsic scores controlled: $r = .14, p = .052$). This was likely explained from the fact that average extrinsic motivation includes identified regulation, which is a form of autonomous motivation, and therefore shares some attributes with average intrinsic motivation.

When these two measures were entered as a block in standard multiple regression modelling, they explained 5.6% of the total variance in MBChB2 semester one GPA ($R^2$ change = .056, $F(2, 129) = 3.81, p = .025$). No other relative measure of extrinsic motivation at sampling time two provided a statistically significant explanation of variance.

However, simple linear regression modelling established that changes in relative external scores from sampling time one to two, which showed an increase in the relative external regulation component of total motivation, could statistically significantly predict MBChB2 semester one GPA, $F(1, 99) = 5.31, p = .023$, and this change in relative external score accounted for 5.1% of the explained variability in MBChB2 semester one GPA. Simple linear regression modelling also established that changes in relative identified scores from sampling time one to two, which also showed an increase, could statistically significantly predict MBChB2 semester one GPA, $F(1, 99) = 6.26, p = .014$, and this change in relative identified score accounted for 5.0% of the explained variability in MBChB2 semester one GPA (see Table 35).

The unstandardised $B$ coefficients of both models were large, but the absolute changes in relative external and relative identified scores were small, reflected in the standardised $\beta$ coefficient which are similar although opposite in sign, which signified that according to

<table>
<thead>
<tr>
<th></th>
<th>$B$</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average extrinsic 2</td>
<td>0.62</td>
<td>0.281</td>
<td>0.190</td>
<td>0.028</td>
</tr>
<tr>
<td>Average intrinsic 2</td>
<td>0.76</td>
<td>0.306</td>
<td>0.213</td>
<td>0.014</td>
</tr>
</tbody>
</table>

Note. $R^2$ (extrinsic) = .036; $R^2$ (intrinsic) = .045.
regression equations, an increase in external regulation would be associated with a higher GPA, and an increase in identified regulation would be associated with a lesser GPA.

Table 35

Simple Linear Regression Modelling of MBChB2 Semester One GPA with Individual Change in Motivation Scores as Independent Variables

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative external 1 → 2</td>
<td>13.07</td>
<td>5.67</td>
<td>.226</td>
<td>.023</td>
</tr>
<tr>
<td>Relative identified 1 → 2</td>
<td>-13.90</td>
<td>5.56</td>
<td>-0.244</td>
<td>.014</td>
</tr>
</tbody>
</table>

Note. $R^2$ (external 1 → 2) = .051; $R^2$ (identified 1 → 2) = .050.

Anxiety scores at both sampling times in semester one showed statistically significant increases in the explanation of variance of MBChB2 semester one GPA (see Table 36).

Table 36

Simple Linear Regression Modelling of MBChB2 Semester One GPA with Individual Anxiety Scores as Independent Variables

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety 1</td>
<td>-0.93</td>
<td>.233</td>
<td>-0.312</td>
<td>.000</td>
</tr>
<tr>
<td>Anxiety 2</td>
<td>-0.72</td>
<td>.204</td>
<td>-0.294</td>
<td>.001</td>
</tr>
</tbody>
</table>

Note. $R^2$ (anxiety 1) = .098; $R^2$ (anxiety 2) = .087.

Hierarchical multiple regression modelling was used to assess the ability of intrinsic motivation at sampling time two to predict MBChB2 semester one GPA, after controlling for the influence of anxiety. Preliminary analyses were conducted to ensure a lack of violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity. Anxiety scores were entered at step one, explaining 20.7% of the variance in MBChB2 semester one GPA ($F(2, 105) = 94.78, p < .001$). Entry of intrinsic motivation at step two, led to a non-statistically significant change in the total variance explained by the model, $R^2$ change = .01, $F(1, 104) = 1.73, p = .191$. However, a similar hierarchical multiple regression model which assessed the ability of extrinsic motivation at sampling time two to predict MBChB2 semester one GPA, after controlling for the influence of anxiety, did lead to a statistically significant model. After entry of the extrinsic motivation at step two, the total variance explained by the model as a whole was 24.4%, ($R^2$ change = .037, $F(1, 105) = 5.17, p = .025$).

In MBChB2, the Principles of Medicine, and Professional and Clinical Skills courses were year-long courses. Thus the GPA for semester two included inputs from semester one.
assessments. An exclusive GPA for semester two was also calculated using the Genitourinary and Cardiorespiratory System courses alone. Simple linear regression modelling of semester two GPA, where motivation orientations at sampling time three were used as the independent variables, showed no statistically significant explanations of variance. When one took a more inclusive view of semester two GPA (including Principles of Medicine and Professional and Clinical Skills), no additional results were forthcoming.

Anxiety scores at sampling time three provided a statistically significant explanation of variance of semester two GPA, as did anxiety scores from sampling times one and two (see Table 37).

Table 37

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety 1</td>
<td>−0.76</td>
<td>0.265</td>
<td>−0.233</td>
<td>0.005</td>
</tr>
<tr>
<td>Anxiety 2</td>
<td>−0.69</td>
<td>0.233</td>
<td>−0.250</td>
<td>0.004</td>
</tr>
<tr>
<td>Anxiety 3</td>
<td>−0.67</td>
<td>0.276</td>
<td>−0.270</td>
<td>0.017</td>
</tr>
</tbody>
</table>

Note. $R^2$ (anxiety 1) = .054; $R^2$ (anxiety 2) = .063; $R^2$ (anxiety 3) = .073.

Hierarchical multiple regression modelling was used to assess the ability of earlier anxiety scores to predict MBChB2 semester two GPA, after controlling for the influence of anxiety scores at sampling time three. Preliminary analyses were conducted to ensure a lack of violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity. Anxiety scores at sampling time three were entered at step one, explaining 7.1% of the variance in GPA ($F(1, 56) = 4.25, p = .044$). Entry of anxiety scores at sampling times one and two at step two, led to a non-statistically significant change in the total variance explained by the model, $R^2$ change = .002, $F(2, 54) = 0.05, p = .950$.

**Average coursework scores.** Simple linear regression modelling of average coursework scores with motivation orientation measures as independent variables largely replicated earlier models. Motivation measures at sampling times one and three did not explain statistically significant amounts of variance in average coursework scores, but simple linear regression modelling established that average extrinsic scores at sampling time two trended toward a statistically significantly prediction of average coursework scores, $F(1, 130) = 3.02, p = .085$, and might have accounted for 2.3% of the explained variability in predicted average coursework scores.
However, simple linear regression modelling did establish that average intrinsic scores at sampling time two could statistically significantly predict average coursework scores, $F(1, 129) = 4.84, p = .030$, and accounted for 3.6% of the explained variability in predicted average coursework scores.

Linear regression modelling also established that anxiety scores at all sampling times could statistically significantly predict average coursework scores (1: $F(1, 147) = 14.69, p < .001$; 2: $F(1, 130) = 10.37, p = .002$; 3: $F(1, 76) = 7.81, p = .007$) and accounted for between 7% and 9% of the explained variability in predicted average coursework scores (see Table 38).

Table 38

<table>
<thead>
<tr>
<th>Anxiety 1</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>−2.75</td>
<td>.718</td>
<td>−.301</td>
<td>.000</td>
</tr>
<tr>
<td>Anxiety 2</td>
<td>−1.94</td>
<td>.604</td>
<td>−.272</td>
<td>.002</td>
</tr>
<tr>
<td>Anxiety 3</td>
<td>−1.88</td>
<td>.674</td>
<td>−.305</td>
<td>.007</td>
</tr>
</tbody>
</table>

*Note.* $R^2$ (anxiety 1) = .091; $R^2$ (anxiety 2) = .074; $R^2$ (anxiety 3) = .093.

Standard multiple regression modelling with all anxiety times were conducted with these three variables entered at step one. Preliminary analyses were conducted to ensure a lack of violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity. All anxiety scores explained 18.6% of the variance of average coursework scores ($F(3, 53) = 4.03, p = .012$). Further addition of average intrinsic motivation scores at sampling time two at step two in a hierarchical multiple regression model did not statistically significantly alter the variance explained by the model as a whole ($R^2$ change = .002, $F(1, 52) = 0.11, p = .742$).

**Average MCQ and SAQ scores.** Simple linear regression models of MCQ and SAQ scores with motivation orientation as independent variables showed largely similar results. Average extrinsic and intrinsic scores at sampling time two were associated with statistically significant models for both dependent variables. A model of MCQ scores was also found to have a statistically significant amount of variance explained by changes in relative identified scores from sampling time one to two. In a similar SAQ model, changes in relative external scores from sampling time one to two were associated with a statistically significant explanation of variance (see Tables 39 and 40).
Table 39
Simple Linear Regression Modelling of MCQ Scores with Individual Motivation Orientation Scores as Independent Variables

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average extrinsic 2</td>
<td>3.25</td>
<td>1.59</td>
<td>.177</td>
<td>.042</td>
</tr>
<tr>
<td>Average intrinsic 2</td>
<td>3.77</td>
<td>1.73</td>
<td>.189</td>
<td>.031</td>
</tr>
<tr>
<td>Relative identified 1 → 2</td>
<td>-72.02</td>
<td>31.69</td>
<td>-.233</td>
<td>.025</td>
</tr>
</tbody>
</table>

Note. $R^2$ (extrinsic 2) = .031; $R^2$ (intrinsic 2) = .036; $R^2$ (relative identified 1 → 2) = .050.

Table 40
Simple Linear Regression Modelling of SAQ Scores with Individual Motivation Orientation Scores as Independent Variables

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average extrinsic 2</td>
<td>3.26</td>
<td>1.43</td>
<td>.195</td>
<td>.025</td>
</tr>
<tr>
<td>Average intrinsic 2</td>
<td>4.41</td>
<td>1.55</td>
<td>.243</td>
<td>.005</td>
</tr>
<tr>
<td>Relative external 1 → 2</td>
<td>60.48</td>
<td>29.58</td>
<td>.201</td>
<td>.044</td>
</tr>
</tbody>
</table>

Note. $R^2$ (extrinsic 2) = .038; $R^2$ (intrinsic 2) = .059; $R^2$ (relative external 1 → 2) = .041.

Anxiety scores at all sampling times were associated with significant explanations of variance of both MCQ and SAQ scores (see Tables 41 and 42).

Table 41
Simple Linear Regression Modelling of MCQ Scores with Individual Anxiety Scores as Independent Variables

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety 1</td>
<td>-3.52</td>
<td>1.35</td>
<td>-.210</td>
<td>.010</td>
</tr>
<tr>
<td>Anxiety 2</td>
<td>-3.51</td>
<td>1.17</td>
<td>-.255</td>
<td>.003</td>
</tr>
<tr>
<td>Anxiety 3</td>
<td>-3.13</td>
<td>1.31</td>
<td>-.264</td>
<td>.020</td>
</tr>
</tbody>
</table>

Note. $R^2$ (anxiety 1) = .044; $R^2$ (anxiety 2) = .065; $R^2$ (anxiety 3) = .070.
Table 42

**Simple Linear Regression Modelling of SAQ Scores with Individual Anxiety Scores as Independent Variables**

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety 1</td>
<td>-3.71</td>
<td>1.20</td>
<td>-.247</td>
<td>.002</td>
</tr>
<tr>
<td>Anxiety 2</td>
<td>-3.22</td>
<td>1.06</td>
<td>-.258</td>
<td>.003</td>
</tr>
<tr>
<td>Anxiety 3</td>
<td>-3.34</td>
<td>1.22</td>
<td>-.299</td>
<td>.008</td>
</tr>
</tbody>
</table>

*Note.* $R^2$ (anxiety 1) = .061; $R^2$ (anxiety 2) = .066; $R^2$ (anxiety 3) = .089.

Standard multiple regression modelling with average extrinsic and intrinsic scores at sampling time two could statistically significantly predict average SAQ scores, $F(2, 128) = 4.62$, $p = .012$, and accounted for 6.7% of the explained variability in SAQ scores. The regression equation was $\text{predicted SAQ scores} = 52.42 + (3.52 \times \text{intrinsic scores}) + (1.73 \times \text{extrinsic scores})$. Similar modelling for average MCQ scores showed a trend toward a statistically significantly prediction of the explained variability in average MCQ scores ($F(2, 128) = 3.05$, $p = .051$, $R^2 = .046$).

Interestingly, unlike other standard multiple regression models, combinations of all three anxiety scores were not associated with statistically significant models for average MCQ and SAQ scores.

However, hierarchical multiple regression models used to assess the ability of average extrinsic motivation, average intrinsic motivation, and average anxiety scores at sampling time two to predict average SAQ scores did provide a statistically significant model. Extrinsic motivation was entered at step one, explaining 3.8% of the variance in average SAQ scores. After entry of intrinsic motivation at step two, the total variance explained by the model was 6.7% ($R^2$ change = .029, $F(1, 128) = 4.01$, $p = .047$). After entry of average anxiety scores at step three, the total variance explained by the model was 12.7% ($R^2$ change = .06, $F(1, 127) = 8.67$, $p = .004$).

A similar result was seen with average MCQ scores, although in this instance the addition of intrinsic motivation to the model did not provide any further statistically significant explanation of variance in average MCQ scores. Extrinsic motivation was entered at step one, explaining 3.1% of the variance in average MCQ scores. After entry of average anxiety scores at step two, the total variance explained by the model was 10.1% ($R^2$ change = .07, $F(1, 129) = 10.04$, $p = .002$).

**Final models for MBChB2.** Hierarchical multiple regression modelling was used to assess the ability of ethnicity, anxiety scores in the first semester, and average extrinsic motivation at sampling time two to predict MBChB2 semester one GPA. Gender was excluded from the final multiple regression models because it failed to show any statistically significant
explanation of variance in linear regression modelling in earlier analyses. These measures provided a statistically significant model. Ethnicity was entered at step one, and explained 19.0% of the variance in MBChB2 semester one GPA. After entry of anxiety scores at step two, the total variance explained by the model was 37.1% ($R^2$ change = .181, $F(2, 103) = 14.82, p < .001$). After entry of average extrinsic motivation at step three, the total variance explained by the model was 39.7% ($R^2$ change = .027, $F(1, 102) = 4.50, p = .037$). Addition of intrinsic motivation scores as an additional step, or combined with extrinsic scores at step three did not statistically significantly increase the amount of explanation of variance in MBChB2 semester one GPA.

In a similar hierarchical model for MBChB2 semester two GPA, addition of average extrinsic or intrinsic scores did not statistically increase the amount explained variance in MBChB2 semester two GPA. Instead, a model of ethnicity and anxiety alone provided the best fit model. Ethnicity entered at step one, and explained 19.6% of the variance in MBChB2 semester two GPA. After entry of anxiety scores at step two, the total variance explained by the model was 24.4% ($R^2$ change = .048, $F(1, 74) = 4.67, p = .034$).

The Relationships Between Motivation, Anxiety, and Academic Outcome: MBChB3

Correlations between motivation and anxiety. There was only one sampling time during the first semester of MBChB3, at the beginning of the semester where the introduction to sampling followed the traditional orientation lecture of the year. The lack of repeated sampling during this semester might be the reason for the paucity of statistically significant correlations.

The Medical Humanities course grade showed a statistically significant positive correlation with average and relative intrinsic scores ($r = .23, p = .032$; and $r = .23, p = .042$ respectively), and negatively correlated with relative external scores ($r = -.24, p = .021$). The MBChB3 semester one GPA also showed a statistically significant relationship with average intrinsic scores ($r = .21, p = .045$).

There was no statistically significant difference in anxiety between sampling time one and time four; ($t(76) = -1.49, p = .141$; i.e., the anxiety levels at the beginning of the calendar years were statistically similar). The only statistically significant correlations with anxiety in semester one were negative small to moderate relationships with the Reproduction and Development course grade, and semester one GPA ($r = -.24, p = .021$; and $r = -.22, p = .040$ respectively). The finding that anxiety scores were statistically significantly unchanged from the beginning of one year to the next, yet the lack of a broader association with outcome that was seen in MBChB2 suggested that the diffuse negative correlation between anxiety and academic outcome had diminished. Unlike previous analyses, anxiety scores at sampling time four (i.e.,
MBChB3 semester one) did not have any statistically significant relationships with the outcomes of semester two. In earlier iterations, anxiety continued to display statistically significant relations long after the original sampling time; this change perhaps reflected students becoming more adept at managing the repercussions of anxiety.

The MBChB3 semester two courses were statistically significantly correlated with average intrinsic motivation scores and average anxiety scores as shown in Table 43.

Table 43

<table>
<thead>
<tr>
<th>Measure</th>
<th>RBF</th>
<th>BII</th>
<th>Semester 2 GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average intrinsic 5</td>
<td>.18*</td>
<td>.18*</td>
<td>.18*</td>
</tr>
<tr>
<td>Anxiety 5</td>
<td>−.24**</td>
<td>−.19*</td>
<td>−.19*</td>
</tr>
</tbody>
</table>

*Note. RBF = Regulation of Body Function; BII = Blood, Immunity, and Infection. *p < .05. **p < .005.

Only one sampling time was undertaken in MBChB3 semester two. This was timed to occur after students had spent time on the medical and surgical wards of various hospitals throughout the greater Auckland region as part of their Professional, Clinical, and Communication Skills (PCCS) course. The only statistically significant correlation for the PCCS course was a change in relative intrinsic motivation from sampling times four to five. The mean score of relative intrinsic motivation changed from 0.2554 to 0.2516 (to give a difference of −0.0038; i.e., less than half a percentage point). This decrease in relative intrinsic motivation may be small but had a moderate statistically significant negative correlation with PCCS grade (r = −.22, p = .045).

**Linear regression modelling.** Simple linear regression modelling of MBChB3 semester one and two GPA with motivational orientation measures as the independent variables revealed that only average intrinsic scores at sampling times four and five provided statistically significant explanations of variance (see Table 44). Simple linear regression modelling established that average intrinsic scores at sampling time four could statistically significantly predict MBChB3 semester one GPA, $F(1, 89) = 4.15$, $p < .045$; and average intrinsic scores at sampling time five could statistically significantly predict MBChB3 semester two GPA, $F(1, 145) = 5.06$, $p < .026$. Average intrinsic scores accounted for 4.5% and 3.4% of the explained variability in MBChB3 semesters one and two GPA respectively.
Table 44

Simple Linear Regression Modelling of MBChB3 Semester One and Two GPA with Respective Contemporaneous Motivation Scores as the Independent Variable

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average intrinsic 4</td>
<td>0.53</td>
<td>.258</td>
<td>.211</td>
<td>.045</td>
</tr>
<tr>
<td>Average intrinsic 5</td>
<td>0.46</td>
<td>.202</td>
<td>.184</td>
<td>.026</td>
</tr>
</tbody>
</table>

Note. $R^2$ (average intrinsic 4) = .045; $R^2$ (average intrinsic 5) = .034.

