# Examining the motivation of health profession students to study human anatomy

Article (Accepted Version)

ASE-18-0207.R1

Research Report

# Examining the motivation of health profession students to study human anatomy

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Running title: Motivation in Anatomy

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ABSTRACT

Students' motivation is a vital determinant of academic performance that is influenced by the learning environment. This study aimed to assess and analyze the motivation subscales between different cohorts (chiropractic, dental, medical) of anatomy students (n = 251) and to investigate if these subscales had an effect on the students' anatomy performance. A 31-item survey, the Motivated Strategies for Learning Questionnaire was utilized, covering items on intrinsic and extrinsic goal orientation, task value, control of learning belief, self-efficiency for learning and performance, and test anxiety. First-year dental students were significantly more anxious than chiropractic students. Second-year chiropractic students attached more value to anatomy education than second-year medical students. The outcome of this research demonstrated a significant relationship in first- and second-year chiropractic students between anatomy performance and motivation subscales controlling for gender such as self-efficacy for learning and performance was (β= 8 CI: 5.18 - 10.8, $P < 0.001$) and (β = 6.25,CI: 3.40 - 9.10, $P < 0.001$) for first-year and second-year respectively. With regards to intrinsic goal orientation, it was (β = 4.02, CI: 1.19 - 6.86, $P = 0.006$) and (β = 5.38, CI: 2.32 - 8.44, $P = 0.001$) for first-year and second-year respectively. For the control of learning beliefs, it was (β = 3.71, 95% CI: 0.18 - 7.25, $P = 0.04$) and (β = 3.07, CI: 0.03 - 6.12, $P = 0.048$) for first-year and second-year respectively. Interventions aimed at improving these motivation subscales in students could boost their anatomy performance.

**Keywords:** gross anatomy education; health profession education; medical education; motivation subscales, MSLQ scale.

## INTRODUCTION

Studies have shown that motivation is the key to work productivity and learning (Keller, 1987). Student motivation is a vital determinant of academic performance and achievement (Maurer et al., 2013). It has always been a key factor in career development (Owolabi et al., 2013).

Motivation in education belongs to the higher-level needs of self-esteem/recognition and achievement of full potential. Intrinsic and extrinsic factors are known to affect students' motivation. The key to encouraging deep learning lies in student motivation (Cake, 2016). Students welcome approaches that are stimulating, motivating and entertaining to encourage their involvement (Evans et al., 2014).

It was found that more positively motivated participants consistently reported more use of deeper-level strategies and expressed more sophisticated beliefs about the nature of knowledge and knowledge acquisition (Bråten and Olaussen, 2005). Motivation of the students was above average when an interdisciplinary course was taught combining closely related subjects to enhance medical comprehension (Dettmer et al., 2010).

Despite the abundant online learning resources in self-directed ways around the world, the learning-related factors, such as informal learners' behaviors and motivations, are the guidelines for improving performance in the current generation. Successful learners are characterized as being internally motivated (Wang and Peverly, 1986). Internally motivated learners actively process information through self-directed learning, by utilizing the learning resources available to them in order to obtain new knowledge and

skills in a self-directed way. Successful learners are characterized as being internally motivated (Keller and Suzuki, 2004).

As anatomy teaching hours have diminished, more self-directed learning is expected from students (Davis et al., 2014). Motivation plays a significant role in learners' ability to undertake self-directed learning (Pintrich, 1999). It is not only an innate, intrinsic characteristic of the student; it can also be influenced by external environmental factors, such as grades, teacher, and instructional design of the curriculum (Keller, 2008).

Motivation is an important factor in determining students' achievement and performance. Cioclov and Lala-Popa (2019) referred to motivation and performance as two interrelated concepts. They demonstrated that motivation generates performance. Sargent et al. (2011) point out that motivation is one of the most important factors in influencing performance in an introductory financial accounting class.

The theory that links personality, human motivation, and optimal functioning is called Self-Determination Theory (SDT). There are two main types of motivation, the extrinsic and the intrinsic motivation. They both have a powerful effect on the behavior of students (Deci and Ryan, 2002). Self-Determination Theory is an approach to human motivation whose basic tenant is the innate desire of humans to learn (Deci and Ryan, 2000). This theory (SDT) is focused on the relationship between the impact of the extrinsic motivation on the intrinsic forces. The main idea of SDT is that if "the environment allows one to encounter feelings of appropriateness; independence and relatedness, the individual's motivation toward a given task will be satisfactory"

(Vallerand et al., 2008). The SDT theory has been successfully applied to a diverse array of important life domains, including work, health, and relationships (Vallerand et al., 2008). Niemec (2006) has declared that SDT is influential in learning since “students' natural tendencies to learn represent the greatest facility educators can use.” Although most theories are interested in the quantity of motivation, SDT is concerned about the quality of motivation.

The most self-determined type of extrinsic motivation arises when a person is involved in a certain task because it is in harmony with their aims, principles, and demands. Identified regulation occurs when an individual engages in an activity that they deem personally valuable and important to attain the desired outcome. In this case, a person endorses the behavior and performs it with a high degree of perceived autonomy (Ryan and Deci, 2000).

