Motivation in medical students

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Motivation in medical students

Motivatie bij medische studenten
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Rashmi Aniruddha Kusurkar

geboren op 18 februari 1975 te Mumbai, India

Promotoren:

Prof dr Th J ten Cate
Prof dr G Croiset

To Aniruddha, Aryaman and Yohaan

&

My Mom and Dad

कामम‍य एवायं पुरुष इति।
स यथाकामो भवति तत्क्रतुर्भवति।
यत्क्रतुर्भवति तत्कर्म कुरुते।
यत्कर्म कुरुते तदभिसंपद्यते॥

English Translation of Sanskrit Quote:

You are what your deep, driving desire is
As your desire is, so is your will
As your will is, so is your deed
As your deed is, so is your destiny.

"Ability is what you are capable of doing. Motivation determines what you do. Attitude determines how well you do it."

- *Lou Holtz*

"To be self-determined is to endorse one's actions at the highest level of reflection.
When self-determined, people experience the freedom to do what is interesting, personally important, and vitalizing."

- *Edward Deci & Richard Ryan.*

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Introduction

Introduction

In the Indian epic Mahabharata, there was known a great student, Arjun. Arjun was a prince keenly interested in the study of archery. Arjun was well-known for his target-oriented study. When Arjun was a little boy studying under his guru (teacher), Dronacharya, he exhibited not only excellence in archery, but also an undying passion to be the best at it. Once Dronacharya decided to test which of his pupils was his greatest pupil. He set a stuffed bird on the branch of a tree and asked his pupils to take aim at the eye of the bird. Then he asked each one of them, "What do you see?" Every pupil replied he could see the tree, the river, the sky and so on. When it was Arjun's turn to take aim and answer the question, he replied, "I can see only the eye of the bird". Dronacharya was impressed with the focused attitude, genuine interest and keen learning of Arjun and declared him as his best pupil.

Once, Dronacharya's other pupils complained that he was partial in imparting his knowledge to Arjun, which is why Arjun was his best pupil. Dronacharya patiently replied that he had imparted the same knowledge to everyone, but what made Arjun the best pupil was that he chose to not be content with the knowledge his Guru gave him and went seeking more knowledge from other sources. Arjun can be considered a symbolism of great self-determined motivation. Arjun has been a legendary figure in Indian epic writings and continues to inspire people, young and old, in India even today.

Wouldn't every teacher desire to have students like Arjun? "What makes students tick?" has fascinated researchers, teachers and educators for a long time. Every teacher would like motivated students who are always interested in learning, attentive in class and complete their assignments in time. Many teachers constantly try to fuel and channelize student motivation so that it translates into desired learning behaviour and performance.

Motivation is a force that drives a person to engage in certain behaviour. Motivation is a broad concept which is important in all spheres of life, be it education, sports, inter-personal relationships, health and so on. Academic achievement motivation is the motivation which drives a person towards academic achievement. When psychologists discuss motivation, it is invariably academic motivation, unless specified otherwise.

Different definitions of motivation

Motivation is a concept that has defied definition acceptable to all learning psychologists.[1] Some of the definitions found in the literature are:

"Motivation is the energizing of behaviour, and especially...the sources of energy in a particular set of responses that keep them temporarily dominant over others and account for continuity and direction in behaviour."[2]

"Motivation in general is regarded as a process internally seated which, once aroused by an appropriate stimulus, leads to more intense activity than otherwise would have been present."[1]

"Motivation is the desire to learn which a student brings with himself to medical school".[1]

"Achievement is task-oriented behaviour that allows the individual's performance to be evaluated according to some internally or externally imposed criteria that involve the individual in competing with others, or that otherwise involves some standard of excellence." (Spence & Helmreich 1983, cited by Franken[3])

Until date, there is no standardized, accepted definition of motivation in the literature.

Theories of motivation

The development of theories of motivation is a fairly recent phenomenon dating back only to the twentieth century. It is interesting to know that the earliest references to motivation were made by Sigmund Freud, an Austrian medical doctor.[4] Freud (1900) described id (instinct), ego and superego. Id is primarily unconscious and ego is primarily conscious. Freud believed in hedonism, i.e. gratification of needs, and homeostasis, i.e. maintenance of a stable internal environment.[4] According to him all behaviour is instigated by instincts and behaviour is always in the direction of satisfying these instincts in order to maintain a steady internal state. Ego can inhibit the strivings of the id and alter behaviour. Superego distinguishes right behaviour from wrong behaviour. A person is in a state of continuous conflict between what he or she wants to do and what the society expects him or her to do.[4]
All of the major work in understanding motivation has been done by the American psychologists, the most prominent names being Skinner (1938), Murray (1938), Maslow (1946), McClelland (1953), Atkinson (1957, 1966), Horner (1968), Weiner (1974), Deci and Ryan (1985), Bandura (1986) and Pintrich (2000).