Anxiety measures were also found to statistically significantly contribute to models of GPA (see Table 45), but unlike MBChB2, only the anxiety sampling time pertinent to the semester (i.e., sampling time four for semester one, sampling time five for semester two) was statistically significant; anxiety scores at sampling time four were not predictive of GPA in semester two.

Table 45

Simple Linear Regression Modelling of MBChB3 Semester One and Two GPA with Respective Contemporaneous Anxiety Scores as the Independent Variable

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety 4</td>
<td>−0.39</td>
<td>.189</td>
<td>−.215</td>
<td>.040</td>
</tr>
<tr>
<td>Anxiety 5</td>
<td>−0.37</td>
<td>.161</td>
<td>−.188</td>
<td>.023</td>
</tr>
</tbody>
</table>

Note. $R^2$ (anxiety 4) = .046; $R^2$ (anxiety 5) = .035.

Standard multiple regression modelling using average intrinsic motivation scores and anxiety scores at sampling time four as a block showed that these variables could statistically significantly predict MBChB3 semester one GPA, $F(2, 87) = 3.97, p = .022$, and accounted for 8.4% of the explained variability. However in hierarchical models the relationship was not as clear. Anxiety scores were entered at step one, explaining 4.3% of the variance in MBChB3 semester one GPA ($F(1, 89) = 4.33, p = .040$). After controlling for the influence of anxiety, average intrinsic scores were entered at step two, and showed a near statistically significant addition to the model ($R^2$ change = .040, $F(1, 87) = 3.82, p = .054$). The overlap between anxiety and intrinsic scores is also alluded to by the also near-significant partial correlations with MBChB3 semester one GPA (with intrinsic motivation controlled for: anxiety $r = −.21, p = .051$; with anxiety controlled for: intrinsic motivation $r = .20, p = .054$). The addition of ethnicity in a two-step model with anxiety scores alone explained a total of 14.9% of variance in GPA ($R^2$ change = .103, $F(3, 86) = 3.46, p = .020$).

In semester two of MBChB3, hierarchical multiple regression modelling using average intrinsic motivation scores and anxiety scores at sampling time five did create a statistically significant model. Anxiety scores were entered at step one, explaining 4.2% of the variance in GPA.
After controlling for the influence of anxiety, average intrinsic scores were entered at step two where the total variance explained by the model as a whole was 6.7%. Intrinsic motivation explained an additional 2.5% of the variance in GPA ($R^2$ change = .025, $F(1, 144) = 3.91, p = .050$). The addition of ethnicity to the model in step three increased the total variance explained to 15.1% ($R^2$ change = .084, $F(3, 141) = 4.64, p = .004$).

**Summary of motivation, anxiety, and academic outcome data.** The principal hypothesis for the current study was about the effects that motivation, motivation change, and anxiety would have on academic outcome. The expectation was that more fully internalised states of motivation or movement towards a such a state was more likely to be associated with a positive academic outcome in terms of grades and satisfaction (Harackiewicz et al., 2002), and that higher levels of anxiety would be associated with poorer outcomes in these domains (Benjamin et al., 1981).

During MBChB2, intrinsic motivation had a greater number of statistically significant correlations across course grade compared with extrinsic motivation. However, within individual courses changes in measures of extrinsic motivation were associated with a variety of outcomes in specific measures: an increase in external motivation was correlated with an increase in Musculoskeletal, Digestive, and Genitourinary MCQ scores; whereas an increase in identified motivation was correlated with a decrease in Musculoskeletal and Digestive SAQ scores.

No statistically significant results were seen between motivation measures in MBChB2 semester two (although the sample size was smaller than previous iterations precluding the possibility of a Type II error).

Anxiety scores had a diffuse correlative relationship with outcome across all courses except the Professional and Clinical Skills course, and demonstrated a prolonged influence, where anxiety scores from earlier sampling times continued to be related to outcome on subsequent assessments. Unlike motivation measures, anxiety scores were correlated with outcomes in semester two.

In simple linear regression modelling, average intrinsic and extrinsic scores at sampling time two explained a degree of variance in MBChB2 semester one GPA, where intrinsic scores provided an explanation for a larger amount of variance, and had a larger coefficient than extrinsic scores. Similar effects were seen in coursework score, MCQ score, and SAQ score models. Specific changes in relative motivation scores were also associated with increased scores in these same measures. Mirroring the correlation data, increases in relative external motivation were associated with increases in semester one GPA, MCQ scores, and SAQ scores, and increases in relative identified motivation were associated with decreases in semester one.
GPA and SAQ scores. Whilst the unstandardised coefficients for these models were large, the actual change in relative motivation scores was small, which provided a modest relationship in line with other models’ standardised coefficients.

Standard and hierarchical multiple regression models with combinations of extrinsic, intrinsic, and anxiety scores provided a model that explained almost one fifth of the variation in MBChB2 semester one GPA. The addition of ethnicity to this model explained close to 40% of the variance in academic outcome. However in semester two, similarly inclusive models explained only 24% of such variance, although this was still a large effect according to Cohen (1988). Hoschl and Kozeny (1997) had previously noted that the amount of variance in medical student academic success (in most cases using GPA) explained by regressors “has never exceeded 19%” (p. 88).

In MBChB3, average intrinsic scores were statistically significantly correlated with a number of academic outcome measures including the Medical Humanities, Regulation of Body Function, and Blood, Infection, and Immunity grade, and semester one and two GPA. There were limited statistically significant associations with extrinsic measures of motivation aside from a negative correlation with Medical Humanities grade, and a single finding that a decrease in relative intrinsic scores in semester two was associated with a decrease in PCCS grade.

Anxiety scores continued to exhibit statistically significant associations across course grades, semester GPA, and year GPA. However, unlike MBChB2, these scores were only associated with contemporaneous academic outcome measures: the prolonged relationship seen in MBChB2 was not apparent in MBChB3.

Simple linear regression modelling demonstrated that average extrinsic and intrinsic scores explained small amounts of variance in semester GPA; more accurate models were seen when both variables were combined in a single model. Still more accurate models were seen with the addition of anxiety, and later ethnicity. In the final analysis, hierarchical multiple regression modelling explained approximately 15% of the variance in MBChB3 semester one and two GPA.

**Discussion**

Study 2 expanded upon the findings of Study 1 and asked whether the differing levels of motivation noted during that study were associated with academic outcome. Specifically it asked whether more fully internalised forms of motivation were associated with better academic outcomes, with the supposition that this would be the case. Study 2 also investigated whether statistically significant differences in outcomes were seen when different demographic groups were examined.
The demographic differences in academic outcome in this study were seen across all demographic measures, although the differences seen with age, mode of entry, and sex were isolated to one or two courses. The major findings were largely confined to differences between ethnic groups, specifically between New Zealand European students and Māori and Pacific students, and to a lesser extent between New Zealand European and Asian students. By extension, similar differences were seen in attenuated admission schemes where MAPAS students were compared with non-attenuated and ROMPE students.

The primary differences seen between older and younger students were disparities in the grade of the Medical Humanities and Professional and Clinical Skills courses. The reason for these differences was likely a function of both age and previous university experience (especially in the Medical Humanities case where this difference was replicated in mode of entry analyses). This is in contrast to the findings of Wilkinson, Wells, and Bushnell (2004) who suggested that age might trump holding a prior degree. In further contrast, the effect of age was less well-pronounced when older students (aged greater than 21 years) were exclusively examined: a lack of statistically significant differences was seen in comparisons among these students. The Medical Humanities course was a break from the traditional curriculum of the preclinical medical programme because this was the only course in the entire programme where students had a choice of which subject they wished to study within the options presented (humanistic subjects with medical biases, e.g., Philosophy and Medicine, Art History and Medicine etc.). Over the period of a typical undergraduate degree it was likely older students had encountered similar general education-types of courses in their prior studies and as such were likely to benefit from studying comparable courses. The finding of a difference in Professional and Clinical Skills grade between younger and older students was somewhat in opposition to the findings of Borges, Manuel, Elam, and Jones (2010). These authors found that millennial students (i.e., aged less than 21 years) scored higher on motives of achievement and affiliation than their Generation X colleagues (i.e., aged greater than 21 years), and had strong desires to “share with others, stronger team instincts and tighter peer bonds, and greater needs to achieve and succeed” (p. 574). However, these findings were based upon differences in nAchievement and nAffiliation scores which were estimated using a single TAT card. The TAT had been shown in later reviews to be unreliable (Lilienfeld et al., 2000). One would have expected that these shared goals would have led to improved outcomes which were not seen in the current study. In the current study, the difference in the Professional and Clinical Skills course was likely a function of the “professional” rather than the “clinical” aspect of the title. Unless graduate students had come from other medical, paramedical, or allied health professions it was unlikely they had been exposed to clinical environments. However, it was more than likely that they had been involved in professional practices, either through their prior undergraduate or graduate degrees, or through practical experience in the workforce.
Moreover these practical experiences were not uniform to all older students (i.e., some of these students aged greater than 21 years entered through the OLY1 pathway) and thus it was unsurprising that this finding was not replicated in the mode of entry analyses. What was unexpected was the difference in the mode of entry cohort seen with the Principles of Medicine course. This course was not comparable to the Professional and Clinical Skills course so these results could not be readily interchanged. It might be as straightforward as that the nature of the assessment of this course (which was made up of no less than 13 assessments over 12 months) favoured students who had previously demonstrated an ability to manage their time and tackle multiple assessment fronts at one time; that is, graduate students (Macan, Shahani, Dipboye, & Phillips, 1990).

The difference in outcome between male and female students appeared to reinforce stereotypical views of the gender differences in approaching assessment (Best et al., 1977). Male students performed better in a course that required three dimensional thinking and mechanics, and female students did better in a course that was more focused on emotional aptitude (Carrothers, Gregory, & Gallagher, 2000). However differences were broader than this, with male students outperforming female students in the MCQ components of all examinations. This finding alone was in contradiction to previous literature which suggested that female students outperformed their male colleagues (Scouller, 1998). What was clear was the reason for the difference in results was not due to a different approach in motivation orientation between the sexes; it was also noteworthy that the importance of this difference was small: sex only explained 2.5% of the variance in MCQ scores, but this was more than had been noted in previous studies (Hoschl & Kozeny, 1997).

By far the most striking and worrying finding was of the clear differences between Māori and Pacific students and their colleagues. These students scored on average 1.9–3.1 grade points less than their New Zealand European colleagues in MBChB2 (i.e., for Pacific students, a full letter grade less). Māori and Pacific students had extra resources available to them such as group tutorials for specific courses (and one-on-one tutorials if required), MAPAS specific study space and computer labs, pre-examination study weekends, and faculty and administrative support to set up study groups to try and mitigate achievement differences that existed between students at the point of entry into medical school (Te Kupenga Hauora Māori, 2013). While the MBChB2 differences could be interpreted as disheartening, the differences seen in MBChB3 were less stark (only 1.3–1.6 grade point differences), which suggested an improvement in performance over time to begin to match those grades of their peers. Whether this continued improvement would have led to parity in grades in future years is unknown. The steeper gradient of improvement seen with Pacific students (see Figure 6) would suggest that they might intersect (and surpass) Māori students in future years (although the number of Pacific students was smaller). This improvement across both groups was also paralleled in regression modelling.
where the amount of variance in GPA attributable to ethnicity was seen to decrease over subsequent years.

Figure 6. Mean grade point averages of New Zealand, Asian, Māori, and Pacific students across the two years of the study. Error bars represent the 95% confidence intervals.

Ernest Hemingway once said: “There is nothing noble in being superior to your fellow man; true nobility is being superior to your former self.” For the relatively short history of educational psychology there has been a fundamental belief that more fully internalised forms of motivation would be associated with superior academic outcomes (Kaplan et al., 2002; Karabenick, 2004; Pintrich, 2000a; Urdan et al., 2002), even where the results were equivocal (Otis et al., 2005). But unlike previous literature, this study was the first time a single cohort had been followed in a longitudinal fashion with serial mapping of motivation according to the self-determination theory framework. The hypothesis of this study was that higher order extrinsic motivation (i.e., identified motivation) and intrinsic motivation would be associated with better academic outcomes than lower order extrinsic motivation (i.e., external and introjected motivation). What was not specifically looked for, but had become apparent, were the mixed orientation states that existed. Such states described by Harackiewicz et al. (2002) for goal theory proposed that students simultaneously held different orientations, and employed the orientation they deemed necessary to best accomplish the task at hand.

In semester one of MBChB2, average intrinsic motivation showed statistically significant positive correlations with academic outcome in three out of four courses (which was likely compounded by a positive statistically significant correlation with performance in the MCQ and SAQ components on these courses’ respective examinations). In the fourth uncorrelated course,
separate statistically significant correlations were seen both negatively with relative external scores and positively with relative identified scores, which suggested that a better outcome in a course that focused on how one became a better doctor (i.e., an intrinsic goal) was associated with the most internalised form of extrinsic motivation. Tellingly, this relationship was only statistically significant during the first sampling time and not with later iterations, which suggested that a change in the overall motivation construct and approach to this course was adopted early.

However, at the same time, average extrinsic scores were also shown to have a statistically significant positive correlation with overall outcome in one course (Musculoskeletal). More specifically increases in relative external orientation scores were positively correlated with improved academic outcome in the MCQ component of Musculoskeletal, Digestive, and Genitourinary examinations (although the latter two courses had no overall association with extrinsic motivation noted), and increases in relative identified motivation scores were statistically significantly associated with poorer academic outcome in the SAQ components of these examinations. This somewhat reinforced the previous findings of Scouller and Prosser (1994) that students adopted surface learning approaches to MCQ examinations, but failed to explain why more internalised forms of extrinsic motivation were associated with poorer performance in SAQ components of examinations, yet fully internalised motivation (i.e., intrinsic motivation) was associated with positive outcomes. The U-shaped curve (see Figure 7) that noted a positive relationship at either end of the self-determination theory framework and a negative relationship in the middle has not been described in the medical education literature to date, but has been noted in general psychology literature. Baylor (2001) described “intuition” as a convergence of immediacy of thinking, reasoning, and relationships (which was strongly influenced by the learner’s knowledge structures). Baylor noted a U-shaped curve in the development of intuition. At the one end, immature intuition described a state where an individual was a novice in a particular subject area (he or she did not know what he or she did not know). At the other end mature intuition reflected an expert with well-developed knowledge structures.
Figure 7. U-shaped curve of the relationship between motivation orientations on the self-determination theory framework with SAQ scores. A: external motivation; B: identified motivation; C: intrinsic motivation.

The classic model from Baylor described children learning verbs. With a limited vocabulary, children conjugated verbs correctly, but as their vocabulary expanded they made errors in conjugation, before they became experts and recognised that, for example, the suffix “-ed” was insufficient in all cases to describe a past tense. Perhaps in a similar fashion medical students must first “deconstruct” their initial approach to examinations before forming more mature approaches (i.e., intrinsic motivation orientation), which led to a nadir of effect with an intermediate motivation orientation on academic outcomes.

Aside from the aforementioned correlation between the change in external motivation from sampling times one to three, and the Genitourinary MCQ scores, semester two of MBChB2 failed to reveal any further statistically significant correlations with any motivation orientation, or changes in motivation orientations.

In semester one of MBChB3, average and relative intrinsic motivation scores had statistically significant positive correlations with outcome in the Medical Humanities course; outcome in the same course was shown to have concurrent statistically significant negative correlations with relative external motivation scores. This course was unique in the medical programme and had no end-of-semester examination, with the entire assessment completed with assignments and presentations throughout the semester calendar. It was not unexpected that a negative relationship existed with external motivation orientation, an orientation which was often used for studying in situations where rote learning was thought to be helpful, or where
it was encouraged, tacitly or openly, by staff and the learning environment (Maguire, Evans, & Dyas, 2001; Ramsden, Martin, & Bowden, 1989). Such situations would be unlikely to be found in a course with no high stakes examination. Average and relative intrinsic scores were also shown to have statistically significant positive correlations with semester GPA.

These findings were repeated in semester two of MBChB3; average intrinsic scores were also statistically significantly correlated with two of the three courses in this semester. There was a lack of statistically significant correlations with extrinsic forms of motivation suggesting the deconstruction/maturation theory of students’ learning alluded to in reference to Baylor (2001) had been completed. The remaining course that was not correlated with average intrinsic scores was statistically significantly correlated with a change in intrinsic motivation over the semester. Compellingly, this change was actually in a negative direction (i.e., the amount of relative intrinsic motivation in this semester decreased) and the weak correlation itself was negative. Whatever the inspiration for this change was, it was clearly a movement in the wrong direction with respect to academic outcomes. This course was the one through which students attended hospital wards one afternoon per week. It might be that the ward served as an original learning environment and had a covert negative influence over students’ motivation orientation in opposition to the previous changes seen in a campus setting.

Anxiety, described by the Danish philosopher Kierkegaard as the “dizziness of freedom”, is unique in that it is a shared human experience, yet one which is fiercely individual. The relationships of anxiety in the current study were pervasive and could have repercussions far beyond the time of the anxiety-provoking event. In MBChB2, anxiety proved to be essentially ubiquitous, with negative relationships with almost all measures of academic outcome. In semester two of MBChB, one also saw the prolonged nature of the relationship of anxiety, where measures of anxiety from an entirely separate semester continued to have statistically significant negative correlations with academic outcomes. These repeated measures of anxiety were noted to be highly correlated, and on regression modelling were found to be indistinct, suggesting that the anxiety bar for MBChB2 was set early and continued to moderate this relation over the course of the year, rather than ongoing anxiety-inducing events being more closely related to students’ latent anxieties.