Self Determination Theory (SDT) is a meta-theory that provides the investigators with an interpretation about motivation towards preferred behaviors (Ryan and Deci, 2002). It focuses on how internalized, or self-determined, one’s actions are in a specific social context (Evans, 2015). It also differentiates between types of motivation (Maurer et al., 2012).

This theory was designed to explain how to influence an individual's intrinsic motivation (Tranquillo and Stecker, 2016).The actual foundation of SDT comes from the Organismic Integration Theory (OIT), a sub-theory of SDT. As stated by OIT, motivation has several dimensions that includes extrinsic, intrinsic, and amotivated motives (Ryan

and Deci, 2002). In contrast, lower levels of self-determined motivation are obvious when an individual's perceived causality is external, and the behavior is undertaken because they would be under pressure to do a task (Ryan and Deci, 2002).Consequently, higher levels of self-determined forms of motivation generate more positive impact than lower levels of self-determination (Ryan and Deci, 2000).

Research in exercise psychology and sport has shown positive evidence supporting SDT's sub-theories (i.e., Organismic Integration Theory and Basic Need Theory). This research has focused on the value of SDT as a broad motivational framework for understanding the behavior of the physical activity. Specifically, the fundamental psychological needs have been connected to physical activity self-determined motivation (Edmunds et al., 2006; Standage et al., 2007). Self-determined motivation in anatomy has been linked to higher levels of physical activity participation such as dissection or examination of prosected specimens and identification of structures (Edmunds et al., 2006).

Extrinsic motivation is related to external values and rewards such as grades (Deci et al., 1991). Intrinsic motivation is an inherent satisfaction of accomplishing an activity and performing a task for the enjoyment (Ryan and Deci, 2000), this latter has more weight in the learning achievements and attitudes of traditional learners (Gottfried et al., 2007). Extrinsic motivation as the perceived usefulness or task value; which is students' evaluation of how useful the task is, and intrinsic motivation, in the form of perceived enjoyment; has been found to play a role on learners' attitudes towards how students

address the educational program (Lee et al., 2005; Kizilcec and Halawa, 2015). The degree of motivation has consequences for the learners as it is the vital determinant of students' academic performance and achievement (Brouse et al., 2010). A lack of motivation has been cited as the top reason for academic failures (Jensen and Moore, 2008).

Anatomy education has been described as a key component of a medical/dental/allied health professional field curriculum and is regarded as the cornerstone of good clinical practice (Davis et al., 2014). Understanding students' motivation in the medical/dental field is particularly important due to a number of reasons including a large volume of information to comprehend; a program that last over several years; areas of high intense study, with high stake examinations; parts of the program that are self-directed learning, and the need to follow a highly defined path (Labaree, 1997). Over recent years, there has been a significant cut to the time devoted to anatomy in the curriculum (Drake et al., 2009). A consequence of this decrease in hours has been the focus to produce an agreed level of what to teach and has resulted in the publication of a core anatomy syllabus (Smith et al., 2016). Anecdotal evidence suggests that some learning outcomes are lightly covered resulting in an increasing burden on students to engage in self-directed learning to cover the syllabus. Current understanding reflects that motivation plays a significant role in learners' self-directed learning (Pintrich, 1999), yet it is not understood how this can be applied to anatomy education.

According to Pintrich (2003), understanding the motivational subscales (intrinsic and extrinsic goal orientation, task value, and control of learning belief, self-efficiency for learning and performance, and test anxiety) through research is crucial as it examines how different personal and contextual factors interact to generate different patterns of the motivated behavior. There may be multiple motivational pathways for the direction of behavior, as students come with different interests, value, and self-efficacy beliefs. Some students are motivated and sustained through their self-efficacy beliefs (Bandura, 2001). The individual's self-efficacy beliefs govern their degree of motivation, as reflected in how much effort they will use in an activity and how long they will successfully continue to overcome obstacles. The stronger the belief in their skills, the more persistent and greater their efforts are. Self-efficacy is defined as people's judgment of their capabilities to plan a set of actions required to succeed in achieving some selected accomplishments (Bandura, 2001). This theory refers to goal-directed motivation, assisted by outcome expectations related to the expected results. From a motivational point of view, outcome expectations are very important because individuals think about the probable end-result of different tasks and act in ways they think will help in achieving the result they desire.

The reason of getting the self-efficacy belief levels of students for anatomy education is to have special consideration to the opinion of students and to make them evaluate their anatomy teaching and learning. This will help students to be talented in their future profession (Acar et al., 2017). Although intrinsic motivation (IM) definitely would motivate students to learn, it is also important that students value the activities.

Most students are motivated to work hard, and become great achievers because of their personal interests, their objectives, or provisional factors that direct and support their actions (Ryan and Deci, 2000; Pintrich, 2003). The above is all true when considering students who are studying anatomy as part of medicine, dentistry or allied health professionals. In anatomy, a student's personal values and beliefs also play out as they experience the dissecting room. It is unknown how this unique experience interplays with students' motivation.