However, in MBChB3, anxiety scores, although remaining negatively correlated in particular outcome domains, failed to demonstrate the broad relationship seen in MBChB2. This finding was supported from previous literature which reflected upon the maturation of students over a preclinical programme and their adaptation to the medical school environment and its particular stressors (Sreeramareddy et al., 2007). Sreeramareddy and colleagues showed that second-year students had almost half the psychological morbidity of first-year students. The current study showed that earlier measures of anxiety no longer had significant relationships
with later academic outcome measures. This decrease in the correlative capacity of anxiety in MBChB3 was reflected in the finding that anxiety scores explained less variance in academic outcome measures in MBChB3, in comparison to the models noted in MBChB2.

Simple linear regression modelling of motivation orientation with academic outcome showed that individually motivation orientations explained small but statistically significant amounts of the total variance in academic outcome. In line with the theory of multiple motivation orientations within an individual prioritised based upon need and outcome, multiple regression models proved in some instances to be more accurate models when seemingly opposing orientations were combined. Because the combined models still only explained small amounts of variance, it would be easy to have dismissed these statistically significant findings as interesting but unimportant. However, in all the multitude of relations on academic outcome, the fact that as much as 6% of this could be explained by simply the way a student approached a learning need, assignment, or examination question was noteworthy. A binomial effect size display indicated that using an intrinsic approach would mean the difference between scoring 38% and 62% (Randolph & Edmondson, 2005; Rosenthal & Rubin, 1982). This was especially apt when one recognised the large association of ethnicity with the amount of variance explained. If all Māori and Pacific students approached learning in the same manner, the difference in academic outcome between these students and their New Zealand European and Asian colleagues would be narrowed, and the achievement gaps not quite as stark. Benjamin Franklin once said that “a great empire, like a great cake, is most easily diminished at the edges”. If one wished to address inequality in education and outcome, this arena might provide such an edge.

Study 3 will provide an additional view to the findings discussed thus far in Studies 1 and 2. The next study used a qualitative methodology to gain insight into the reasons for motivation change during the course of medical students’ preclinical curriculum. By establishing a narrative to complement the quantitative results, one provides a compellingly unique yet broad enough context through which other learners can recognise themselves.
Study 3 expanded upon the results of Studies 1 and 2 by exploring the qualitative responses of a smaller group of medical students to general questions about their preclinical undergraduate medical studies. The aim was to provide a more nuanced narrative to changes in motivation and identify potential overarching reasons and themes. Collins, Onwuegbuzie, and Sutton (2006) described four rationales for mixed methods research: participant enrichment, instrument fidelity, treatment integrity, and significance enhancement. The inclusion of qualitative data provided triangulation and also potential contradictions to the quantitative data derived from questionnaires (Knafl & Breitmayer, 1989; Shih, 1998). No specific hypotheses were proposed prior to data analyses. By using a thematic analysis approach, ideas and themes were allowed to evolve organically. The research questions for this study were: what influences the learning of medical student learning, and do these influences change students’ motivation?

Method

Participants

The participants for this study were 13 medical students from the original cohort of 213 students from Studies One and Two who were enrolled in the second year of the Bachelor of Medicine/Bachelor of Surgery (MBChB) programme at the University of Auckland in 2011. All 213 students (although the intention was to limit the sample to a maximum of 20 students) were invited to participate in this component of the study by the author at the initial introductory lecture in a simultaneous, convenience sampling manner with his other studies. A follow-up email was posted on the class portal. As the purpose of this study was to provide a fuller description of the earlier studies, no additional sampling beyond this study population was required (Sandelowski, 1995). As it was important to collect medical students’ initial impressions of the medical programme, recruitment for this study closed within a month of the start of semester one of 2011. There was no way to ensure a representative sample of the entire class cohort without using a different, purposive sampling method.

When an expression of interest to participate in the study was received, respondents were sent a participant information sheet, and asked to reply once more if they were interested
in participating in the study. No participant chose not to do so at this stage. Prior to their first
interview, participants were asked to sign a consent form for the study. Copies of the participant
information sheets and consent forms used in this study may be found in Appendix B.

The participants were interviewed in up to four individual interviews (mean 3.0 per
participant, $SD$ 1.08), and in up to three focus groups (mean 1.3 per participant, $SD$ 1.25) with a
mean of 5.67 ($SD$ 0.58) participants per focus group. A total of 38 interviews and three focus
groups were conducted that gave almost 19 hours of data. This allowed for the establishment of
a consensus amongst participants (Atran, Medin, & Ross, 2005). As noted by Guest, Bunce, and
Johnson (2006), “the idea of saturation ... provides little practical guidance of estimating sample
sizes for robust resarch prior to data collection” (p. 59). Previous authors (Cresswell, 1998;
Morse, 1994) had proposed that for a grounded theory methodology between 20 and 50
interviews were required.

Of the 13 participants, 11 continued to be involved for the entirety of the study; two
individuals did not respond to later requests for interviews, but neither did they request that
their information from initial interviews be returned to them, and so were included in analyses.
Table 46 provides demographic details of the participants and their pseudonyms.

Table 46

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Sex</th>
<th>Ethnicity</th>
<th>Mode of Entry</th>
<th>Admission Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angela</td>
<td>Female</td>
<td>NZE</td>
<td>OLY1</td>
<td>Non-attenuated</td>
</tr>
<tr>
<td>Brenda</td>
<td>Female</td>
<td>NZE</td>
<td>Graduate</td>
<td>Non-attenuated</td>
</tr>
<tr>
<td>Chris</td>
<td>Male</td>
<td>NZE</td>
<td>Graduate</td>
<td>Non-attenuated</td>
</tr>
<tr>
<td>Daniel</td>
<td>Male</td>
<td>NZE</td>
<td>OLY1</td>
<td>ROMPE</td>
</tr>
<tr>
<td>Eve</td>
<td>Female</td>
<td>Pacific</td>
<td>OLY1</td>
<td>MAPAS</td>
</tr>
<tr>
<td>Frank</td>
<td>Male</td>
<td>OE</td>
<td>OLY1</td>
<td>ROMPE</td>
</tr>
<tr>
<td>Greg</td>
<td>Male</td>
<td>NZE</td>
<td>OLY1</td>
<td>Non-attenuated</td>
</tr>
<tr>
<td>Harry</td>
<td>Male</td>
<td>NZE</td>
<td>Graduate</td>
<td>Non-attenuated</td>
</tr>
<tr>
<td>Iris</td>
<td>Female</td>
<td>NZE</td>
<td>OLY1</td>
<td>Non-attenuated</td>
</tr>
<tr>
<td>Jane</td>
<td>Female</td>
<td>NZE</td>
<td>OLY1</td>
<td>Non-attenuated</td>
</tr>
<tr>
<td>Katie</td>
<td>Female</td>
<td>NZE</td>
<td>OLY1</td>
<td>Non-attenuated</td>
</tr>
<tr>
<td>Lee</td>
<td>Male</td>
<td>NZE</td>
<td>OLY1</td>
<td>Non-attenuated</td>
</tr>
<tr>
<td>Michelle</td>
<td>Female</td>
<td>NZE</td>
<td>OLY1</td>
<td>Non-attenuated</td>
</tr>
</tbody>
</table>

*Note. NZE = New Zealand European; OE = Other European; OLY1 = Overlapping Year 1; MAPAS = Māori
and Pacific Admission Scheme; ROMPE = Rural Origin Medical Preferential Entry.

*Indicated previous undergraduate degree although entered through OLY1.

*Indicated participants who only completed the initial interview.
Ethical approval

Ethical approval was obtained for this study from the University of Auckland Human Participants Ethics Committee (reference 2011/041) on 22 February, 2011 for the duration of the study (not exceeding three years).

Settings for interview

Participants were invited to individual interviews on four occasions over two years, and were invited to participate in three focus groups over the same time period. Invitations for interviews were sent individually by email to all participants. The interviews took place roughly over a one-week period at a time that was convenient for the participant. The timing was deliberately chosen to sample the participants at particular times during the medical programme. The first interview time (23 March, 2011–01 April, 2011) was chosen for a time when students would have begun to acclimatise to the medical school environment and workload. The second time (4–12 October, 2011) was toward the end of MBChB2 semester two and allowed time for reflection on the year as a whole as well as their anxieties around imminent exams. The third occasion (25 June, 2012) was during the mid-semester break in MBChB3 and allowed a reflection on the first semester of 2012. The final juncture (9–17 November 2012) was immediately after the MBChB3 end-of-year examinations but before results were released, which again allowed reflection on the semester as a whole, but also their anxieties about examinations and the forthcoming change to a clinical programme in MBChB4.

The interview typically took place in a quiet room booked by the author on the Grafton campus of the University of Auckland, but on one occasion was conducted at a café in central Auckland for the convenience of one participant. The interviews could be during or after university hours depending on the availability of the participant.

Potential dates for focus groups were also sent to all participants individually by email, with a view to setting the date based on a time when the largest number of participants could attend. The dates of the focus groups were 19 July, 2011, 14 November, 2011, and 9 November, 2012. Each of these dates were after the end of their respective semesters (MBChB2 semester one, MBChB2 semester two, and MBChB3 semester two), which allowed the focus group to reflect on the previous semester’s teaching, learning, and challenges, and how these influenced their motivation. The focus group always took place outside of university hours but was conducted in a room at the Grafton campus for convenience. A light dinner and refreshments were provided for the participants.

Other data collection tools recommended for qualitative research in medical education include observation and review of textual documents, for example, assignments, examinations,
course curricula (Lingard & Kennedy, 2010). The author felt that within the constraints of this study, neither of these tools were practical, and nor were they expected to reveal any additional information beyond the data garnered from interviews and focus groups.

**Interview schedule**

A standard interview schedule was developed for the initial individual interviews, which allowed a consistent introductory interview and established the aims and goals of the study (Powney & Watts, 1987). The specific questions were developed with a view to answering the research question of this study. The interview schedule was similar to one used in an earlier unpublished study from 2008 by the author with nine MBChB3 students when the author was employed as a teaching fellow at the University of Auckland. The experiences of this prior study informed the style of questioning used for this current study but did not lead to any drastic changes in methodology or questions. Subsequent interviews were much less structured but tended to follow similar themes at each occasion (e.g., open-ended questions would be asked about the semester to date, assignments and examinations, and hopes for the coming semester). This approach mirrored the dictum that qualitative research questions be “open-ended, evolving, and non-directional” (Creswell & Piano-Clark, 2010, p. 107). No prior list of questions was given to participants. No difficulty in understanding of the questions was encountered at any interview. Table 47 provides a copy of the interview schedule used for the initial individual interviews.

The focus groups were even less formal and often the author took a more passive role in the proceedings and was hardly involved in questioning except to steer the conversation into certain realms; more often the participants themselves evolved the line of questioning and explored ideas by generating ideas from one another.
Table 47

Medical Student Interview Schedule

1. How do you learn?
2. What methods do you use to help you pass assignments and exams?
3. Do you think your learning style can change? How?
4. Can lecturers make you learn differently? How?
5. What does motivation mean to you?
6. Are you motivated in all subjects or only some? Why do you think that is?
7. Which subject do you find most interesting? Why?
8. Is your most interesting subject also your best? Why?
9. What do you think of the OLY1 (or previous degree) lectures?
10. What do you think about clinical methods?
11. Do you learn clinical methods differently? How?
12. How would you approach studying for your clinical methods assessment?
13. How have you changed as a person this year?
14. Are you looking forward to next year? Why?
15. What events in your life recently have had an impact on your learning?
16. How does your home life affect your study?
17. How do you cope/manage with changes in learning environments?

Procedure

All interviews were carried out between March 2011 and November 2012. The interviews, which were all conducted by the author, varied in length from 20–40 minutes depending on the responses of the participants. Focus groups tended to last longer and varied in length from 60–90 minutes, which largely depended on the degree of interaction between the participants. During these interviews the author would make written notes as the interviews progressed. The author had no contact with participants outside of these times, and had no direct or indirect role in writing, delivering, or marking of assessments.

There were no objections from any participant to being recorded. All interviews were digitally recorded by the author and then transcribed by professional transcriptionists. A copy of the confidentiality agreement signed by these transcriptionists can be reviewed in Appendix C. Following this, transcriptions were assessed by the author for accuracy by comparing the audio file with the transcription. An agreement rate of approximately 99.3% was obtained. Any identifying names were changed during the reviewing process to a pseudonym. The speakers in the focus group transcriptions were individually identified by the author during the reviewing process and their quotations were incorporated alongside their individual interview comments.
Interviewees were not permitted to review or alter the content of the interview but were advised that they could withdraw their consent and have their collected information to date (excluding where they had attended a focus group) deleted. No participant requested this course of action. Every effort was made to ensure the confidentiality of participants and anonymity of their data, and aside from during focus groups, the participants did not know who else was involved in the study.

Data collection and analysis

Qualitative analyses were performed using a thematic analysis methodology as described by Braun and Clarke (2006). A contextualist approach was used where participants ascribed their own interpretation of their experiences, and the ways in which the environment (i.e., the medical school) influenced these interpretations (Willig, 1999). It was assumed that a unidirectional relationship existed between meaning, experience, and language. The broader research question was accompanied by further questioning as described in Table 47, and by additional questions that were generated in response to participants’ answers. The data were coded and themes and subthemes emerged in an inductive, bottom-up manner. An inductive approach shared some similarities with grounded theory where data were coded without fitting into pre-existing themes. In an inductive approach the literature was not consulted in the early coding process to allow an unforced exploration of ideas (Braun & Clarke, 2006). An open coding process was employed (Strauss & Corbin, 1998) where the author reduced textual data into more manageable groupings. This was an organic process and terms used to describe codes were born out of the ascribed meaning of the data or in vivo (i.e., the participant’s own words) coding. This generated 516 codes which were later grouped into a more manageable set of 43 parent codes. At this stage, coded extracts were reviewed to ensure “internal homogeneity and external heterogeneity” (Braun & Clarke, 2006, p. 91); that is, that coded extracts were sufficiently similar to each other to justify grouping, and were sufficiently dissimilar to other groupings to warrant their exclusive coding. Some original codes were amalgamated or renamed during this process. The parent codes were further reviewed and the author actively identified patterns and selected themes of interest to the questions at hand (Taylor & Ussher, 2001). Themes were identified at an interpretative level where an attempt was made to discuss the significance of the themes and the repeated patterns identified across the data set, and later their broader meanings with reference to previous literature (Patton, 1990). Rigour of the data was ensured by using prolonged engagement strategies, which allowed the development of rapport with the participants and consequent increased disclosure, although reflexive analyses were performed by the author to ensure his own biases were not used in the interpretation of the data (Krefting,
Triangulation of data sources using both the interview and focus group data also increased the reliability of the data (Knafl & Breitmayer, 1989; Shih, 1998). Qualitative analysis support was provided by NVivo version 10.0.4 (QSR International, 2014), which also enhanced the rigour of analyses (Seale & Silverman, 1997).

**Limitations**

The qualitative data had inherent biases and assumptions. The nature of volunteering for this research relied on invested individuals, and as such presented a motivated group, introducing sampling bias. Additionally, although the group was heterogeneous in similarity to the overall study population, the small numbers did reduce any attempt at generalisation. However, the intent was never to generalise beyond the study population and in this case such an attempt at a limited generalisation might be valid. The qualitative data from this study presented a skewed view of the medical school learning environment, but provided a context for the changes seen in the earlier studies.

Furthermore, the author was the only researcher who participated in coding and analysis. However, as outlined above, reflexive analyses were undertaken to mitigate any effect on the reliability of his coding.

**Results and Discussion**

Thematic analysis of the data permitted parent codes and subthemes to emerge in an unaffected manner. These were coalesced into natural overarching themes that primarily reflected the learning environment of students and the influence this had on their learning and motivation orientation. Accordingly, two major themes were identified for discussion: the actual act of the “learning of medicine” and the “psychosocial aspects of [learning] medicine”. The natural distinction and importance of the two themes was supported by the belief of Robbins et al. (2004) that psychosocial and study skills factors (the latter of which this author had included in the “learning of medicine” theme) manifested positive correlations with grade point average (GPA) and explained an additional amount of variance in outcome that was not explained by traditional, conventional predictors of outcome measures (such as high school GPA, standardised test scores).

**Learning of Medicine**

The “learning of medicine” theme had six major subthemes, some of which had further subthemes. The principal themes are outlined in Figure 8.
Assessment. Assessment has been identified as “the single most potent influence on student learning, narrowing students’ focus to concentrate only on topics to be examined and shaping their learning approaches” (Scouller & Prosser, 1994, p. 268). Multiple-choice questions are a valid method of competence testing, and can strike an appropriate balance between the length of the examination and the breadth of subject matter assessed (McCoubrie, 2004). Angela had particular feelings on the matter:

There's been a lot of multi-choice questions this year, which I don't think many of us have been particularly thrilled with because you feel like you don't really get the credit for knowing some stuff—you have to know everything about that question.

These comments were in opposition to the findings of Case and Swanson (1993) who suggested that well-constructed multiple-choice questions could assess higher order cognitive processes (e.g., interpretation, synthesis, and application of knowledge) over recall of isolated facts. A blinkered view of multiple-choice questions exists. Some researchers believe that all a student has to do is recognise the answer, compared with an open-ended question where the answer must be generated spontaneously (Ward, 1982). Harry agreed with this view: “MCQ forces me to, like I don’t learn anything nearly as well because I have to recognise the answer.” Research by Schuwirth and Van der Vleuten (2003) has consistently shown that it is the content, not the format, of the question that determines what exactly the question examined. In a focus group...
setting, one lecturer was singled out as a particularly poor writer of questions. Katie, Michelle, and Harry agreed: “If 50 percent of your class is getting your questions wrong do you not think maybe something could be wrong with the teacher”, “You have five options so there should be a minimum of 20 percent. One question was like 16 percent got it right. I was like ... no way”, and “That was the point. She wasn’t concerned, why aren’t these people getting it right? She was like ha, ha, I tricked them.” Assessment has a role beyond the individual and their examiner, and has a role in stakeholder (licensing bodies, government, and the public) reassurance with regards to the rigour and quality of training (McCoubrie, 2004). When rogue examiners create unfair questions, it threatens to undermine this relationship. Examinees’ perceptions of fairness of an examination are important and should be solicited during evaluative processes (Duffield & Spencer, 2002). A utility model of assessment would suggest that beyond validity and reliability, assessment must also be judged on “educational impact, the acceptability of the method to the stakeholders [emphasis added] and the investment required in terms of resources” (Van der Vleuten & Schuwirth, 2005, p. 309).

With respect to assessment modalities, participants described different reasons for preferring one modality to another. Michelle noted: “I don’t mind MCQs. Because you know the answer is there. You just have to find it. Or remember it.” Whereas Harry found this aspect frustrating:

_I don’t like multi-choice because it’s like often I tend to second guess, maybe it’s just a confidence issue but it’s like I think it’s that one which means it’s probably not that one, or you kind of narrow it down to two but it’s kind of annoying because like you know quite a lot about it but not enough._

A common element from 5 of the 13 participants was of “multiple-choice question fatigue” reflected upon by Katie and Lee: “Doing that many MCQs, like three hours of MCQs, I wanted to hit my head against a wall, I was just over it”, and “You get half way and you can feel tired, you feel the fatigue, whereas with most other exams, because you are formulating your own answer, you don’t feel that kind of fatigue until the very end of the exam.” A commonality was noted by several respondents around their approach to short answer questions. There was a perception that these type of questions had more latitude in the accuracy of the response, and credited partial knowledge. Greg and Harry reflected on these assumptions:

_At least with short answer questions you know if you got it usually or not, whereas with MCQs ... you’ve got five choices, I could narrow it down to two, and I’d go I’m pretty sure it’s this one, but I’m not a hundred percent sure,_

and “At least with a short answer question you can put down what you know and get a mark relative to [your answer].”
Harry, having completed a previous humanities degree, noted a preference for assignments, but also the similarity in his approach to assignments and short answer questions: “I [did] a lot of essay writing so anything that’s like a short answer question I can usually fly through”, and

“I love assignments and I always get them done really early because there’s a finish point that I can work to … as opposed to an exam where there’s not really an end point. You’ve just got to go in and do it and if it’s not right that’s it.”

The locus of control was disputed by Michelle, who felt the opposite: “In an exam I feel way more in control because it’s like I learn what I can learn and then just you apply it in the three hours.” Iris also indicated a preference for assignments but reflected on a preference for a specific kind of test: “A test where they test like a broad bringing together [off] a whole lot of stuff. I can do that.” This statement reflected a study in undergraduate chemistry students where conceptual questions were preferred to “algorithmic” questions (Nakhleh & Mitchell, 1993), although in that study students preferred these questions in a homework-sense rather than in a time-pressured examination.

Relevance. All participants reflected that clinical relevance made learning, studying, and being examined easier. Diemers et al. (2008) found that such relevance helped students understand the effect of illness (i.e., enhanced their empathy), aided in the socialisation of students into medicine, and provided a potent aide-mémoire. Michelle summed up the sentiment of the participants:

“It was really easy to remember, because you can link it to a patient. And it just made it more interesting as well, and just seemed more relevant … and then the patient would come in, and you can actually see why you need to remember it, that it was relevant and stuff.”

Once participants made foundations and links between subjects their interest subsequently increased, as noted by Chris and Greg: “I like applying knowledge and just seeing that knowledge, you can actually figure out why they’ve got the symptoms and stuff like that”, and “I’m really enjoying it right now, because I think I’m getting to the stage where I know enough to start asking deeper questions and getting into it.”

Learning environment. The learning environment strongly influenced the sense of relevance of lectures. When lecturers were clinicians Michelle stated: “That really helps. Once again it’s just the relevance thing. Like they … will teach us stuff that they think is relevant.” Often the influence of clinicians as teachers extended beyond the curriculum as again noted by Michelle: “They give you, I don’t know, just a lot of their life experience and stuff which can be useful, and like clinical examples.” Later in the programme when learning moved into outpatient and hospital settings the benefits of this were also seen. Iris and Katie indicated: “I didn’t really
get taught many skills at Zulu Hospital[^16] I don’t think, it was more talking, which was practice, which was good, like a confidence thing”, and “But [the GP visit] was really good because it kind of put relevance to a lot of the stuff you learn. You kind of think when am I ever going to use this, and then you see it.” Early professional contact had been found to inspire students toward their future work as doctors and increased their confidence in dealing with patients (von Below et al., 2008). But Michelle noted that a conceptual framework was needed to which patient experiences could be related: “But sometimes if you are just there and you haven’t had any prior knowledge, like you won’t understand what is going on.” This mirrored a study by Pelaccia et al. (2009), who found that to increase motivation to learn students needed both a framework and the clinical experience. A hospital setting also allowed a phenomenon of “retrospective relevance”, where material which previously seemed irrelevant became important (Diemers et al., 2008). Brenda reflected:

> I think it made you appreciate the PCCS [Professional, Clinical, and Communication Skills] programme a lot more, because up until then it was all a bit airy fairy, but then once you got in the hospital it was like oh, okay, this stuff is actually quite useful.

The hospital setting (and the vertical nature of the medical school where one interacted with peers in other years) perpetuated the notion of the hidden curriculum. The hidden curriculum was “the processes, pressures and constraints which fall outside of, or are embedded within, the formal curriculum and which are often unarticulated or unexplored” (Cribb & Bignold, 1999, p. 197). This has emerged as an influential concept in medical education (Lempp & Seale, 2004) and acted to socialise novices into the profession of medicine and inform the way they viewed themselves, as Katie pointed out: “I’m just nervous about how other people will treat you. Because as a fourth year obviously you don’t know anything and you are probably just going to get in people’s way and look stupid and that kind of thing.” A difficulty arises from the fact that the hidden curriculum might erode the humanistic values of the overt curriculum (Crandal & Marion, 2009). Harry reflected on this dissonance: “The interviewing, getting the patient histories, everyone has got their own style and it’s barely recognisable from what they teach us is the orthodox manner.” Although Lee noted a degree of resilience in his reconciliation of these differences:

> Even if they are doing bad practice, I know what ... ideal practice should be, so it makes me think okay well I’m not going to be like him at least, instead of being okay I want to practice like him.

When it came to the professional development courses (Professional and Clinical Skills; Professional, Clinical, and Communication Skills), there was a general sense that some of the

[^16]: A pseudonym.
items in the courses were “common sense”. Angela agreed with this evaluation but also noted the usefulness of it:

I know one of my friends actually in the course was saying, this could be a waste of time, there is so much other stuff I have to learn. But it was really good to reinforce stuff that may to some extent seem like common sense.

Other students noted these skills were second nature, and reflected previous findings that a medical school whose focus went beyond the biomedical orientation tended to select for emotionally mature students (Carrothers et al., 2000). Daniel reflected on his prowess in communication skills and, like Angela, recognised the need to develop these:

I think with the oral aspect I’m quite good. I think it’s definitely necessary because doctors need to communicate. A lot of people respect doctors’ views and they need to be able to convey them properly. I think definitely people have an innate ability from the start. It’s like any skill, people are always going to start off better than others at it, but I definitely think you can learn it to a certain extent and I think it’s good that they’re teaching it.

Clinical work. Learning clinical skills had a different perspective to traditional learning, as noted by Michelle:

In lectures you kind of like, I don’t know … lose concentration and stuff. But I never lose my focus in those clinical skills because they are like—everything seems so relevant. A lot of it is probably like information beyond what we need to know, but it just seems so like important that we know it.

Medical students often lacked a context for the learning of clinical skills in the non-clinical setting. Their concept of the medical profession was often limited to the social aspects reflected in the media: talking with patients and performing in the operating theatre (Kusurkar, Kruitwagen, Ten Cate, & Croiset, 2010; Nieuwhof, Ten Cate, Oosterveld, & Soetout, 2004). The influence of the media on what it meant to be a doctor gave primacy to clinical skills learning as “tools of the trade”. Eve agreed: “I really enjoyed it [learning clinical skills] because it kind of introduces you to all the stuff that you hear about or see in movies and stuff.” All participants interviewed after the start of clinical ward attachments expressed their enjoyment of these sessions and the way in which these sessions enhanced their learning. Harry particularly enjoyed the apprenticeship model:

I like that sort of learning, on-the-job training kind of thing. Like actually seeing it and applying it and using it is a lot better than sitting there in a lecture and have someone talk at you for an hour and go home and read a book.

Diemers et al. (2008) further noted that learning from different patients with similar conditions helped students develop a more nuanced view of disease—that disease rarely presented in a
textbook manner, and that in contrast to real patients, simulated patients were often too “typical” and rarely added to students’ understanding.

**Studying.** Participants employed a range of study habits including rewriting lecture notes, flashcards, posters, recordings, and cramming. Angela converted walls of her rooms to study charts to aid her visual memory (see Figure 9).

![Figure 9. Photograph of Angela’s study wall. Used with permission.](image-url)

Almost all (12 out of 13) participants noted that their study habits from OLY1 or previous degrees were insufficient for medical school. The most oft-cited reason was that the workload made earlier methods impractical, as expressed by Brenda and Katie: “I have been recording the lectures on a dictaphone and I’ve been using a computer more because my hand was killing me from trying to do hand notes too much last semester, so I type up my notes now”, and “You just don’t have the time to do what I would call like perfectionistic learning.” Participants became more savvy at studying, employing their time more efficiently. Both Angela and Katie used the lecture objectives as guides to study:

> You do need to realise that you can’t learn every single thing about every single topic, because there is just so much to learn. So yeah you do need to look at the learning objectives and try and prioritise, as hard as it can be at times to figure that out.
and “I think this year I am more like ‘what are the lecture objectives?’, and then what questions they asked last year and trying to do the whole study smarter and not harder [emphasis added] thing.” Michelle and Iris agreed with this conclusion and felt that after two years of medical school they had become more savvy in their approach to assessment: “I think we are maybe getting better at remembering what is relevant or what we think is going to be relevant, and just kind of not dismissing the rest, but not worrying so much”, and “I think you can probably pick out the sort of things they are going to ask as well, I would imagine having done it a few times, you would start seeing the areas they like to question on.” Chris and Harry used old examination scripts as a guide: “Once I’ve learnt all the material then I’ll go over the last exam to like consolidate my knowledge”, and “I don’t usually [study from old tests] but I learnt last year that that’s a very, very good thing to do.”

The advent of social media had also changed the way studying occurs as an online presence increases in education settings (Giustini, 2006; Kind, Genrich, Sodhi, & Chretien, 2010). The concept of a study group as a finite number of individuals in a room together has become defunct when a large class has access to a communal Facebook page, or a Google Docs account. Angela reflected on the wider use of the Facebook page:

> On our class Facebook page whenever someone was confused about something in the past exam they would post it up and all sorts of people would give their opinion and weigh in and it was really nice to have everyone helping out everyone else.

Michelle used this as a form of study: “I don’t think I have asked many questions but I have learnt a lot from [the site], even just reading people’s answers or even the discussion around it.” Jane also noted that it enabled students to share useful information which saved time in having to search for these resources herself: “It’s good because people post like links to websites that they’ve found really useful.” These applications reflected the findings of George and Dellasega (2011) who noted social media helped students acquire the skills desirable in lifelong learners: problem-solving, networking, and collaboration.

**Outcome.** Almost all (12 out of 13) participants expressed a view that grades were unimportant. Most of the students who came through OLY1 noted this was a change from their previous attitudes, which supported the findings of Horowitz (2009) who noted that 94% of premedical students reported that getting a good grade was important to them; and Amin et al. (2009) who noted that “getting a good grade” was the second most important of six motivators of pre-university medical students, but fell to fifth most important in actual university medical students. Katie and Michelle reflected: “I decided that this year that marks aren’t going to get you anything anyway, so why bother? Let’s just have a bit more fun as well”, and “But I don’t feel as competitive or as like into it, not as into the A pluses and things as I was last year.” In spite of a professed lack of caring about grades, a lower limit of achievement was cared about, as noted by Brenda: “I don’t care if I get an A plus or an A minus, but I’d care if I got under a C to be honest. But
for me there’s not that much difference between getting an A or B.” Chris, another graduate student, shared a similar outlook: “I obviously don’t want to fail but I’m not aiming for A plus this year.” This professed laissez-faire approach to grades did not resemble self-handicapping or the “frog pond” metaphor noted by Davis (1966) where students lowered their expectations when surrounded by very able colleagues. Bachman and O’Malley (1986) refuted this observation by Davis and found that actual academic ability was the strongest measure of academic self-concept. Academic ability was not solely defined by grades, and included interactions between personal attributes, the characteristics of the learning environment, and the nature of the curriculum (McLean, 2001). The Faculty of Medical and Health Sciences had a strong desire to de-emphasise high stakes assessment with the introduction of progress testing (W. Bagg, personal communication, 27 June, 2012), a message which had filtered through to students. Brenda noted: “I really like the progress testing and I think it’s a really good idea. Because the idea of doing one test at the end of fourth year and one at the end of fifth year just seems horrendous.” In spite of these cues from the faculty, Lee changed his views on grades in MBChB3: “I said to you last year I felt the grades don’t really reflect too much, but now I really feel that they do.” Lee felt that grades were a reflection on the amount of knowledge acquired and the speed of recall of this knowledge, demonstrating the “memorising and reproducing” conception of learning which has been largely associated with poorer academic outcomes (Marton, Dall’alba, & Beaty, 1993). Daniel was the sole student who held a consistent belief in the value of grades as an external device: “At the end of the day people look at your marks and you want the highest marks possible … life works on results and you’re going to do the best you can to get results.” Jane agreed with these judgements but felt they needed further context: “Grades give an indication of your academic ability but not of your social skills and that’s really important for a doctor.” This somewhat reflected the idea that students’ desire to outperform others was not an ego-enhancing goal, but more of a means to achieve one’s own goals (Horowitz, 2009), in this case of being a good doctor.

**Psychosocial Aspects of Medicine**

The psychosocial aspects of medicine theme had two major subthemes, both of which had further subthemes. The principle themes are outlined in Figure 10.
The importance and justification of the psychological aspects of medicine model is further supported by social cognitive theory (Artino et al., 2010) which suggests that medical student academic outcome and satisfaction arises from dynamic and reciprocal interactions between personal factors (motivational beliefs and achievement emotion), behaviours, and the socio-cultural and physical environment. The principal difference between the current proposed thematic model and that by Artino and colleagues is that the physical environment was included in the earlier “learning of medicine” theme. The author felt this subtheme was more in keeping with the act of learning and influences therein, rather than the psychosocial influences on learning as demonstrated through other works (e.g., Karabenick, 2004; Perry & Dickens, 1984; Tabernero & Wood, 1999).

**Psychology of medicine.** The psychology of medicine encompasses such aspects as feelings, goals and motivations, and maintaining a study–life balance, which are discussed in turn.

**Feelings.** Every participant in the study spoke of the importance and primacy of their feelings about medicine. These were further subdivided into feelings about medical school, feelings about lectures, feelings about exams, and uncertainty about the future. There was a general recognition that medical school was hard, and this was to be expected. Daniel and Greg, having come through the OLY1 scheme felt: “You don’t sign up for something easy if you want to be a doctor”, and “I think it was probably at the beginning of this degree that I realised that I just had
to put in a bit more work and yeah I’ve just been refining that.” But there was also a general recognition that the faculty had a vested interest in their well-being, which Brenda and Iris reflected upon: “I believe the medical school has got our best interests at heart”, and “[The faculty] obviously know that medicine is hard. They are worried about us because in other times we have had, in the last four weeks, stress lectures, or how to relax, meditation, they are piling on us to begin with.” Tosteson (1981) noted an earlier preoccupation with what medical schools thought should be taught, and little focus on how this should be learnt. Participants in the current study noted conflicting thoughts about the motives of the faculty with regards to their autonomous learning where Michelle proposed an almost Machiavellian approach: “I don’t think they want us to direct our [own] learning. They just want us to learn everything … They teach us [it] all and they want us to know it all, I think. They don’t want us to prioritise.” Artino et al. (2010) noted that medical educators had a great deal of latitude over educational outcomes through decisions on course delivery and assessment and that these processes had large implications on students’ emotions. Finally, a belief of self-efficacy in learning, unlike that described by Michelle, has been associated with better academic outcomes (Bandura, 1997; Caprara et al., 2008; Pietsch, Walker, & Chapman, 2003). However, Michelle later moderated her views on self-efficacy and noted that:

> I try to go to most lectures. Because I think, in terms of being a doctor, like while learning every single thing isn’t important, [emphasis added] I think being in the lectures, they give you, I don’t know, just a lot of their life experience and stuff which can be useful, and like clinical examples and stuff.

The most common concern about lectures was the idea that a kernel of information might be imparted, and medical students as a whole balanced a fear of missing out and a need to prioritise their time. Brenda, a graduate student, felt that lecture attendance was paramount: “I haven’t ever sort of been in there and switched off. Like you kind of feel like you need to listen because it’s going to be relevant at some stage”, and even noted precedence over her own health and well-being:

> Well I’m burnt out here, but I don’t find it nearly as difficult as having to get up and [physically] exert myself, because all I have to do is just sit and be here, and I might miss half of it because I might be tired, but there will be something that I take away from each lecture, and that’s worth it.

Chris, another graduate student, concurred: “I just want to show up for the lectures, just you know I’m there to learn so try and focus. Sometimes it’s harder than others but yeah I just keep on trucking on.” This contrasted with the feelings of Iris, a student from OLY1, about being tired and burnt out: “I don’t really skip lectures that much, unless sometimes the 8 am ones if I am really tired.” Greg (also from OLY1) noted a general evolution in his feelings towards lectures: “For the first half I was going to all lectures and everything, and the second half of that term I just decided to
flag, because I don’t get anything from actually listening.” Katie, an OLY1 student, noted a transaction-like calculus towards lectures: “I've already been analysing lectures, yeah, this is probably a lecture I can miss. Like when they have good enough notes, you're like oh yeah that would be okay to miss, you know?” However, she also noted a degree of cognitive dissonance to this approach when she later commented: “I miss out on learning all the stuff that we were supposed to learn. And I am like what if I need that one day?” She also reflected on the false economy that skipping lectures engendered: “I missed innumerable numbers of lectures, and then you get to exams and you are like oh crap, you know, like I don't really have time to re-listen to all of those lectures.” In one study of general undergraduate students, physical presence at lectures was a better predictor of academic performance than pre-admission GPA, study skills, or the number of hours spent studying (Credé, Roch, & Kieszczynka, 2010).