Stoffa et al. (2011) examined the potential of utilizing the Motivated Strategies for Learning Questionnaire (MSLQ) in measuring students' motivation and their use of language learning strategies. The MSLQ was of particular interest because it contains both a basic motivation subscale as well as a motivation learning strategies subscale. Results indicated that the two scales measured two discrete indices.

To assess students' motivation in this study, the Motivated Strategies for Learning Questionnaire (MSLQ) was adopted. The MSLQ is based on a general cognitive view of motivation and learning strategies. It is a self-report instrument designed to assess students' motivational orientations. There are essentially two sections to the MSLQ, a learning strategy section and a motivation section (Pintrich et al., 1991; Neuville et al., 2007; Feiz et al., 2013). The learning strategy section includes items regarding students' use of different cognitive and metacognitive strategies while the motivation section assesses students' goals (intrinsic and extrinsic) and value beliefs (task value and

learning beliefs) for a program, their beliefs about their skill to succeed, and their anxiety about tests (test anxiety). Task Value is different from goal orientation in that task value is related to the student's evaluation of how important and how interesting the activity is. There are many learning and teaching tasks in anatomy education such as dissection, prosection, interpretation of radiological images etc.

Research has revealed that academic motivation predicts academic performance (Afzal et al., 2010; Dogan, 2015) which includes course grades (Wilson and Wilson, 2007), course attendance (Niemiec et al., 2006), and being persistent in the course (Erten, 2014). Students whose motivations are more intrinsic have better academic performance, lower rates of absenteeism and withdrawal (Black and Deci, 2000; Próspero and Vohra-Gupta, 2007; Burnam et al., 2014).

Intrinsic motivation (IM) shows learners commitment to learning for their interest. The Goal Orientation Theory emphasizes the reasons learners perceive and pursue their achievement. Research studies support that intrinsic motivation and intrinsic learning goals are influential facilitators for learning and academic success and that significant correlation exists between IM and intrinsic Goal Orientation (Wolters and Yu 1996; Tariq et al., 2011).

Intrinsic Goal Orientation refers to the student's perception of the reasons why they are engaging in a learning task, for example in anatomy and why they are learning the arrangement of the cranial nerves. The Intrinsic Goal Orientation is concerned with the

degree to which the student perceives themselves to be participating in a task for reasons such as challenge or curiosity (Pintrich et al., 1991). Intrinsic motivation (IM) has been linked with higher autonomous self-regulation that is associated with greater effort, persistence, higher perceived competence and enjoyment of the program material (Standage et al., 2006). It represents the most self-determined type of motivation, in which tasks are done for the sake of enjoyment, taking into consideration the student desire to learn (Gramzow et al., 2003).

Extrinsic Goal Orientation is concerned with the degree to which the student perceives themselves to be participating in a task for reasons such as grades, performance, evaluation by others, and competition. Not only does extrinsic motivation (EM) lies in the center of the continuum of self-determination but also it represents actions taken to achieve a goal or reward beyond the activity itself.

In anatomy education, IM is likely to be present for some students. The enjoyment of understanding and seeing the Circle of Willis/Cerebral arterial circle and how the brain received its oxygenated blood but at the same time, parts of EM reminds students of the looming examination that will count towards their overall year assessment. There may be some overlap with EM in anatomy and the strategic approach to learning where students adopt whatever way of learning they feel will reward them the best in examinations (Smith and Mathias, 2010). The dissection of a cadaver or the ability of students to identify structures in a prosected specimen is a form of extrinsic goal orientation.

To motivate individuals, their interest must be maintained; the instruction must be directed to achieving the required extrinsic goals such as passing the examination. The more interest a student has in a subject, the more motivated they are to learn about that topic (Hidi and Harackiewicz, 2000, Schraw and Lehman, 2001; Rotgans and Schmidt, 2014). Interest is known to increase attention, concentration and enhance problem-solving abilities, and motivate initiatives (Hidi, 2006; Lujan and DiCarlo, 2017).

In terms of anatomy laboratory classes, irrespective of the mode of delivery that can be by dissection, prosection, augmented reality or ultrasound etc., anatomy placed in the clinical context will assist with the interest and the problem-solving strategies. Students' motivation was found to be high when they were studying subjects that were seen as relevant to clinical practice (Parkinson, 2006). The learning tasks if well designed will help direct attention and keep the student engaged and motivated.

On the Motivated Strategies for Learning Questionnaire (MSLQ), task value refers to students' perceptions of the program material in terms of interest, importance, and utility. Control of Learning Beliefs refers to students' beliefs that their efforts to learn will result in positive outcomes. It is concerned with the belief that outcomes are contingent on one's effort. If students believe that their efforts to study make a difference, they should be more likely to study more strategically and effectively (Pintrich et al., 1991).

Self-efficacy for learning and performance is defined as a person's beliefs in their abilities to successfully complete a task. It influences student motivation and academic behaviors (Burgoon et al., 2012).

Test Anxiety is negatively related to expectancies as well as academic performance. It is thought to have two components: a worry, or cognitive component, and an emotionality component. The worry component is linked to students' negative thoughts that decrease performance, while the emotionality component is linked to anxiety. Cognitive concern is the greatest sources of performance decrement (Cassady and Johnson, 2001). Recognizing the important value and relevance of motivation to the learning of anatomy, the main goal of this study was to investigate students' motivation. There has been limited attention given to the influence of motivation on performance across cultures (the United Kingdom and Australia).