All graduate students (and two OLY1 students with previous Humanities degrees) reflected on the importance of lecture attendance, even in the face of perceived irrelevance. The antithesis of this was seen in the non-graduate students who adopted a more laissez-faire approach to lecture attendance if they felt their time could be better spent elsewhere. Graduate students have been shown to have higher scores on a Strength of Motivation for Medical School questionnaire (a measure of the willingness of medical students to continue with medical school even in the face of difficulty and sacrifice) than non-graduate entrants (Kusurkar et al., 2010); Angela stated: “I am very happy that I did do the undergraduate degree first because for one thing I now know for sure that I definitely want to do medicine.” Age at medical school entry (more so than graduate status) has also shown an association with certainty and strength of motivation with regards to career choice (Wilkinson et al., 2004), which was mirrored further by Chris: “There’s a drive in me to do well but like I know that I’m here and like I’m here to stay and nothing is … going to push me out.” The certainty of graduate students was contrasted in the statements by Lee, a younger, OLY1 student: “Because I was just thinking as an undergrad you don’t, a lot of people, I mean I used to think that I knew exactly what I wanted, and then I realised that I don’t know what I want.” Greg also reflected on several occasions his uncertainty about the choice of medicine: “I just was, you know thinking do I really want to do medicine? And I got real down and depressed about it, and that was only after a week and a half [of starting MBChB2].”

**Goals and motivation.** Medical education was noted by Kusurkar, Ten Cate, et al. (2011) to be unlike general education in several regards: medical students work toward a singular outcome, they have very little choice to create unique subject profiles for their study, clinical work is intertwined with traditional learning, and an homogeneous learning environment is shared by all students. A rigorous selection process also selected for highly motivated individuals (Prideaux et al., 2011). This was reflected in the responses of the participants. Brenda, a graduate student, stated:
I did a degree in sports science, mainly to aid my triathlon [training], and loved it. So I knew that I was fascinated by the human body and everything to do with it, and I love people and I interact with people really well. So, when I combined my need for a challenge and all the skills that I’ve developed through my sport, making me quite mentally tough, when I put that with my academic ability and my need to kind of do something socially and give back to people in society it just completely makes sense that I should be doing this [studying medicine].

Brenda saw medicine as a natural culmination of her efforts to date, whereas Chris, another graduate student, saw the benefits of medicine in the future:

It’s something I’ve been building up to my whole life and now that I’m here I really want to give it a good go and give it a good shot and it’s an exciting career. Also I’m kind of motivated by the fact that at the end of the day I’m going to have a good job and I do want to settle down and have a family and like I think it’s a good way to provide for my family.

Finding an interesting and challenging job that pays well has been recognised as a primary, external motivator for undertaking medical studies (Amin et al., 2009), and is perhaps stronger in graduate students given their longer course of study (Harth et al., 1990). This general motivation for medicine was not isolated to graduate students; Michelle noted an altruistic element in her motivation: “My motivation is generally to do something good that will be productive and to help people, and something that is more real than some of the other things that we’ve created.”

The narrowed scope of outcome in medical education also distinguished this course of study from general education; medical education relies heavily on students’ motivation to become doctors (Mann, 1999). Mann noted that medical educators looked for a number of specific motivations in their entrants, but amongst these were a desire “to motivate learners to accept personal responsibility for lifelong learning” (p. 237). For this goal to be achieved, educators must explicitly and clearly communicate this to students. Brenda reflected on her goals for medical school:

But my whole aim going through medical school isn’t to get top of the class, it’s to learn as much as I can within the time frame, so this is the time frame that they have set me and what I will learn.

A desire for lifelong learning was not expressly noted by participants, but Greg touched on self-efficacy in his learning, a requisite for lifelong learning: “Maybe that’s one the reasons why I actually worked harder because it was cool trying to piece it all together about how things work and stuff”; and in a later interview returned to this theme: “What I am going to try and take away
into next semester, is actually trying to get myself interested in how things work and then try to figure it out, try and learn that way, stay motivated that way.”

Mann (1999) also commented that assessment provides one of the most powerful motivators to learn. This was reflected in Frank’s comments: “Some things you learn because you want to learn. Other things you learn because you have to do them for the exam. So exams are a strong motivating force.” Yet in an opposite fashion, Katie noted about learning clinical skills (which were not assessed in a traditional written exam fashion): “In a way it’s good it’s not assessed because you do it for enjoyment rather than like madly writing notes, thinking what am I going to have to know for exams?” Although Katie learnt for enjoyment (an intrinsic motivation) she reflected that often her learning was tied to what she had to know for exams (an identified motivation).

**Maintaining a study–life balance.** Burnout is a known issue among medical students; studies have suggested that medical student mental health declines upon admission to medical school (Dyrbye, Thomas, & Shanafelt, 2005). Additionally, student distress can undermine faculty goals of professional development and lifelong learning (Dyrbye et al., 2006). Factors that have been previously associated with higher rates of burnout include personal life events (positive events such as marriage could be protective compared with personal ill health or ill health in a family member which were associated with an increasing prevalence of burnout), depersonalisation, adjustment to the medical school environment (workload, concern for academic performance), and progression through training (where fourth-year students have higher rates of burnout than second-year students; Dyrbye et al., 2006; Dyrbye et al., 2005). Michelle noted the effect of burnout on her exam preparation:

> I remember last year I didn’t have a break and I was like worn out by exam time … I need to refresh myself. And if I don’t have a break then I will probably just procrastinate when I have to study, yeah and that won’t be as efficient for me.

In addition to these stressors, Lowe and Gayle (2007) found that in a study of students in higher education, full-time students were spending an average of 30 hours per week studying and 16–20 hours working. Although higher education students are not directly comparable to medical students, this finding does raise the issue that students as a whole have commitments that can rival their curricular studies. Harry and Iris commented on these commitments:

> I’ve got to stop pretending that I can keep being a professional musician and doing medical school because I can’t, like it’s the first test next week and I’m already feeling quite under-prepared, spending most of my spare time doing music-related things,

and “So last semester seemed ridiculously stressed because I was so structured and I was training and then I was studying and there was no time for anything else.”
Lowe and Gayle (2007) noted that graduate students might prioritise their studies over and above (and to the detriment of) their other commitments. Brenda and Katie, two older students reflected: “I do struggle to keep my non-academic interests. It’s hard for me to maintain them. So at the moment I tend to come to uni, do my uni stuff, go home, study and go to bed”, and “I’ve just kind of decided not to worry about balance outside of medical school, but find balance within it.” In contrast, Lee, an OLY1 student, worked full time alongside his studies and noted that where conflict arose he typically sided with his work commitments over his studies:

But then during the semester my boss would be like you have to edit this, you have to do this ... I would be in lectures and he would say that ... so I would just walk out of the lecture, do that and then try and get as much of the lecture after I had finished.

Having a support network has been associated with a higher degree of ability to maintain an appropriate balance between studies and outside commitments; however, students have also recognised the risk of taking these support people for granted and spoken of guilt and conflict with personal relationships, which have the potential to turn a support network into an additional stressor (Lowe & Gayle, 2007). Brenda and Iris contrasted these two states. Brenda had moved home with her parents: “So I am making the most of it. It’s not bad. It’s quite cool being at home because I get meals and washing and it’s just clean all the time. So yeah, there’s a lot of benefits.” Iris also lived at home but spoke of the difficulties in maintaining these relationships: “I did drop, you have to sort of, yeah sort of didn’t speak to my family for periods of time cause I was studying, even though I live at home.”

The effect of study–life balance on motivation has been seldom studied in the literature; various studies have posited that both feelings of self-efficacy (i.e., a sense of an internal locus of causality) and well-being would be associated with intrinsic motivation (Pelaccia et al., 2009; Ratanawongsa, Wright, & Carrese, 2008). In concert, these two measures could be thought of as akin to a study–life balance. Greg explained an evolution in his approach to balance and the pay-off of that:

So now I finish lectures and I’ve got nothing to do in the afternoon but to study. So I think in terms of timetabling and actual use of my time it’s helped a lot. So I guess in that way it’s helped. I guess it’s more the routine stuff as well. I’ve learnt that I do work a lot better with routines.

Social aspects of medicine. The social aspects of medicine encompasses such terms as origins (i.e., the method of entry into medical school), and class comparison and competition which are discussed in turn.

Origins. Learning medicine was an inherent social endeavour: “Learning medicine is developing knowledge of this distinctive lifeworld and requires an entry into a distinctive reality.
system” (Good, 1994, p. 71). Within this socialisation into medicine, students brought their own prejudices and self-beliefs, many of which were borne from their mode of entry into medical school. Michelle, a student from OLY1, commented:

Going into last year [OLY1] at the beginning I wasn’t really competitive, but it just makes you competitive, just the whole environment. Everyone is asking about what you got in the last test and how you are going and how much you are studying and things.

Angela noted the change this had created in her approach to medical school:

So I think that it’s hard coming into second year and trying to get your head around the fact that it’s not only a certain number of you who are going to get through and you can actually help others without harming yourself. And that’s definitely a change of mindset.

Chris, a graduate entry student, observed this change of mindset alluded to by Angela was harder to break for some students (specifically OLY1) than others: “I think people still put too much pressure on themselves, especially maybe the people that are just straight out of first year.” This finding was in contravention to Borges et al. (2010) who found that millennial students tended to have higher scores for nAffiliation on thematic apperception testing, although the learning environment of OLY1 is unique compared with MBChB2 and beyond. Eve and Frank, two students from OLY1 who came through the MAPAS and ROMPE schemes respectively, noted a degree of “insulation” from the typical OLY1 environment that came from camaraderie:

I think for me that the MAPAS is kind of a family of students and is so much different from the rest of the cohort. Like, everybody is there to help everyone else and despite the fact that you know that maybe half of you aren’t going to get in, if someone has got extra resources everyone is going to have them by the end of the day,

and

It was quite competitive, but like all the ROMPE guys are in, and me included. We all helped each other.

Lee expanded upon the reason for ROMPE camaraderie and the resultant benefits: “So being relaxed and supportive seems to actually get you in [to medical school] rather than keep you out. So the ones that ‘Oh no we don’t talk to you because you are competition’, they actually miss out I think.” Greg, who was a non-attenuated entry OLY1 student also demonstrated a degree of resilience aided by forming his own study group and support network during OLY1: “Everyone [in MBChB2] I talked to so far has been quite keen to help, but ... you can still tell that they are getting used to it, whereas like I had a whole year of helping each other out.”

Harth et al. (1990) found that graduate entry students had statistically significantly higher scores of loneliness and isolation from other students compared with their school leaver colleagues; however the current study was more aligned with Wilkinson et al. (2004) who
suggested that having a prior degree was positively associated with scores of “association” on the Achievement Motivation Profile. What this current study added was that there appeared to be a degree of segregation within the class between graduate and non-graduate entry students, and that this only increased with time. Harry, a graduate entry student, commented on the difference:

I find the graduate students they've got a bigger picture on what life is. We've got to learn to get through it. These are the important things you know. It [medical school] is just like a means to an end as opposed to the younger students who it’s kind of everything. And the older students seem to have other things. I think that’s the bigger picture thing because they’re older they've done other things and realised that life is about keeping a good balance and the brief periods I have hung out with the younger guys I kind of haven’t really clicked with them very well.

Chris also noted a difference, and suggested that OLY1 students were less affected by "studying fatigue": “I know somehow I’ve just gravitated towards graduate students ... the undergraduate students, I think maybe they've got a bit more energy or something like that and they haven’t like done a degree.” Finally, Brenda noticed the tolerance gap got wider between graduate and OLY1 students:

I've actually noticed that this year, the maturity between the younger ones and the older ones has kind of—the gaps have widened. Last year we got along a lot better, but now I do sort of notice that I am less tolerant of the younger ones and I would rather hang out with the older ones.

These comments by Brenda reflected the findings of Williams and Deci (1996) who noted older students were statistically significantly less impersonal and considered themselves statistically significantly more competent.

Class comparison and competition. Medicine is a unique course of study in that students typically spend a minimum of four years with the same cohort of learners (Kusurkar, Croiset, et al., 2011). As such a broader sense of community appeared to have developed among students in the current study. Iris noted this sense of togetherness: “There’s a whole support network that you didn’t have at all last year. You can sort of learn through that as well, and you are not all by yourselves.” Katie posited that this was due to a shared learning ethic: “It’s quite funny, you know, normally like group work you sort of think oh group work, great. But when you are in a class full of other kind of anal retentive people you can really rely on them.” Dolmans, Wolfhagen, and Vleuten (1998) noted that groups motivated each other based on the notion that where one achieved the group did so too. Brenda agreed with Katie, but noted that shared priorities were often different:
And someone said, oh it’s good to be with a group of people who want an A plus and won’t settle for anything less. And I was sort of thinking, I don’t think we actually sat down at the start of this and talked about each other’s expectations and all decided on wanting an A plus, but I will just go with that, yeah.

Mann (1999) noted that institutional goals and personal goals might be dissimilar. As personal goals were individualised this led to differences in goal behaviour as noted by Brenda. Harry noted that the medical school learning environment was unique among professional programmes:

It is good that like everyone has got each other’s backs, and it’s almost like the more you can help other people the more kudos you get, as opposed to like law [students], there’s a lot of incentive to try and drag others down.

In spite of the degree of community, some students still found their external friend circles more helpful, such as Greg, in part because of some of the reasons Katie had for liking to work with her colleagues: “I guess it’s a nice relief, because often medical students are quite intense and that sort of thing ... So I think I enjoy the company of my high school mates a bit more.”

The flipside to being in constant contact with the same cohort of learners was that comparisons and competition did inevitably occur. In later years (MBChB4 through MBChB6) fail, pass, and distinction grades are given. This technique has been shown to minimise competition with the aim of enhancing collaboration (Bloodgood, Short, Jackson, & Martindale, 2009), but individual letter grades remain for MBChB2 and MBChB3. Eve noted that the faculty tried to address this upon starting MBChB2:

They are always telling us don’t get depressed if you are not at the top of the class anymore, because you know class averages are so high. They are like you won’t be in that top 10 percent bracket anymore, because you are the top 10 percent bracket.

This was reinforced by Daniel’s comments following their first test:

I suppose this year especially in a medical class we’ve got 200 really of the brightest, best individuals in New Zealand you could argue and when we got our first test mark I was really happy with my test result and then when you see the class average, and when you end up with 80 plus percent and you’re still below the class average it’s a bit of a joke.

Eve was more pragmatic in her approach to this phenomenon: “But some people just get so caught up over ‘oh I was under the class median.’ It’s like you passed, so why are you worried?” Often, self-perception and self-worth of students was distorted by the fact that students were generally clustered at one end of a bell curve. Brenda stated: “People that you think are going to get A pluses and beat you by miles, get the same marks as you.” She also felt that class rankings were unhelpful: “I don’t think it’s that indicative for how you are going to be when you are a doctor.”
Non-Medical Student

Although this concept was not described in the thematic maps above, the effects of the unmasking of a “fake” medical student at the faculty on 15 October, 2012, is worthy of mention in that this was a significant “personal life event” (Dyrbye et al., 2006) shared in varying degrees by participants in this study. The student (who was alluded to in Chapter 3, and for reasons of data security was not confirmed as a valid, enrolled student and therefore not used in this study) had been unsuccessful in his application to medical school after OLY1 in 2010. He chose to continue attending lectures and masquerading as a member of the class for two years until he was discovered when he submitted an assignment that was not matched with an enrolled student. The overwhelming feeling from those participants interviewed following this event was one of sadness. Brenda stated: “I think there are very few people in my class who are angry at the student at all, because he was such a nice guy.” Lee, a close friend of the student, compared finding out about this student as equivalent to the death of a close friend:

> I had a friend pass away when I was 16–17 and it feels the same way, like you are not going to be able to talk to them again, you’re not going to share the same experiences, you don’t know who they are. So it literally feels the same way. It’s pretty hard to deal with.

The other response noted by participants related to an unknown leak from within the class to the media, which caused the event to become an item of some newsworthiness. Harry summarised the participants’ feeling:

> Whoever went to the media, a lot of the class is out for that person’s blood, because they told the media that he had been to the hospitals and had seen patients and then the media blew it up and made out [he had] when he hadn’t.

The sense of betrayal was again summarised by Lee, who also noted that the sense of class solidarity took a blow:

> Because we had a kind of collegial kind of outlook, like we were going to look out for each other’s back. He was basically a part of our medical school. He was a part of a family. We’ll defend him as far as it goes, and someone let the ball drop. Yeah that was quite harsh to find out.

Student distress has been recognised as an important factor in personal development (Stewart, Lam, Betson, Wong, & Wong, 1999). Negative personal life events have been associated with higher degrees of personal burnout in medical students (Dyrbye et al., 2006), although the participants’ responses from the current study did not indicate any features of burnout, and were more predisposed to sadness for the student involved, and anger at the betrayal from within the class.
Conclusion

Medical students learn “within a context of interlocking rewards and relationships, incentives and barriers” (Mann, 1999, p. 237). This study sought to explore, and attempt to define, the various influences on medical students’ motivation and in doing so was able to create thematic maps of influence in this regard. There were multiple pressures on the practical act and psychosocial aspect of learning at medical school, which have been presented above. Many of these could influence students’ motivation including assessment, the learning environment, academic outcome, origins of students, and cohort comparison.

Results from the qualitative analysis have particular relevance to the quantitative results. For instance, the increasing relevance of lectures and the learning of clinical skills could be framed as increasing relatedness and competence, two prerequisites for the development of intrinsic motivation. The lessening of a focus on grades and the increased focus on aspects of becoming a good doctor indicates a more integrated motivational framework (albeit with the locus of causality as external).

This study lacks generalisability beyond the study population from which the cohort was derived. However the purpose of including a qualitative study was that mixed methods research allows participant enrichment, instrument fidelity, and treatment integrity (Collins et al., 2006); as well as understanding and theory building (Lingard & Kennedy, 2010). This study provided a unique insight into the maelstrom of rewards, relationships, incentives, and barriers specific to this particular group of students at the Faculty of Medical and Health Sciences at the University of Auckland.