More information is needed about how cultural issues are related to individual motivation, and perceptions of performance.

**Research Questions and Hypothesis**

While it is known that motivation is closely linked to performance, what motivates one person may not motivate another in a different culture, and hence research into motivation subscales is, therefore, more important than ever.

(1). What is the global view (combined responses) of all respondents with regards to the motivation subscales?; (2). Is there a difference in the subscales of motivation between the heterogeneous students enrolled in this study (first- and second-year chiropractic students, first-year dental and second-year medical students)?; and (3). Are motivation subscales associated with anatomy examination performance?

The purpose of using the motivational subscales for medical, dental students and chiropractic year one and year two students was to investigate if there would be a difference in motivation subscales between the three cohorts. The hypothesis is students are intrinsically motivated, and the motivation subscales may affect their anatomy examination performance. Some differences in responses are expected among the student groups

# MATERIALS AND METHODS

The study was conducted at three Universities: the School of Health Professions, Murdoch University, Australia; the School of Medicine, Dentistry and Biomedical Sciences, Belfast, Northern Ireland and Brighton and Sussex Medical School, University of Sussex, England. The study was comparative in its design. It was ethically approved from the three universities (Research and Ethics Governance Committee approval was granted from Brighton and Sussex Medical School and Murdoch University: 2016/143 as well as from Queen's University Belfast: 17.13v2).

## Participants

A total of 375 students from three universities were invited to participate in this study. First- and second-year chiropractic students, Murdoch University (n = 101 and 82 respectively); first-year dental students (n = 60), Queen's University Belfast (QUB), and second-year medical students (n = 132), Brighton and Sussex Medical School (BSMS), United Kingdom (UK) were invited to participate in a survey at the end of the academic year 2016/2017. The questionnaire was completed by 251 students.

## Educational Context

Syllabi in medical, dental and chiropractic education display many similarities: in the methods of teaching adopted, the breadth of new information students are required to grasp, and the new skills and attitudes to be mastered.

At Murdoch University, Chiropractic students were enrolled in a 3-year Bachelor's degree of Science (BSc) majoring in Chiropractic Science. First-year chiropractic students studied CHI108 Human Anatomy for 12 weeks. The content of this unit provides a deeper understanding of the nervous, musculoskeletal, cardiovascular and respiratory systems of the human body. Students were taught by a variety of teaching methods (2-hours lectures/week, 1-hour workshop/week, 1-hour tutorial/week and 1-hour laboratory/week; 60 hours total in 12 weeks).

Second-year chiropractic students were enrolled in the unit CHI255 Human Anatomy II. This unit has a regional clinically-oriented approach to gross human anatomy and is based on a medical undergraduate anatomy curriculum. The regions covered are the head and neck, thorax, abdomen and pelvis. Emphasis is placed on the viscera, autonomic innervation and the anatomical basis of common pathologies. Students had undertaken 2-hours/week lectures, 1-hour/week workshop, 1-hour/week laboratory and 2-hours/week practical classes consisting of prosection laboratories (the viewing of human cadavers), living and radiographic anatomy (72 hours in 12 weeks). The total number of hours devoted to anatomy in the entire chiropractic program is 204 hours.

At Queen's University Belfast, first-year dental students were enrolled in the Bachelor of Dental Surgery Program. DEN1020 human anatomy module is taught in 24 weeks and is formed of 1-hour/week lecture and 4-hours/week practical sessions (120 hours total in 24 weeks) which included dissection of the head and neck and brain sectioning in addition to the use of prosected specimens for the whole body. During the first

semester, students study the general anatomy of the musculoskeletal system, the thorax and abdomen including all the viscera. During the second semester, students learn neuroanatomy including all the cranial nerves, the anatomy of the head and neck including the cranial cavity, blood vessels, oral cavity, salivary glands, orbit, ear, pharynx, larynx and paranasal sinuses. Through this module, anatomy is delivered to students in the form of lectures, problem-based learning, clinical cases and practical classes where the students dissect the head and neck and the brain and use prosected specimens for the whole body. The total number of hours devoted to anatomy in the dental program is 120 hours.

At Brighton and Sussex Medical School, second-year medical students were enrolled in the Bachelor of Medicine, Bachelor of Surgery (BMBS) program. Students who participated in this research had undertaken Module 204 (Musculoskeletal and Immune Systems) that examined the structure and function of the back, upper and lower limbs, common musculoskeletal diseases of the limbs, as well as limb trauma and repair. The core content of this module seeks to demonstrate how the pathobiology of an indicative range of immunological and musculoskeletal diseases may be explained in terms of studying principles of the scientific basis of the musculoskeletal and immune systems. Over the entire anatomy modules, students experienced a variety of teaching and learning methods in the form of eight hours of lectures, two hours of tutorials and 18 hours of practical sessions (4 hours living anatomy and ultrasound in addition to 14 hours dissection, 28 hours total). The total number of hours devoted to anatomy over the medical program is 230 hours (Smith et al., 2016, 2018).

Methods of anatomy teaching adopted for medical, dental and chiropractic students in the three universities were quite similar. They all enjoyed a variety of teaching and learning methods which was set in a way to increase their motivation to learn and predict their success. Anatomy teaching was placed in clinical context to assist with interest and problem-solving strategies. The learning tasks were well designed to keep students engaged and motivated. The academic performance was compared across the three cohorts.

Bloom's Taxonomy assessment methods were used in designing the questions. There were different levels of skills ranked in order from the most basic to the most complex. Each level of skill is associated with a learning objective. It was ensured that the questions asked were pulled from all levels of the taxonomy pyramid.

**Initial quantitative data collection**

Demographic data including name, age, gender, unit code, institution and anatomy performance were collected and de-identified prior to data analysis. Subscales of motivational influences in Australia and the UK were examined in relation to the academic performance of students.

The research instrument was the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1991; Duncan and McKeachie, 2005) which has been previously validated and widely used (Table 1). The MSLQ was the most appropriate instrument to measure reflective learning as it considered reflective learning as a self-regulated

learning activity and included items assessing the cognitive, metacognitive, motivational and emotional aspects of the learning process (Soemantri et al., 2018).

Recent studies employing the MSLQ have examined the motivation and learning strategies of first-year medical gross anatomy students (Pizzimenti and Axelson, 2015) and second-year medical pathophysiology students (Kauffman et al., 2018).

For scoring the MSLQ, students rated themselves on a seven-point Likert-scale from "not at all true of me" = 1 to "very true of me" = 7. Each motivation subscale score was reported as mean ±SD. Reliability analysis of each motivation subscale was conducted and reported as Cronbach's alpha (α).The six motivation subscales of the MSLQ (with their MSLQ Scoring Manual Reference Cronbach's alpha listed) are composed of 31 closed statement items: intrinsic goal orientation (n = 4; α = 0.74); extrinsic goal orientation (n = 4; α = 0.62); task value (n = 6; α = 0.90); control of learning beliefs (n = 4; α = 0.68); self-efficiency for learning and performance (n = 8; α = 0.93); and test anxiety (n = 5; α = 0.80).

**Statistical Analysis of Data**

All data were analyzed in SPSS statistical package, version 22 (IBM Corp., Armonk, NY) and reported descriptively. Mean values were calculated for the MSLQ subscales and analyzed using one-way ANOVA. Reliability and internal consistency for each of these subscales were examined with the use of Cronbach's alpha. Linear regression analysis was used to examine the association between the individual MSLQ subscales

and anatomy performance of all students. All MSLQ subscales were then added to a step-wise multivariate analysis using gender as a covariate because female students may academically outperform male students (Duckworth and Seligman, 2006). Multivariate analyses are reported as unstandardized beta ± standard error with 95% confidence interval and P value. There was a small amount of multicollinearity, the collinearity tolerance was 0.985.

Post-hoc tests used with the ANOVA were LSD Bonferroni with alpha at 0.05. Skewness ranged from 0.279 – 0.333 and Kurtosis ranged from 0.552 – 0.656 which is acceptable for normal distribution.

RESULTS

**Demographic Characteristics**

The questionnaire was completed by 251 students where 97 (39%) of them were males and 154 (61%) were females, corresponding to a total response rate of 69.9%: first-year chiropractic students n = 74 (73.2%), second-year chiropractic n = 73 (89%), first-year dental n = 53 (88.3%), and second-year medical n = 51 (38.6%).

The mean age for all participants was 21.0 ±5.0 years (range: 18–55 years). More than half of the cohort n = 54 (61%) reported their gender as female: first-year chiropractic: n = 46 (62%); second-year chiropractic: n = 39 (53%); first-year dental: n = 38 (72%); second-year medical: n = 31 (61%) female. The mean of the student final anatomy unit grades were significantly lower in second-year chiropractic students (62.0 ±SD 13.0) compared to the other cohorts (first-year chiropractic: 71.0 ±13.0; first-year dental: 71.0 ±14.0; second-year medical: 72.0±9.0; F = 9.6, $P < 0.001$).

**Addressing the first goal**

**Combined responses of all respondents to the motivation subscales:**

All six categories of the motivation subscales had a mean above 4.5; the mean of Self-Efficacy for Learning and Performance 5.13 (0.86), Task Value 5.99 (0.81), Intrinsic Goal Orientation 5.24 (1.00), Control of Learning Beliefs 5.68 (0.84), Extrinsic Goal Orientation 5.51 (0.95) and test anxiety 4.58 (±1.17); however, the mean of the task value was the highest 5.99 (±81) and mean of anxiety was the lowest (4.58 ±1.17), (Table 2).

**Responses concerning the six motivation subscales:**

***Task Value***

Almost all respondents (95%) indicated it was important to learn the program material, and would be able to use what they (94%) had learnt in other programs. The majority of the respondents (90%) liked the subject matter (90%) and they (87%) were interested in the program content. The mean value for the task value scale was 5.99 ± 0.81 and Cronbach's Alpha 0.881.