The next chapter will bring together findings of note from the three studies presented in the preceding chapters. In doing so, the forthcoming chapter will bring strands from all three studies into a single tapestry to describe both the complementary and unique results with respect to medical student motivation, anxiety, and academic outcome provided by this thesis.
Chapter 6
Discussion

“The only thing you can do easily is be wrong, and that's hardly worth the effort.”
– Norton Juster, *The Phantom Tollbooth*

The purpose of this research was to scrutinise the motivation of medical students in their early preclinical career, and to follow these same students over 24 months to determine whether any changes in their motivation occurred over this time. Parallel to this, additional enquiries were made into the relationships that motivation, changes in motivation, and anxiety, had with academic outcome. The general aim of the study was to develop a deeper understanding of the general and unique influences of psychosocial factors on the learning of medical students, and the subsequent tangible effects of these influences on outcome measures.

The next section will revisit the research hypotheses proposed in Chapter 1, and answered in the studies presented in Chapters 3, 4, and 5. The following section briefly summarises the results of Chapters 3, 4, and 5. The subsequent section will outline six unique findings of the current research and place them within a context of existing literature. The final section will conclude the research and discuss the limitations, educational implications, and directions for future research in light of the findings discussed.

Research Hypotheses

The first hypothesis of this research was that medical students would display differing amounts of extrinsic and intrinsic motivation across the two-year period of the study. It was proposed that from the beginning of medical school and over the course of the study, these students would have greater levels of intrinsic motivation over extrinsic motivation, in line with previous research which suggested that medical students were highly motivated individuals as a consequence of a highly competitive selection process. This hypothesis was not rejected by the current research, which demonstrated that within their motivation constructs, students maintained a consistent majority of autonomous motivation over controlled motivation. For the purpose of further analyses, students were also grouped based upon differing demographic backgrounds which included fixed traits such as age, sex, and ethnicity; and similarly fixed traits (although not ones fundamental to the individual), such as mode of entry (OLY1 or graduate) and attenuated admission scheme (MAPAS or ROMPE). It was also hypothesised that students would differ among themselves based upon these unique demographic backgrounds. Again this hypothesis was not rejected by the current research.
The second hypothesis was that motivation constructs within individuals would change over time to become more fully internalised (i.e., move towards an intrinsic form of motivation orientation), as a consequence of both maturation and the influence of the learning environment. This hypothesis was not rejected by the current research, but a qualification is needed that motivation became more autonomous, but not ultimately more intrinsic. Motivation constructs observed during the course of the current research were discerned as complicated models although some fluidity was seen within these models. Ultimately, students continued to display evidence of a range of motivation orientations, most likely to cope with varied and potentially conflicting demands from both within the medical school (e.g., assessment) and outside of this environment (e.g., personal influences). The ultimate resolution of conflicting demands required that at a minimum integrated regulation was attained (Deci & Ryan, 1985). Since this research was not able to assess this specific construct, students who had successfully integrated all demands into their motivation construct would have been said to have attained full intrinsic motivation.

The third hypothesis dealt with anxiety. It postulated that medical students would possess moderate to high levels of anxiety, and that these levels would differ among the aforementioned demographic backgrounds (age, sex, ethnicity, mode of entry, and attenuated admission). It was also hypothesised that especially high anxiety states would affect motivation orientation. These hypotheses were not rejected by the current research. Medical students were found to possess high to normal levels of anxiety (Driscoll, 2007); but greater levels were also seen in particular demographic groupings (e.g., sex and ethnicity), and were more likely to occur at particular times within the medical curriculum that were perceived of as threatening to these particular demographic groups. Qualitative responses by students revealed that anxiety and stress were particularly pertinent to medical students, and that some stressors were unique to the medical school curriculum; yet for all the assumptions of medical student learning occurring within a unique andragogic bubble, these same students were prone to similar stressors as their non-medical peers.

The fourth hypothesis addressed the relationship of motivation orientation, changes in motivation orientation, and anxiety, with academic outcome measures. It was proposed that more fully internalised forms of motivation, changes towards these forms, and lower levels of anxiety would relate positively to academic outcome. These hypotheses were not rejected by the current research. In general, more fully internalised forms of motivation were correlated with academic outcome, although less internalised forms were also responsible for discrete explanations of variance in outcome. Anxiety also had negative associations with these same measures of outcome.
The final question of the current research had no specific hypotheses to be rejected or not. This aspect of the research explored influences on medical student motivation through a qualitative lens. The data obtained through this arm of the current research was novel and exclusive to this particular learning environment, but nevertheless provided a rich tapestry on which to view the non-rejection of the earlier hypotheses.

The next section will briefly summarise the findings of the current research, following which an exploration of the unique findings of the three studies together will be presented to more fully inform the discussion about the educational effects of student motivation orientation. After this, the final section will discuss the limitations of the research, the educational implication of these findings, and directions for future research.

**Summary of Results**

Over one quarter of medical students’ motivation constructs were completely internalised and when coupled with identified motivation, more than half of all motivation was autonomous in nature. Average intrinsic scores were statistically significantly lower in later sampling times when compared with initial intrinsic motivation levels, although these later levels were not statistically significantly different among themselves, which suggested an initial drop in average intrinsic scores and then an assumption of a new steady state of motivation. In concert, there were also statistically significant changes in relative scores for identified regulation, which reflected a late move to more autonomous forms of motivation. The question was whether these late changes were a result of natural progression as postulated by Otis et al. (2005) or due to something else. Interview responses suggested that the late change in motivation was due to an increasing knowledge base and recognition of relevance of material presented in lectures. These responses agreed with the conclusions of Pelaccia et al. (2009) who noted that a sufficient body of knowledge was required before medical students could increase their motivation with clinical experience.

Medical students aged greater than 21 years had higher intrinsic scores at the end of the current research than their younger colleagues. Older students, as suggested from interview data, had achieved integration of competing motivations. However, in spite of these moves toward an enlightened motivation, the same interviews showed that ego-centred motivation was still prominent among older students, and was reflected by higher levels of introjected motivation in the quantitative data. These same students had higher introjected regulation and lower identified regulation during the entire study. This mirrored the previous findings of Williams and Deci (1996) who noted that older students saw themselves as subjectively more competent, which, at least in the current research, was not borne out objectively (i.e., this was an egocentric judgement rather than one based in fact).
Māori and Pacific students had lower mean levels of intrinsic motivation than all other students at the start of medical school. As MAPAS students, these students continued to have statistically significantly lower levels of intrinsic motivation across the majority of sampling times.

Medical students were also anxious, but within acceptable, non-pathological limits. At the start of medical school, older students were noted to have low to normal levels of anxiety compared with their younger colleagues. However, over time this statistically significant difference narrowed as younger students became less anxious.

The utility in assessing motivation and anxiety was to evaluate the relationship these measures had on one another. Previous literature had suggested that “high anxiety level produces task-irrelevant responses (error tendencies and self-centered responses) [emphasis added]” (Benjamin et al., 1981, p. 816). Self-centred responses were an ego-driven behaviour reminiscent of introjected motivation. Higher anxiety levels in the current research were statistically significantly correlated with changes in intrinsic motivation; a moderate negative relationship was described.

Medical students at the University of Auckland were generally academically successful with a mean and median GPA greater than a B grade. For the most part, there were no statistically significant relationships with age, although a trend to significance was seen where age would have explained just under 2% of variance in coursework scores across MBChB2. With regards to sex, male students performed statistically significantly better in multiple-choice questions across the entirety of MBChB2 over female students; male students performed approximately three absolute percentage points better on the basis of their gender alone.

The most striking and diffuse differences in results were seen with ethnicity data. Aside from a single course in MBChB3, all other outcome measures across both years were statistically significantly lower for Māori and Pacific students compared with all other ethnicities. Ethnicity alone accounted for greater than one quarter of the variance in MBChB2 GPA; where Māori students scored 1.9 grade points less than non-Māori and non-Pacific students, and Pacific students scored 3.1 grade points less than these same students. These differences were disproportionately the result of poorer examination performance, where multiple-choice and short answer question average scores were statistically significantly lower in these two ethnic groups, compared with coursework scores where the difference was much narrower.

Improvements were seen in MBChB3 GPA where ethnicity in this year accounted for less variance in outcome, and Māori and Pacific students scored only 1.3 and 1.6 grade points lower respectively.

Average intrinsic motivation scores at the end of the first semester of MBChB2 had small to medium statistically significant positive correlations with course grade for the semester one
courses, and semester one GPA overall. Although average extrinsic scores also had a small statistically significant positive correlation with semester one GPA, a more diffuse effect on individual courses was not seen. Average intrinsic motivation scores explained just under 5% of the variance in semester one GPA; average extrinsic scores were less predictive, only explaining 3.6% of variance. Average intrinsic scores in MBChB3 also had statistically significant positive small to medium correlations with the respective semester GPA and accounted for 3–5% of total variance in GPA. There were no statistically significant correlations with less internalised forms of motivation.

Anxiety scores from MBChB2 had small to medium statistically significant negative correlations with semester GPA. Anxiety scores at all sampling times allowed statistically significant explanations of variance in the GPA of their respective semester. Anxiety scores were more powerful than motivation orientation scores, and explained 7–10% of the variance in contemporaneous semester GPA. Anxiety scores from MBChB3 also had statistically significant negative correlations with semester GPA, although explained only half as much of the variance in MBChB3 GPA as it did in MBChB2 (4–5%).

Multiple regression models which combined motivation scores (average intrinsic and/or extrinsic scores), anxiety scores, and ethnicity explained the greatest amount of variance in MBChB2 and MBChB3 GPA (although the amount of variance explained in the latter year was less).

**Unique Findings of the Current Research**

While many of the findings discussed above are in keeping with current literature on the topic of motivation and anxiety, the findings discussed in this section are novel outcomes from the current research. These either expand upon existing theories (a multiple orientation view of self-determination theory, further evidence for the use of ethnicity in regression models of academic outcome); provide unique explanations of phenomena distinct to a New Zealand setting (the motivation orientation of Māori and Pacific students, the development of a MAPAS identity); present contrary evidence for current research (the location of stressors in a New Zealand medical school setting); or proffer new avenues for research in existing fields (the anxiety hangover, the mitigation of negative correlative effects of anxiety on academic outcome).

**Multiple Motivation Orientations in Self-Determination Theory**

The current research demonstrated that medical students possessed both extrinsic and intrinsic motivation orientations during the course of their preclinical studies, although their levels of intrinsic motivation seemed high, in keeping with previous studies that suggested
medical students were more intrinsically motivated than other general education students (Kusurkar, Ten Cate, et al., 2011; Mattick & Knight, 2009). The presence of extrinsic and intrinsic motivation was supported not just in the quantitative data, but also in qualitative analyses where participants simultaneously noted intrinsic and introjected motivations for particular tasks. The levels of intrinsic motivation in the quantitative analyses were relatively fixed over the course of the study, even with evidence from the study that showed intrinsic motivation was more closely aligned with positive academic outcome measures, in keeping with other studies (Pintrich & De Groot, 1990; Ratelle et al., 2007). However, changes within the specific forms proffered by self-determination theory were seen where students developed more internalised forms of extrinsic motivation (although their absolute “extrinsic motivation” remained largely unchanged). This finding was again in line with previous literature that suggested a natural integration of motivation orientation over time (Pintrich, 2003).

What this current research has added to the existing literature is the presence of a multiple model of self-determination theory. Dowson and McInerney (2003) had previously proposed that multiple-dimension goal combinations could be present within the realms of goal theory, and Dodge et al. (1989) also noted the multiple, concurrent influences on motivation by behavioural, social, and cognitive factors. Chemolli and Gagné (2014) have more recently suggested that the continuum of self-determination theory (that motivation can be represented using a continuum of relative autonomy) established by Ryan and Connell (1989), was inadequate to describe the theory fully. A Rasch analysis undertaken by Chemolli and Gagné challenged this conceptualisation, and suggested a contiguous structure was more appropriate.

This current research would certainly support Chemolli and Gagné’s assertion of this revised model. The pattern of correlation between the subscales of the AMS in the current research would agree with the efforts of Ryan and Connell, that showed that there was a particular order to the individual motivation orientations, and would align with the original authors’ concept of the organisation based on the degree of integration of the behaviour and motivation. Empirically speaking this arrangement of motivation orientations made more sense as a contiguum (see Figure 11) because this allowed individuals to be at more than one location at a time (i.e., possess multiple motivational approaches). This proposed contiguum would also upset the use of a relative autonomy index (Grolnick & Ryan, 1989) in calculating gross motivation values in future self-determination research.
What Figure 11 notes is an integration of motivational beliefs over time, but allows individuals to retain controlled behaviours (in ever-decreasing amounts) for use under particular circumstances and environmental influences. What is proposed in this classification, but was not seen in the current research, was the theoretical situation that as one’s behaviour became more and more internalised, the “ability” to call upon these less internalised motivations would become less and less such that the least internalised form that learners could call upon was still within an autonomous taxonomy. Other models (e.g., Chemolli & Gagné, 2014) have been proposed including radex and simplex models, but what these all fail to appreciate is the finding seen in the current research that a definite change was seen over time with increased levels of more internalised motivations as both a function of time and age. A radex model would propose a continued presence of less internalised motivations in an individual who was inexorably marching to a self-determined state.

**Why are Māori and Pacific Students Less Intrinsically Motivated?**

The literature on differences in motivation in minority ethnic populations has proven contradictory. Earlier studies (Ogbu, 1978) noted that differences were due largely to cultural differences, more specifically a difficulty for “involuntary minorities” (i.e., indigenous peoples) in accepting the dominant cultural norms. Ogbu noted that immigrant minorities were not faced with the same difficulties because of the insulative effect provided by being part of an immigrant community. In contrast, McInerney et al. (1997) found that across a wide range of indigenous minority students the motivation profiles or minority and majority ethnic groups were broadly similar in more ways than they were different.

In the current research, Māori students (an involuntary minority group) and Asian students (an immigrant minority group) showed differing amounts of motivation. New Zealand European students (the dominant ethnic group) had higher levels of intrinsic motivation and lower levels of extrinsic motivation than Māori students. Although Asian students also showed an initial difference with less intrinsic and more extrinsic motivation than New Zealand European students, this difference was not seen in later iterations. As an ethnic group, Pacific
students, while technically an immigrant minority, showed results that were more similar to Māori students. This is likely due to high volume immigration in the mid-20th century (Phillips, 2013), in contrast to Asian immigration that began in the latter parts of the 20th century, and a shared meta-cultural heritage (Māori oral history states that Māori immigrated to the New Zealand islands from the fabled Hawaiki, a presumed location within the Pacific Ocean). Māori and Pacific students had lower amounts of intrinsic motivation than all other students throughout the study. In discussing the view that African American students have an extrinsic motivation orientation bias, Cokley, Komarraju, King, Cunningham, and Muhammad (2003) found that African American students did not appear to believe that a direct relationship between effort and grades existed, relegating their views to one of a performance orientation.

Cokley (2003) found that African American students attending historically Black southern colleges or universities (HBCU) were more intrinsically motivated than African American students attending primary White colleges or universities (PWCU). When comparing African American students to White students at PWCU, African American students were more extrinsically motivated, but had higher levels of self-esteem, even in light of having a lower GPA than White students. Trueba (1988) noted the requirement for “cultural congruence” (the internalisation of the mainstream cultural values) for effective learning in minority groups. In the current research Māori and Pacific students behaved in a similar fashion to Cokley’s African American students from a PWCU. Although the University of Auckland has a strong commitment to Māori and Pacific health and cultural awareness, this may be insufficient to overcome the development of an oppositional cultural frame of reference (Fordham & Ogbu, 1986). Spencer, Noll, Stoltzfus, and Harpalani (2001) used the Racial Identity Attitudes Scale to show that high internalisation scores, which were reflective of a “an internalised and proactive Black salience identity that also acknowledges the positive aspects of other cultural traditions” (p. 26), were positively correlated with academic achievement. Where Māori and Pacific students sat between an opposition frame of reference and internalisation of cultural norms is beyond the scope of the current research.

The rationale behind internalisation of cultural norms, at least in a goal theory context, was explored by other authors (Schwartz, 1990; Triandis et al., 1993), who noted the concept that goal theory was individualistic in nature (which reflected a Western philosophy of individualism), and this was highlighted as a particular difficulty for individuals from non-Western cultures due to the lack of an approach for those in whom the group goal or need was paramount. This was reflected in an interview comment made by a Pacific student who noted the high degree of collectivism between Māori and Pacific students with regards to teaching and learning resources. Fordham (1988) also noted the individualistic ethos of American schools. Fordham proposed that this contributed to an oppositional position. Black families did not foster high achievement for the feat that signified moving away from a Black (collectivist) culture.
More recently, a strong and positive focus on future orientation has been shown to protect minority students from disengagement with learning in the face of repeated failure (Meece & Kurtz-Costes, 2001). However, Andriessen et al. (2006) did note that conditions of severe disadvantage and discrimination can undermine the positive effects of a future orientation. This is thought to explain the phenomenon seen in the United States, where African American populations have high levels of motivation to achieve upward social mobility, but low levels of school achievement (Ogbu & Simons, 1998). A Pacific student noted the pastoral support from the faculty in the light of her initial failure in MBChB2 and her subsequent return to the course, was a testament that the discrimination noted by Andriessen and colleagues was not seen in this setting. Additionally, although parity in GPA was not reached between Māori and Pacific students and their New Zealand European colleagues, a trend towards this was seen with decreasing amounts of variance explained by ethnicity as the preclinical curriculum continued.

**The MAPAS Identity**

Qualitative results from the current research emphasised the importance of support networks in students’ health and well-being. In addition to their individual support networks in the form of friends and family, Māori and Pacific students had a further sense of camaraderie formed from their shared experience of admission through the Māori and Pacific Admission Scheme. Tellingly, one MAPAS student referred to this shared experience and sense of togetherness as something completely unknown to mainstream students. During the preclinical curriculum, MAPAS students also had access to additional educational support from the faculty (Te Kupenga Hauora Māori, 2013). As a result of the sense of fellowship, and the additional support from faculty, it was proposed by the current research that a sense of identity around this admission scheme, a **MAPAS identity**, was formed.

Identity development is thought to occur as a product of an interaction between intrapersonal and interpersonal factors and the effects of learning institutions (Cote & Turgeon, 2005; McCaslin, 2009). Rich and Schachter (2012) noted that a nurturing learning environment could enhance the process of identity development. In the current research, the more nurturing environment was not the faculty as such (which would have otherwise led to a faculty identity), but Te Kupenga Hauora Māori (the unit responsible for coordination Māori health teaching across the faculty, and the source of support for MAPAS students) as reflected in comments with interviewees.

Although the numbers were smaller, the other attenuated admission scheme was not associated with a similar **ROMPE identity**. Continued affiliation, a prerequisite for the formation of identity (Schachter & Rich, 2011), was seen with ROMPE students in the form of the Grassroots Rural Health Club (Grassroots Rural Health Club, 2014), a social club to which most
ROMPE students belong. Therefore the lack of formation of a ROMPE identity might be due to a lack of additional educational support from the faculty. As an additional reason, students from this attenuated admission scheme may have identified with other identity-forming groups more strongly than they did as "rural students". Also, the concept of a majority cultural awareness to integrate into students’ attitudes in a similar tone to that noted by Spencer et al. (2001) for ethnicity (e.g., acting "urban" rather than acting "White"), seems nonsensical and was not borne out in the qualitative data analyses for the current research.

MAPAS students maintained lower intrinsic motivation scores across the entire study when compared with ROMPE and non-attenuated students. This was in spite of sharing the same learning environment with its same cues on motivation. Cokley (2003) noted that for African American students, "learning for learning's sake may be seen as a luxury that is not instrumental to doing well in school, getting a job, and making money" (p. 553). It may very well be that intrinsic motivation was not seen as important by these students (although the current research did not investigate this point specifically) and hence they did not take up the cues intended for its assimilation into their motivation construct. As they had a great deal of support from Te Kupenga Hauora Māori, this also formed a unique learning environment that may have had its own set of environmental motivations that ROMPE and non-attenuated students were not privy to. Additionally, Fordham and Ogbu (1986) noted that Black students experience greater numbers of external demands and influences compared with White students when navigating the requirements of schooling. As a consequence, these external demands (e.g., social influences, overcoming stereotypes) may be perceived of as more important than "esoteric" internal influences.

La Guardia (2009) noted identities were adopted in the service of the same three basic psychological needs seen with self-determination theory (autonomy, competence, and relatedness), that is, should an environment support self-determination it would also promote identity formation. This presents the paradox of the MAPAS identity: an environment which supported intrinsic motivation promoted the formation of the MAPAS identity, which then rendered these students less intrinsically motivated.

**The Role of Ethnicity in Explanations of Variance in Academic Outcome**

Of all the independent variables used to explain variance in academic outcome (average coursework scores, average MCQ scores, average SAQ scores, course grades, and GPA), ethnicity consistently explained more variance in outcome than any other variable. Hoschl and Kozeny (1997) had previously noted that the amount of variance in medical student academic success explained by any regressors had exceeded 19%. At present, few studies have investigated the direct role of ethnicity in academic outcome. Hackett, Betz, Casas, and Rocha-Singh (1992) and
Muijs (1997) both failed to find any direct relationship between ethnicity and academic outcome (in part because of small numbers of particular ethnicities), but did show an indirect relationship between the two, mediated through academic self-concept.

As a proxy for ethnicity, socioeconomic status (SES) has been shown to explain variance in academic outcome (Martens, 1981; Verhoeven & Beuselinck, 1995). However, the use of SES is not an accurate surrogate for ethnicity, especially as many of the cited studies were undertaken in the Low Countries and Scandinavia which, at the time of publication of these results, were relatively ethnically homogeneous. What is perhaps more accurate is the finding that students who spoke a non-national language at home had inferior academic results to those that spoke the national language (Muijs, 1997).

The current research showed that ethnicity explained a statistically significant amount of variance in year GPA. What was highlighted from the serial nature of the current research was that the amount of explained variance dropped by more than half from MBChB2 to MBChB3. Kao and Thompson (2003) noted that as an outcome measure, grades were more sensitive to student input, and thus reflective of differences in approaches to studying. Another author (Camburn, 1990) noted that when the effect of ethnicity was controlled for with grades, differences in college completion rates were due to differences in academic preparation. Both of these findings suggest a difference in motivation as the reason for changes in explained variance over time.

Ethnicity was disproportionately more effective in explaining variance in multiple choice questions over short answer questions (one third versus one quarter respectively). The reason for this fundamental difference in approach to examinations is difficult to reconcile. In an earlier study of United Kingdom medical students, McManus, Richards, Winder, and Sproston (1996) showed that ethnic minority students performed less well than White students across multiple examination formats (MCQ, SAQ, clinical, and oral examinations). In a similar study of qualified doctors sitting their general practice exam, Wakeford, Farooqi, Rashid, and Southgate (1992) found that ethnic minority doctors performed less well on the MCQ component of the examination (with no difference noted in the oral examination). At this point, the current research could not offer an explanation for this difference, except for a single difference noted in interview data. A Pacific interviewee noted her suspicion with regards to examination content in that she felt that lecturers never examined exactly on what they had been taught in class, and that extensive reading around a topic was required. This was in contravention to every other participant who agreed that lecture content and learning objectives were the only materials examinable. Whether this suspicion was to blame remains an open question.

Additionally, the amount of variance in coursework scores explained by ethnicity was among the lowest of all academic outcome measures. This was likely a reflection of the diverse range of assessments that came under the umbrella term of coursework, and therefore was an
indication of the diverse number of other variables that could have potentially explained similar amounts of variance. One reason for the differential results between coursework and examination scores was potentially alluded to by one of the Pacific interviewees who noted that examinations required reading around a topic, less so than assignments.

The Anxiety Hangover

Medical students within the current research were generally anxious, but within acceptable, non-pathological limits, in keeping with previous literature on this subject (Firth, 1986; Guthrie et al., 1995; Lloyd & Gatrell, 1984). Although anxiety levels initially increased before reaching a steady state, a lessening of the importance of anxiety was seen in the qualitative data where descriptions of particular stressors around academic outcome and workload decreased as the study progressed, even as more and more respondents took the opportunity to increasingly discuss their individual stressors. Additionally, in spite of the assumption of a steady state of anxiety, the relations between this construct and other measures varied at each sampling time. Even if the quantity of the anxiety was similar, the quality was presumably different.

Nonetheless, during semester one of MBChB3 it was noted that half of respondents had a pathological score on this occasion alone. The third year of the medical programme represented a time of change. The students were due to experience increased clinical exposure later that year in preparation for their transition to a fully clinical curriculum at the conclusion of the year. The anticipatory anxiety described by El-Masry et al. (2013) may have accounted for this change. Uncertainty was noted by respondents in the questionnaire data where students equated entering a clinical phase in their studies as a step on the path of becoming a future health professional.

The utility in assessing motivation and anxiety was to measure the relationship these measures had on one another. Higher anxiety levels in the current research were negatively correlated with changes in intrinsic motivation. However, the particular facet of anxiety that the current research noted as unique was the concept of the anxiety hangover. Generally a factor has a defined period of influence that begins, rises to its maximal influence, and then decays. This is reminiscent of a theory of motivation from Weiner (1990), that one is motivated to complete an action to return to a desired resting state. It proposes a finite period of influence. What anxiety demonstrated in the current research was that this decay, or tail of influence, was particularly drawn out (see Figure 12). This was such that an anxiety promoting event at one time point continued to demonstrate significant relationships with measures of both motivation and academic outcome at distant sampling times, long after other factors (e.g., earlier motivation orientations) had lost any modicum of influence.
Figure 12. Theoretical model of the anxiety “hangover effect” whereby previous anxiety scores affected contemporaneous sampling. The vertical bars represent theoretical sampling times.

What was noted was that the effect scores for the relationship between anxiety and outcome measures fell the further one progressed in time from the initial anxiety-inducing effect (e.g., the anxiety from sampling time one had a small correlative effect size compared with a moderate effect for sampling time three on GPA for MBChB2 semester two). A change in this relationship was noted in MBChB3 which agreed with previous studies by Sreeramareddy et al. (2007) who found that that latter-year students had almost half the psychological morbidity of first-year students. The current research showed that the tail of influence of anxiety shortened considerably to the point that only contemporaneous measures of anxiety were correlated with outcome and motivation orientation changes. This was also reflected in the qualitative questionnaire data where the number of responses about stressors increased, but the pattern changed to reflect stressors and anxieties that were generally outside of the medical school environment (e.g., where assessment was initially a prominent anxiety, in later iterations personal issues were much more noteworthy; this will be explored further in the next section). As previously noted by others (Elliot & McGregor, 1999; Pekrun et al., 2009), this change in emphasis potentially reflected a change in motivation, which may be responsible for the decreased effect of anxiety. Students were moving away from controlled motivation which focused heavily on external rewards and punishments (e.g., assessment), and towards autonomous motivation where learning was undertaken for learning’s sake, and other anxieties unrelated to the act of learning became more apparent.

Unique Relationships of Anxiety to Medical Students

In the current research, the majority of reported stressors in the questionnaire qualitative data arose from outside of medical school. These primarily related to personal issues and commitments outside of medical school, including the difficulties in maintaining (or achieving) a study–life balance. Dyrbye et al. (2006) has shown that student distress can undermine learning institution goals. The most common personal issues were personal health problems, and problems pertaining to friends and family. This was in opposition to previous
studies of anxiety in medical students which focused on stressors within the medical school environment (Firth, 1986; Radcliffe & Lester, 2003). El-Masry et al. (2013) divided stressors into relationship problems, hospital problems, and professional problems. The relationships problem category (which included relationships with faculty and competition with colleagues) proved to be the least subscribed category of the study in early medical students. The current research found that personal issues and maintaining a study–life balance were the most, and third-most recognised stressors respectively in this cohort. The significance of this finding is that faculty resources (Student Learning Services, 2014) directed at addressing “inside medical school” factors (e.g., managing workload, methods of effective study, guides for assessment) are potentially missing the target of students’ chief stressors, and instead resources should be directed towards helping students manage their own health, deal with interpersonal conflict, time management, and so on.

The question around a study–life balance was also raised during the interview and focus group portion of the current research as a subtheme of the psychology of studying medicine. Firth (1986) has previously noted that aside from having to talk to patients, the next most common source of stress described by students was the effect their medical training was having on their personal life. Miller (1994) also commented that medical students described particular difficulties in time management, especially in balancing social activities and academic tasks. The difficulty in achieving a balance between study and life could be compounded by an inability to attend to relationships and support networks, as reported by Heins, Fahey, and Leiden (1984), who found that medical students had less time to spend with friends than their peers in law, psychology and chemistry programmes. This is particularly pertinent in that students with a robust support network reported less stress compared to those who attempted to tackle problems alone (Mosely et al., 1994; Supe, 1998). A meta-analysis by Viswesvaran, Sanchez, and Fisher (1999) discovered that support networks function in three ways: to reduce strains (the individual’s response to stressors), to reduce the strength of stressors, and to alleviate the effect of stressors on strains.

The recognition of the concept of study–life balance as an important factor in their lives was more evident as students progressed through their preclinical studies with increased reference to this in questionnaire, interview, and focus group data. James (2002) reflected on the changing expectations of students in higher education: “Student involvement with university life is subject to new forms of negotiation” (p. 72), and an increasing awareness on a faculty’s part of the need to address issues around balance in study and life would go some way to addressing students’ latent and manifest anxieties.

The combination of objective rating scores for anxiety, and an opportunity to express these anxieties in a qualitative fashion provided additional fidelity to the current research. This
combination is seldom seen in the literature. While previous studies (Sreeramareddy et al., 2007; Wolf, Elston, & Kissling, 1989) have shown that psychological morbidity decreased as students progressed through medical school, the current research suggested that the number of reported personal stressors increased, even where quantitative measures of anxiety remained unchanged. One particularly interesting finding was that although objective measures of anxiety were higher in participants who responded in the free text portion of the questionnaire, their GPA was no different to non-responders. This is in spite of the negative correlation found between anxiety and academic outcome. The act of sharing their anxieties may have abrogated this relationship (akin to a problem shared is a problem halved). This is particularly relevant to motivation theory, as cognitive-processing theory suggests that the method through which stressors can cause emotional disturbance is by challenging one’s beliefs about the self and the world, including one’s sense of control (Epstein, 1985). Lepore, Ragan, and Jones (2000) have shown that talking about stressors could reduce the frequency of distressing thoughts about the stressor, and reduced stress on re-exposure. The current research has failed to demonstrate similar reduced stress in respondents and this may be due to the fact that Lepore and colleagues’ study involved talk therapy; where participants were involved in invalidated conversations (i.e., the interviewer did not appear to share the same values as the participant), the effect on subsequent stress upon re-exposure was diluted. An invalidated talk approach is probably the least dissimilar to an unanswered written report of stress. Nevertheless, the current research is the first to demonstrate that although anxiety levels themselves were unchanged by reporting stressors, the negative academic effects correlated with anxiety were.

**Conclusion**

Previous authors (Chessell, 1986; Mattick et al., 2004) have noted that medical students are intrinsically motivated. This has been achieved through different studies looking at medical students at discrete points in their studies, but seldom has this been completed in a longitudinal fashion, following a single cohort. The current research has shown that medical students are intrinsically motivated at the beginning of medical school and continue to develop an autonomous motivation orientation over the course of the preclinical curriculum. The study also noted findings of multiple motivation orientations in these individuals, and constructed a theoretical contiguous relationship to describe self-determination theory (e.g., Chemolli & Gagné, 2014). The current research supported earlier findings that proposed differences in motivation constructs based upon an individual’s age and sex (Inglehart, 1987; Kronqvist et al., 2007; Newble & Entwistle, 1986; Perrott et al., 2001). Conflicting data had previously been reported on differences between ethnic groups (Andriessen et al., 2006; McInerney et al., 1997; Ogbu, 1978; Trueba, 1988).
Notably, this was the first research to postulate the formation of an identity around ethnic groups that was not restricted to definitions of ethnicity, but was formed based upon an attenuated admission scheme into medical school. Unlike ethnicity, identity was much more pervasive and motivation orientation differences continued to exist between those who formed this identity and those who did not.

Moreover, this research continued to support the findings (e.g., Grant & Dweck, 2003) that more fully internalised forms of motivation were more advantageous with respect to academic outcome than less internalised forms of motivation. Differences were also seen in outcome and different forms of motivation based upon the type of assessment and the needs of the individual learner. This research also expanded upon the role that ethnicity played in the variance in academic outcome measures. Whereas previously (Hoschl & Kozeny, 1997), regressors had been shown to contribute less than a fifth of explanations of variance, the current research described multiple regression models that explained closer to double Hoschl and Kozeny's previous limit.

The current research also noted the powerful effect of anxiety on motivation change and academic outcome; but expanded upon this finding by noting the novel concept of the anxiety hangover. This is a description of the phenomenon whereby anxiety scores continued to have negative correlations long after their original sampling time, albeit with a waning correlative relationship, such that by the end of the preclinical curriculum, anxiety only had contemporaneous relationships with outcome measures.

A unique aspect of this research was the qualitative data, which provided depth to the breadth of quantitative analyses, especially in the realm of anxiety where themes of stressors and anxieties of students were noted in questionnaire free text responses. This research showed that a mixed methods framework allowed a more complete answer to the research hypotheses proposed. This was also apparent in the interview and focus group data which discussed individual and medical school-wide influences on students’ learning, which both reinforced and expanded upon previous models of learning (Artino et al., 2010; Karabenick, 2004; Perry & Dickens, 1984; Tabernero & Wood, 1999), and noted uniquely that the major stressors facing medical students typically were largely unassociated with the medical school environment.

**Limitations of the Current Research**

One of the current research’s greatest strengths was also one of its greatest weaknesses. The study was deliberately designed to follow a single cohort over 24 months. This cohort was representative of those that have and continue to come through the medical programme at the University of Auckland, but it remained a single cohort. A multiple-group longitudinal study
would have proven more reliable but this was beyond the scope and resources of the author. Additionally, the University of Auckland is only one of two medical schools in New Zealand. Although there is little empirical evidence to suggest that the student bodies of either institution are vastly different, it is impossible to generalise these results to the medical school community of the entire country.

The results from the quantitative analysis relied on the use of five- and three-factor models of the AMS. Although there was theoretical justification, and precedence in the literature for these models, confirmatory factor analyses (CFA) failed to find these models showed a better fit than the original seven-factor AMS. However, it should also be recalled that the goodness-of-fit statistics for the seven-factor model in the literature have never been meticulous. A potential reason for the lack of a robust model for the current research is the sample size of the study. Exploratory factor analyses (EFA) typically require greater than 300 sets of data (Field, 2009), and CFA requires in excess of 200 (MacCallum, Widaman, Zhang, & Hong, 1999). Therefore, any of the findings of the research using the higher-order factors (average extrinsic motivation, relative intrinsic motivation, average intrinsic motivation) need to be interpreted with caution. However, an absence of evidence does not necessarily imply an evidence of absence, and it may well have been that with an adequate population sample these condensed models could have been supported.

Furthermore, on the third sampling time the response rate, although within above acceptable minimums set by Dillman (2000) and Nulty (2008), was lower than the other sampling times, and may have contributed to a potential Type II error. There may have been several reasons for this lower response rate, including: a lack of interest, the change to an online format, the timing of the study, or the lack of adequate or appropriate incentives for participation—although Asch, Jedrziewski, and Christakis (1997) have shown that financial incentives were not associated with higher response rates. Although the study was designed to only have five sampling times, an extra sampling time in MBChB3 may have shown additional findings beyond those discussed in this research. However, a balance needed to be struck between enough sampling times to make the study robust without oversampling the participants, with an inherent risk of reducing response rate over time (Baruch, 1999).

The qualitative aspect of the current research was completed with 13 participants, only 11 of whom completed more than one interview. This clearly presents a motivation bias, not only in those who chose to participate in the first place, but those who chose to continue. The only participant from a Māori or Pacific background was one of the two who did not respond to further interview requests. Given that many of the findings of this study relate to differences between Māori and Pacific students and their New Zealand European counterparts, it would have
added fidelity to the findings had further views from a student from this background been obtained.

Furthermore, the author was the only researcher who participated in coding and analyses. This could lead to a reporting bias, although steps were taken during the process in an attempt to mitigate these concerns.

**Educational Implications of the Current Research and Future Directions for Research**

The current research used a novel approach not previously explored in the literature to investigate the changes in motivation orientation in medical students within a self-determination theory framework. Although others have asked this question (Patrick & Williams, 2009; Williams et al., 1997; Williams & Deci, 1996), none have done so using a longitudinal format and tracked individual changes. This study supported what has long been shown: that medical students were intrinsically motivated at the start of medical school, and increased their total autonomous motivation throughout the course of their preclinical studies. It also showed that changes in motivation were correlated with changes in academic outcome, and that particular forms of motivation provided robust predictive models of these same outcome measures. While these findings are of particular interest, future research is needed across multiple cohorts that would enable further confirmation and wider generalisation of the results. Particular areas of interest would be medical schools internationally with different selection procedures and programme lengths (e.g., graduate entry schools) to determine whether the changes described in the current research are seen in wholly different settings.