All six categories of the motivation subscales, Self-Efficacy for Learning and Performance, Task Value, Intrinsic Goal Orientation, Control of Learning Beliefs, Extrinsic Goal Orientation and test anxiety had a mean above 4.5; however, the mean of the task value was the highest (5.99), taking into account the global view of all participants. This high mean of the task value can be easily explained as almost all respondents (95%) indicated that it was important to learn the program material and 94% agreed about the statement "I think I will be able to use what I learn in this program in other courses."

***Control over Learning Beliefs***

Almost all respondents (96%) indicated they would be able to learn program material if they used appropriate study methods and if they (95%) tried hard enough. An overwhelming majority (79%) accepted that it would be their own fault if they didn't learn the program material. The mean score for the control of learning beliefs scale was 5.68 ± 0.84 and Cronbach's Alpha 0.699.

### *Extrinsic Goal Orientation*

An overwhelming majority of the respondents noted that they wanted to obtain better grades than most other class members (n = 203, 81%). It was important to do well as it demonstrated their ability to family, friends and employers (n = 195, 78%).

The mean value for the extrinsic goal orientation scale was 5.51 ± 0.95 and Cronbach's alpha 0.695. Respondents commonly indicated that achieving a good grade was the most satisfying aspect (n = 200, 80%). Their main concern was getting a good grade in order to improve their overall grade point average (n = 210, 84%).

### *Self-Efficacy for Learning and Performance*

Most respondents were certain they could master the taught skills (84%) and thought they would do well (72%), especially considering the program's difficulty (75%). Respondents were typically confident that they could understand the basic concepts (95%) and most difficult material (73%). Nonetheless, slightly less than two-thirds (63%) thought they would excel on the assignments and tests, and about half (49%) believed they would receive an excellent grade.

The mean score for the self-efficacy for learning and performance scale was 5.13 ±0.86 and Cronbach's Alpha 0.908.

### *Test Anxiety*

Respondents tended to report that when taking an examination their heart noticeably beat fast (64%), and they felt upset and uneasy (52%) as they (64%) were inclined to

think about the consequences of failing, and thought about items on other parts of the test they (54%) couldn't answer. However, during tests only one-third of the respondents (36%) were thinking of how poorly they were doing compared to other class members. The mean value for the test anxiety scale was 4.58 ± 1.17and Cronbach's Alpha 0.744.

***Intrinsic Goal Orientation***

Most participants noted that they preferred challenging program material as it promoted learning new things (n = 153, 61%). The majority of respondents (n = 198, 79%) indicated that they preferred program material that aroused their curiosity even if it was difficult, and (n = 195, 78% of them were most satisfied when trying to understand program material as thoroughly as possible. The mean value for the intrinsic goal orientation scale was 5.24 ± 1.0 and Cronbach's alpha 0.633.

**Addressing second goal**

**Motivation subscales in different cohorts (chiropractic, dentistry, medical) of students:**

Five out of six motivation subscales were not different between first-year anatomy students in chiropractic and dentistry. The only motivation subscale that differed between the cohorts was test anxiety. First-year dental students were significantly more anxious than chiropractic students (dental: 4.87 ±1.20, chiropractic: 4.43 ±1.17, *P* = 0.043). The specific test anxiety items that differed between first-year chiropractic and first-year dental students were: "When I take a test I think about items on other parts of

the test I can't answer" (dental: 5.09 ±1.53, chiropractic: 4.41 ±1.60, *P* = 0.016) and "When I take tests I think of the consequences of failing" (dental: 5.75 ±1.27, chiropractic: 4.64 ±1.78, *P* < 0.001).

Four out of six motivation subscales were not different between second-year anatomy students in chiropractic and medicine. The two motivation subscales that differed between the cohorts were task value and extrinsic goal orientation. Second-year chiropractic students attached more value to anatomy education (chiropractic: 5.92 ±0.82; medical: 5.27 ±0.91, *P* < 0.001) and were more extrinsically goal oriented (chiropractic: 5.32 ±1.12; medical: 4.76 ±0.93, *P* = 0.004) than the second-year medical students. All items for task value subscale were significantly different between second-year chiropractic and medical students. The items out of the Extrinsic Goal Orientation subscale that differed significantly between second-year chiropractic and medical students were: "Getting a good grade in this class is the most satisfying thing for me right now" (chiropractic Y2: 5.34 ±1.54, medical Y2: 4.39 ±1.47, *P* = 0.001) and "I want to do well in this class because it is important to show my ability to my family, friends, employer, or others" (chiropractic Y2: 5.40 ±1.46, medical Y2: 4.47 ±1.39, P = 0.001).

**Addressing the third goal**

**Motivation subscales and anatomy performance:**

Linear Regression Analysis was used to test the correlation between motivation subscales and examination scores. The linear regression analysis demonstrated that increased self-efficacy resulted in significantly higher anatomy unit grades (β = 4.56, $R^2$

= 0.109, *P* < 0.001; Figure 1). Control of Learning Beliefs (β = 3.34, $R^2$ = 0.053, P < 0.001), Intrinsic Goal Orientation (β = 3.13, $R^2$ = 0.052, P < 0.001) and Task Value (β = 3.15, $R^2$ = 0.046, P = 0.001) were also significant positive predictors of students' anatomy unit grade. Extrinsic Goal Orientation and Test Anxiety were not significant predictors of students' anatomy unit grade.