With increased data it may be possible to create even better models for explanation of the variance in outcome, which would provide particular tailored remedial programmes and pastoral care for students at risk of failure.

Additionally, with the clinical years characterised by objectives-based assessments, it would be a worthy avenue of investigation to determine whether the relationships seen in the preclinical curriculum continued into the hospital environment.

Furthermore, the identification of a contiguous model of self-determination theory may allow more nuanced descriptions of students’ motivation constructs. Others (Edwards, 2001; Judge, Erez, Bono, & Locke, 2005) have advocated moving away from composite scores of motivation, and the current research would further justify these arguments. Further research is needed into the relationship between motivation orientations to further elucidate how one develops a unidimensional representation of an individual’s multiple-dimensional motivation.

An ephemeral concept such as the “learning environment” is difficult to adequately scrutinise, but the current research provided a window into this phenomenon through
qualitative methodology. This will require further research before the models developed in this study are accepted widely, but it does provide an initial launching point for further enquiry.

This research has returned the issue of ethnicity and attenuated admissions to the forefront of motivation theory. Although this research studied the indigenous population of New Zealand, there is enough supposition from the noted literature that many of the changes seen with Māori would also be applicable and replicable in other indigenous populations, or as in the case of Pacific students, a well-established, non-indigenous minority group. Although ethnicity was not associated with a continued difference in motivation compared with other ethnic groups, these same students admitted through an attenuated entry scheme did have differences in their motivation construct compared with their non-attenuated colleagues. Lower intrinsic motivation scores were generally correlated with poorer outcomes over the course of the current research; yet in spite of the differences in motivation orientation seen with attenuated admission students over the course of the study, this identity also served as a means to narrow the gap in educational outcomes. These findings, especially in light of concurrent findings of a difficulty in maintaining a consistent pool of minority students interested in medicine (Barr, 2014), places an emphasis on the development and support of such schemes. Attenuated admission schemes are increasingly under greater scrutiny, especially affirmative action in the United States (Curfman, Morrissey, & Drazen, 2013). Curfman and colleagues noted that these schemes allowed the imbalance between the ethnic diversity of physicians and the populations they served to be redressed. These schemes would become an easy target if they were considered to be acting against the interests of student motivation orientation. Further research is needed to clarify the exact educational outcomes of these identities, and where their genesis lies. Additional longitudinal data is required on the effect of ethnicity and identity within the clinical environment. Data from the current research suggested that achievement gaps would narrow further and potentially reach parity with New Zealand European students (i.e., the cultural and ethnic majority) during the latter years of clinical study.

The main stressors that medical students noted (assessment, interpersonal issues, study–life balance, personal health issues, and financial issues) were primarily located in a locus outside of the medical school. Although one could argue that interpersonal, personal health, and financial issues were not the sole remit of the medical school, the concept of a study–life balance was largely dictated by the medical school structure around workload, assessment, and time commitment. If medical schools addressed this particular concern, a portion of potentially modifiable risk could be ameliorated. Additionally, a longitudinal study of anxiety in the clinical years would answer a question about the longevity of the anxiety hangover, and whether this finding continued in the clinical years. It would be important to maintain a mixed methods approach in this setting because the anxieties of a clinical medical student might prove to be very different from those of the preclinical medical student.
The findings in the current research have important implications for medical school administration from selection policies to curriculum design to assessment modalities. The clear identification of the benefits of autonomous motivation could provide further insight into the ways in which medical students learn, study, and eventually practice. This has the potential for consequences beyond the medical school classroom for stakeholders in health care delivery worldwide.
References


Faculty of Medical and Health Sciences. (2014). *The University of Auckland Faculty of Medical and Health Sciences undergraduate prospectus* [Brochure]. Auckland, New Zealand: University of Auckland.


IBM SPSS Statistics (Version 22.0.0.0) [Computer software]. Chicago, IL: IBM Corporation.


James, R. (2002). Students’ changing expectations of higher education and the consequences of mismatches with the reality. In *Responding to Student Expectations (pp. 71–84)*. Paris, France: OECD.


NVivo 10 for Mac (Version 10.0.4) [Computer software]. Melbourne, Australia: QSR International.


Poole, P. J. (2009). Who are our MBChB students and where do they come from? (Board of Studies Discussion Paper). Auckland, New Zealand: University of Auckland.


Randolph, J. J., & Edmondson, R. S. (2005). Using the binomial effect size display (BESD) to present the magnitude of effect sizes to the evaluation audience. Practical Assessment, Research & Evaluation, 10(14).


Appendix A

Academic Motivation Scale (College Version) and Westside Test Anxiety Scale

ACADEMIC MOTIVATION AND ANXIETY SCALE

ID NUMBER: _______________________

Before you start, please take the time to fill out the following demographic data:

SEX: Male □ Female □

ENTRY SCHEME: OLY1 □ ROMPE □ MAPAS □

ETHNICITY: _______________________

AGE: _______________________

Using the scale below (1: strongly disagree, 2: disagree, 3: undecided, 4: agree, 5: strongly agree), indicate to what extent each of the following items corresponds to the reasons why you chose to accept a place in medical school.

Why I chose to come to medical school:

Because with NCEA I would not find a high-paying job later on.  
<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Because I experience pleasure and satisfaction while learning new things.  
<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Because I think that a college education will help me better prepare for the career I have chosen.  
<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

For the intense feelings I experience when I am communicating my own ideas to others.  
<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Honesty, I don’t know; I really feel that I am wasting my time in medical school.  
<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

For the pleasure I experience while surpassing myself in my studies.  
<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

To prove to myself that I am capable of completing my medical degree.  
<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

In order to obtain a more prestigious job later on.  
<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

For the pleasure I experience when I discover new things never seen before.  
<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Because eventually it will enable me to enter the medical profession.  
<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

I once had good reasons for going to medical school; however, now I wonder whether I should continue.  
<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Undecided</td>
<td>Agree</td>
</tr>
<tr>
<td>-----------------------------------------------------------------</td>
<td>-------------------</td>
<td>----------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>For the pleasure I experience while I am surpassing myself in one of my personal accomplishments.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Because of the fact that when I succeed in medical school I feel important.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Because I want to have the &quot;good life&quot; later on.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>For the pleasure that I experience in broadening my knowledge about subjects which appeal to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Because this will help me make a better choice regarding my career direction.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>For the pleasure that I experience when I feel completely absorbed by what certain authors have written.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I can't see why I go to medical school and frankly, I couldn't care less.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>For the satisfaction I feel when I am in the process of accomplishing difficult academic activities.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To show myself that I am an intelligent person.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>In order to have a better salary later on.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Because my studies allow me to continue to learn about many things that interest me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Because I believe that a few additional years of education will improve my competence as a worker.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>For the &quot;high&quot; feeling that I experience while reading about various interesting subjects.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>I don't know; I can't understand what I am doing in medical school.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Because medical school allows me to experience a personal satisfaction in my quest for excellence in my studies.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Because I want to show myself that I can succeed in my studies.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Below are some statements about stress and anxiety that you may experience around exam times. Please read each statement carefully and then circle the number that corresponds with how you feel about the statement (1: strongly disagree, 2: disagree, 3: undecided, 4: agree, 5: strongly agree).

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The closer I am to a major exam, the harder it is for me to concentrate on the material.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When I study, I worry that I will not remember the material on the exam.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>During important exams, I think that I am doing awful or that I may fail.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I lose focus on important exams, and I cannot remember material that I knew before the exam.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Statement</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>The closer I am to a major exam, the harder it is for me to concentrate on the material.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When I study, I worry that I will not remember the material on the exam.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>During important exams, I think that I am doing awful or that I may fail.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I lose focus on important exams, and I cannot remember material that I knew before the exam.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please reflect on the last few weeks and tell me about any major events or stressors in your life.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 22/02/2011 FOR 3 YEARS REFERENCE NUMBER 2011 / 041.
Appendix B
Participation Information Sheets and Consent Forms for all Studies

Appendix B-1
Participant Information Sheet for the Questionnaires

Appendix B-2
Participant Information Sheet for the Interviews

Appendix B-3
Consent Form for the Questionnaires

Appendix B-4
Consent Form for the Interviews
Appendix B-1

PARTICIPANT INFORMATION SHEET
(Questionnaire)

Project title: Motivation changes in medical students during two years of the pre-clinical curriculum.

Name of Researcher: Clinton Mitchell

Researcher introduction
My name is Clinton Mitchell. I am a PhD student with the Faculty of Education. I graduated from the Faculty of Medical and Health Sciences in 2005 and currently work as an advanced trainee in medicine. I am also an Honorary Clinical Lecturer with the Department of Medicine. I have been awarded a University of Auckland Doctoral Scholarship.

Project description and invitation
I am interested in studying how medical students’ approach to learning changes over the course of the medical programme and whether different approaches to learning are associated with different academic outcomes (like grades). I would like to invite you to participate in this research although you are under no obligation to do so.

Project procedures
The research involves completing the attached questionnaire. This should take less than ten minutes to complete. I would also like you to write your student identification number on the questionnaire. The reason for doing this is so that I can keep track of your different questionnaires and that I will administer over the next two years and see any changes in you as an individual. With your permission I will also be able to match your responses to your grades. At no time will I know your name: the only identifying feature will be your ID number. Only myself and my supervisors will have access to your questionnaire responses and your matched grades.

Once you have completed the questionnaire and consent form you can return it to the boxes at the front and back of the lecture theatre or at another time to the box in the Student Centre on the ground floor.

I have no involvement in any decisions as to your grades or the progression of medical students.

Throughout the course of the research it may become apparent that some cohorts of students are at risk for poorer outcomes in assessments or in their approach to learning. If this were to be discovered I will notify the Assistant Dean for Student Affairs and counselling will be offered to at-risk cohorts of students.

Data storage/retention/destruction/future use
The completed questionnaires will be kept in a locked filing cabinet for a period of six years. Consent forms will be stored separately to data. After this time the questionnaires and consent forms will be securely destroyed.

The data obtained from the questionnaires will be used to complete my PhD. The results may also be presented at conferences or published. At no time will any information that could be traced back to you (such as your ID number) be used in a public forum.

A summary of the study will be available to any participant who wishes a copy.
Right to withdraw from participation
If you wish to withdraw yourself from this study and have your questionnaires returned you can do this at any time up until 04 March 2013 without giving a reason.

Anonymity and confidentiality
I will do everything in my power to ensure your anonymity. I am aware of the great trust you place in me by giving me your ID number and do not want to abuse this trust.

Contact details
Thank you very much for your time and help in making this study possible. If you have any queries or wish to know more please do not hesitate to contact me at:

Clinton Mitchell  
Department of Medicine  
Faculty of Medical and Health Sciences  
c.mitchell@auckland.ac.nz  
Phone: +64 9 923 1606

Associate Professor Christine-Rubie Davies  
School of Teaching, Learning and Development  
Faculty of Education  
c.rubie@auckland.ac.nz  
Phone: +64 9 923 2974

Dr Frances Langdon  
Head of Department  
School of Teaching, Learning and Development  
Faculty of Education  
f.langdon@auckland.ac.nz  
Phone: +64 9 623 8899 extension 48769

For any queries regarding ethical concerns you may contact the Chair, The University of Auckland Human Participants Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland 1142. Telephone 09 373 7588 extension 63711.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 22/02/2011 FOR 3 YEARS, REFERENCE NUMBER 2011 / 041.
PARTICIPANT INFORMATION SHEET
(INTERVIEWS)

Project title: Motivation changes in medical students during two years of the pre-clinical curriculum.

Name of Researcher: Clinton Mitchell

Researcher introduction
My name is Clinton Mitchell. I am a PhD student with the Faculty of Education. I graduated from the Faculty of Medical and Health Sciences in 2005 and currently work as an advanced trainee in medicine. I am also an Honorary Clinical Lecturer with the Department of Medicine. I have been awarded a University of Auckland Doctoral Scholarship.

Project description and invitation
I am interested in studying how medical students’ approach to learning changes over the course of the medical programme and whether different approaches to learning are associated with different academic outcomes (like grades). I would like to invite you to participate in this research although you are under no obligation to do so.

Project procedures
The research involves a series of interviews over two years. There will be approximately 4-6 interviews over two years and each will take approximately 30-45 minutes at a time convenient to you. I will try to not schedule interviews around times of exams or other major events in your calendar. I may also ask you to participate in 1-2 focus groups with a number of your colleagues who have also agreed to participate in this study. These interviews will take 90-120 minutes and I will serve dinner and refreshments during this.

I will be asking questions about your feelings towards different teaching methods and subjects, and how you feel these may have changed.

The interviews will be digitally recorded and later transcribed by a third party who has signed a confidentiality agreement. Recording is an essential part of the research. The device can be turned off at anytime upon request without giving a reason.

I have no involvement in any decisions as to your grades or the progression of medical students.

Data storage/retention/destruction/future use
All digital recordings of the interviews will be kept on a password-protected external hard drive and kept in a locked filing cabinet for a period of six years. After this time they will be erased. Any notes I make during the interviews and physical transcripts of the interviews will be kept in a locked filing cabinet for a period of six years. After this time they will be securely destroyed. Consent forms will be stored separately to this data and will also be securely destroyed after six years.

The data obtained from the interviews will be used to complete my PhD. The results may also be presented at conferences or published. At no time will any information that could be traced back to you (such as your ID number) be used in a public forum.

A summary of the study will be available to any participant who wishes a copy.
Right to withdraw from participation
If you wish to withdraw yourself from this study and have any materials returned you can do this at any time up until 04 March 2013 without giving a reason. However, information from focus groups cannot be returned nor can you withdraw any information related to the focus groups.

Anonymity and confidentiality
During the transcription process you will be given a pseudonym. Only myself and my supervisors will have access to a list that matches your pseudonyms with your real name. At no time will any information that could identify you be used in a public forum.

The use of focus groups prevents anonymity and compromises confidentiality. The transcriptions of these interviews will maintain the pseudonym established in individual interviews. Participants will be asked to respect one another’s privacy in these small groups, establishing a “code of silence” with respect to the meetings. Hence, while anonymity is not possible, participants will agree to keep everything discussed in the focus groups confidential.

Contact details
Thank you very much for your time and help in making this study possible. If you have any queries or wish to know more please do not hesitate to contact me at:

Clinton Mitchell
Department of Medicine
Faculty of Medical and Health Sciences
c.mitchell@auckland.ac.nz
Phone: +64 9 923 1606

Associate Professor Christine-Rubie Davies
School of Teaching, Learning and Development
Faculty of Education
c.rubie@auckland.ac.nz
Phone: +64 9 923 2974

Dr Frances Langdon
Head of Department
School of Teaching, Learning and Development
Faculty of Education
f.langdon@auckland.ac.nz
Phone: +64 9 623 8899 extension 48769

For any queries regarding ethical concerns you may contact the Chair, The University of Auckland Human Participants Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland 1142. Telephone 09 373 7599 extension 83711.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 22/02/2011 FOR 3 YEARS, REFERENCE NUMBER 2011/041.
CONSENT FORM (QUESTIONNAIRES)

THIS FORM WILL BE HELD FOR A PERIOD OF SIX YEARS

Project title: Motivation changes in medical students during two years of the pre-clinical curriculum.

Name of Researcher: Clinton Mitchell

I have read the Participant Information Sheet and have understood the nature of the research. I have had the opportunity to ask questions and have them answered to my satisfaction.

- I understand that I am free to withdraw participation at any time, and to withdraw any data traceable to me up until 04 March 2014.
- I understand that while the researcher will be able to match my student identification number, he will have no access to my name.
- I understand that my student identification number will be used to match my questionnaire responses to my grade point average.
- I understand that I may be offered counselling if my responses show me to be at risk of adverse educational outcomes.
- I understand that data will be kept for 6 years, after which they will be destroyed.
- I understand data obtained may be published in the future.

I wish / do not wish to receive the summary of findings.

__________________________  _______________________
Name                        Date

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 22/02/2011 FOR 3 YEARS REFERENCE NUMBER 2011/041.
Appendix B-4

THE UNIVERSITY OF AUCKLAND
Te Whare Wānanga o Tamaki Māori

Faculty of Medical and Health Sciences
Faculty of Education
The University of Auckland
Private Bag 92019
Auckland, New Zealand

CONSENT FORM
(INTEVIEW)

THIS FORM WILL BE HELD FOR A PERIOD OF SIX YEARS

Project title: Motivation changes in medical students during two years of the pre-clinical curriculum.

Name of Researcher: Clinton Mitchell

I have read the Participant Information Sheet and have understood the nature of the research. I have had the opportunity to ask questions and have them answered to my satisfaction.

• I understand that I am free to withdraw participation at any time, and to withdraw any data traceable to me excepting data from the focus groups, up until 04 March 2013.
• I agree to not disclose anything discussed in the focus groups.
• I understand that a third party, who has signed a confidentiality agreement, will transcribe the tapes.
• I understand that data will be kept for 6 years, after which they will be destroyed.
• I understand data obtained may be published in the future.

I agree / do not agree to take part in the interviews.

I agree / do not agree to take part in the focus groups.

I agree / do not agree to be audiotaped.

I wish / do not wish to receive the summary of findings.

Name ______________________

Signature ____________________ Date _____________

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 22/02/2011 FOR 3 YEARS REFERENCE NUMBER 2011 / 041.
Appendix C
Confidentiality Agreement

TRANSCRIBER CONFIDENTIALITY AGREEMENT

Project title: Motivation changes in medical students during two years of the pre-clinical curriculum.

Name of Researcher: Clinton Mitchell

Supervisors: Associate Professor Christine Rubie-Davies
Dr Marcus Henning

I agree to transcribe the digital recordings for the above research project. I understand that the information contained within them is confidential and must not be disclosed to, or discussed with, anyone other than the researcher and his supervisors.

Name ____________________________

Signature ____________________________ Date ________________

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 22/02/2011 FOR 3 YEARS REFERENCE NUMBER 2011 / 041.