**Motivation subscales insignificantly different between the three cohorts (chiropractic, dentistry, medical) of students:**

The Intrinsic Goal Orientation and Anxiety motivation subscales were found to be insignificantly different between the three cohorts. They were (F=0.477, P = 0.699) and (F=1.50, P=0.214) respectively.

**Correlation between gender and motivation subscales and anatomy grades**

Exclusive examination of female students (n = 153) demonstrated that Self-Efficacy for Learning Performance (β = 5.65 ±1.16, 95% CI: 3.37 – 7.93, *P* < 0.001) was a positive predictor and Test Anxiety (β = -1.85 ± SD 0.89, 95% CI: -3.63 to -0.08, *P* = 0.041) was a negative predictor of anatomy unit grade and accounted for 17.1% of the variance in anatomy unit grades.

Step-wise multiple regression analysis demonstrated that Self-Efficacy for Learning Performance (β = 5.14 ±1.23, 95% CI: 2.71 – 7.58, P < 0.001) was a positive predictor of male students' (n = 96) anatomy unit grade and explained 15.6% of the variance.

# DISCUSSION

Considering the crucial role of health professions in the health care delivery and given the importance of anatomical knowledge as a foundation for good practice (Davis et al., 2014), examining students' motivations is imperative to predicting students' performance in these programs. This is especially true when there is always failure, or withdrawal rates, which, in turn, impact students' progression (Sturges et al., 2016). Understanding how much students have learned based on their motivation may be helpful in reducing trends of malpractice linked to a deficit of anatomical knowledge (Ellis 2001). Previous studies have demonstrated that there was a significant relationship between students' overall self-reported motivation, how many hours studying they reported, students' grade point average (GPA), and their academic performance (Baker, 2003; Hakan and Münire, 2014). Students with higher GPAs, who reported to be more motivated to succeed, studied for longer hours and did better academically in the class (Baker, 2003; Hakan and Münire, 2014).

## Task value: The most rated motivation subscale

The main concern of 84% of those who participated in this study was getting a good grade in order to improve their overall grade point average because this would have an impact on their future career. Students with internal motivation were shown to have more interest, more confidence, more persistence, and use more deep level learning strategies for better performance (Simons et al., 2004). Kim et al. (2016) found that those who are intrinsically motivated (IM) in their career choice are likely to have higher intrinsic interest in learning medicine than those who are extrinsically motivated (EM)

and that higher intrinsic interest in learning may be linked to higher academic performance. The positive feedback also increases the intrinsic motivation and has positive impact on students' performance (Deci et al., 1991). Significant positive correlation between academic motivation and academic achievement were also observed (Sobral, 2016).

Campos-Sánchez et al. (2014) demonstrated that for intrinsic motivation and self-efficacy, the highest values corresponded to medical students, whereas dental students showed the highest values for self-determination and grade motivation. Genders differences were found for career motivation in medicine, self-efficacy in dentistry, and intrinsic motivation, self-determination and grade motivation in pharmacy

Motivation changes have been reported with progression in college with IM and EM declining over time but with EM scores consistently higher than IM scores (Burnam et al., 2014). These findings are consistent with the findings of the current project as 80% of the respondents to the items concerning external goal orientation commonly indicated that achieving a good grade was the most satisfying aspect of the class.

This suggests that students attend college for future rewards such as finding a good job as a result of their high achievements and that EM tends to be more deeply rooted than IM (Kruger and Dunning, 1999; Finch, 2004; Clark and Schroth, 2010). Intrinsic motivation and autonomous forms of EM relate positively to important academic outcomes such as good performance (Koseoglu, 2013). Furthermore, students are

increasingly taking a consumerist approach to higher education, suggesting a shift from intrinsic to extrinsic motivation (Lee, 2005).

The findings of Clark and Schroth (2010) and Burnam et al. (2014) suggest that student motivation is a vital determinant of academic performance and achievement. This is consistent with the findings of the current research as the linear regression analysis demonstrated that increased self-efficacy for learning and performance motivation subscale resulted in significantly higher examination scores.

**Motivation subscales and anatomy examination performance**

Examining students' motivations subscales is important as it is associated with their performance in programs. If a student is to be self-motivated, it is expected that they will perform better in examinations (Abdel Meguid et al., 2017). Furthermore, higher levels of self-confidence decrease propensity to be self-motivated and detrimentally impacts on examination performance (Koseoglu, 2013). Results of the analysis of gender differences showed that when entering (dental Y1 + medical Y2) and (chiropractic Y1 + chiropractic Y2) into multivariate analyses with gender and motivation subscales, the Self-efficacy for learning and performance were significantly positively associated with anatomy grade. Self-efficacy for learning and performance had proven to have a great influence on achievement (Schunk et al., 2008). As educators, we can enhance this self-efficacy through a variety of strategies such as stimulating critical thinking, using open-ended questions and the positive reinforcement. Some students may need extra help to boost their understanding and their self-efficacy.

Despite a higher level of test anxiety in female students, there is evidence to suggest that the relationship between academic performance and test anxiety is more pronounced in male students compared to female students. Test anxiety appears to be negatively associated with academic performance (Freudenthaler et al., 2008). This is in consistent with the findings of the current study that demonstrated that the Test Anxiety was a negative predictor of anatomy unit grade and accounted for 17.1% of the variance in anatomy unit grades.

The statistical analysis of the item that stated “When I take tests I think of the consequences of failing” showed that there was a significant difference between chiropractic and dental students. Anxiety tends to be higher in younger students; Singleton et al. (2002) demonstrated that there was an increase in prevalence of mental health problems/anxiety at 16 to 19 years-old. In the present study, dental students were younger than the chiropractic students. Further, if dental students score less than 50% in one of their four continuous assessments, they must sit an additional examination that covers all unit content. International dental students (who contribute to 15% of the total students) pay higher tuition fees exacerbating anxiety and fear of failure. Pintrich et al. (1991) recommended getting more training in effective learning strategies and test-taking skills to help in reducing the degree of anxiety among students.

The majority of students viewed anatomy as an important subject; they realized its "Task Value". Second-year chiropractic students attached more value to anatomy education than the second-year medical students because results demonstrated that chiropractic students were fully aware that anatomy is an extremely relevant subject to their future career. All subscale items for Task Value were significantly different between second-year chiropractic and second-year medical students.

**Gender and Academic Performance**

Sinha et al. (2017) found that female students out-performed males in assessments. Increased performance by female students has been attributed to the fact that they are inherently better at reading comprehension, perceptual speed and associative memory skills or because of their more sincere and greater efforts in medical programs (Deepak et al., 2011). It may be further emphasized here that increased performance by females suggests a higher ability for reasoning, depth of knowledge and conceptualization. Also, it may be mentioned that the failure rate of male students was much higher as compared to female students. It is concluded that the overall performance of female students was better than males.

Statistical analysis of gender differences demonstrated that being a female was significantly positively associated with anatomy grades which coincided with the findings of McDonough et al. (2000) who demonstrated that females are better in planning ahead, setting academic goals and putting much effort in achieving them. Despite having a great support system through advisors of studies and personal tutors who

plays a magnificent role in giving lot of guidance, first-year dental students significantly suffered more from test anxiety than chiropractic students.

**Educational Implications**

The results of this study provide useful information in selecting and generating motivational tactics/strategies. Learner's analysis is an important step in identifying the general level of the learner's motivation and the learner's characteristics. The latter include gender differences, background information and previous anatomy knowledge. The different motivational subscales represented in this study were investigated. The information provided from this research guides in the generation of motivational objectives and in the selection of appropriate strategies to achieve these objectives.

Two strategies can be implemented to increase students' motivation. The first strategy is the variability strategy which incorporates different learning strategies and different delivery methods while the second strategy is the conflict strategy in which the learners' attention can be grabbed by presenting information that may be contrary to what they know or believe (van Dinther et al., 2011). If the overall motivation of students is found to be high, lecturers should sustain it by using different varieties in teaching approaches and by providing appropriate types of motivation feedback (Bengtssson and Ohlsson, 2010). Students' motivation can be formatively evaluated during the middle of anatomy program to identify deficiencies in the areas of motivational subscales. Evaluation of students' motivation at the end of the programs can then provide assessment to the success of the adopted strategies.

**Limitation of the Study**

The main limitation of this study is that it evaluated students' motivation to anatomy education without taking consideration that different variables in different countries could affect the results such as the different teaching methods (e.g. virtual dissection or prosection) or the different assessment period. The different activities and teaching methods that can be used during the sessions may facilitate the Intrinsic Goal Orientation by supporting autonomy and competence and relatedness; the major elements of self-determination theory. Using a variety of assessments may be motivating for students as they may be influenced by the perceived relevance and contents of the assessment. An enthusiastic committed professor, and classmate influences may play a great role in affecting the level of students' motivation. As the previously mentioned points were not investigated in the current study, further research is recommended to provide an educational environment that resonates with the students' needs.

CONCLUSIONS

The outcome of this research demonstrated that self-efficacy for learning, control over learning beliefs; task value, intrinsic goal orientation and gender can be significant predictors of student anatomy performance. Interventions aimed at improving these motivation subscales in students could boost their anatomy performance.

ACKNOWLEDGEMENTS

The authors wish to thank all participants of this study for their time and engagement and Ms. Angela Jaques for her preliminary statistical advice.

The authors thank Ms Lisa Kearley, Phase 1 Curriculum and Assessment Manager, Brighton and Sussex Medical School for her help with obtaining the assessment data.

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FIGURE LEGEND

**Figure 1:** Self-Efficacy for Learning Performance (SELP) was a significant predictor of anatomy unit grade. SELP explained 10.9% of the variance in grade. For every one point increase in SELP, anatomy unit grade increased by 4.56%.

Likert scale (1= not at all true and 7= very true of me).