Burrhus Skinner[5] (1938) proposed the Operant behaviour theory which said that behaviour is driven by conditioning towards positive reinforcement (reward) or away from negative reinforcement (punishment). Skinner's theory is important from the point of view of the concept of rewards which was introduced for the first time in motivation.
Henry Murray (1938) observed that people have differing tendencies to "overcome obstacles, to exercise power, to strive to do something difficult

as well as and as quickly as possible".[6] This tendency was called "the need to achieve" and the theory called the *Need to Achieve theory*. Murray devised the Thematic Apperception Test (TAT) to measure the variations in human motivation. This test consisted of a series of pictures on which people were asked to write stories and the theme of the stories was analyzed. The basic assumption is that a person will project his motivational orientation at that particular time in the stories that he writes. Thus, Murray describes a dynamic, time and context-dependent construct of motivation. This description was important because it did not look at motivation as a fixed trait; a fact that could be manipulated to enhance learning.

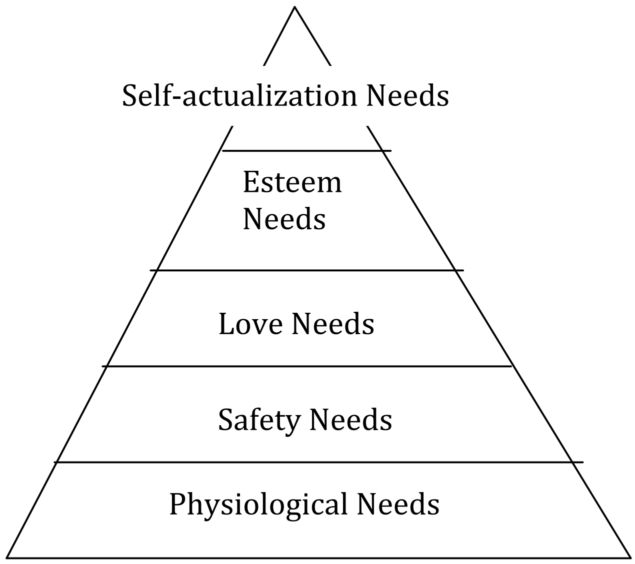
Clark Hull (cited by Weiner[4]) (1943) proposed the Drive theory. In this theory, needs drive behaviour in a way that results in satisfaction or fulfilment of these needs, maintaining a steady state in the body. He proposed and developed a formula for calculating motivation[4]:

Motivation or Behaviour = Drive X Habit

This was a part of his theory for learning, so we see reference to academic motivation or motivation for learning for the first time in history.

Maslow[7], one of the founders of humanistic psychology, looked at motivation as a need and his theory of motivation called *Theory of hierarchy of needs*, was based on the relative importance of the different needs in a person's life.[7] It said that basic human drive or motivation ultimately reflected a need for self-actualization. Self-actualization means that one is becoming all that he is capable of becoming; he is utilizing his potential fully. But it comes into action only if the underlying basic needs are satisfied. These basic needs were physiological needs, safety needs, love and belongingness needs and esteem needs which are arranged in the ascending order of their importance (see Figure 1). Only if the basic needs are satisfied, the higher needs dominate the conscience of the person and shape his behaviour.

Figure1 Maslow's Hierarchy of Needs



In 1953, McLelland and his colleagues (Atkinson, Clark, and Roby) adapted the TAT and developed a precise method for scoring the achievement motive.[8] It was shown that a generalized motive does exist and that it can predict behaviour in a wide variety of situations. This seems to describe the underlying motivational construct as stable and predictive for behaviour. The work resulted in the publishing of a book, *The Achievement Motive*, in 1953. This approach was a quantitative approach since it actually measured motivation.

Atkinson's work is considered as an important milestone in research on motivation and proposed another dimension to motivation, "Motivation to Avoid Failure".[9] This theory proposed that every individual has 'Motivation to succeed' and 'Motivation to avoid failure'. The motivation of an individual at any given time is a resultant sum of the above two dimensions. Therefore,

$$\boxed{\text{Motivation} = \text{Motivation to Succeed} + \text{Motivation to Avoid Failure}}$$

Motivation to avoid failure means the motivation to avoid the task that can lead to failure and is always a negative value. He also found that Motivation is dependent on Motive, Expectancy of success or failure and Incentive value of success or failure i.e.

$$\boxed{\text{Motivation} = f\,(\text{Motive} \times \text{Expectancy} \times \text{Incentive})}$$

Therefore,

$$\boxed{\begin{gathered}\text{Overall Motivation} = f\,(\text{Motive}_S \times \text{Expectancy}_S \times \text{Incentive}_S) + \\ f_1(\text{Motive}_{AF} \times \text{Expectancy}_F \times \text{Incentive}_F)\end{gathered}}$$

Where, S represents Success, F represents Failure and AF represents Avoid Failure, F represents Failure, f and f_1 are constants. This theory was called the *Expectancy-value theory*. It also proposed that the motivation and efforts would be the strongest when the probability of success was moderate (reaching the target was neither too easy nor too difficult).

There seems to be a gender aspect to motivation. Martina Horner (1968) did research on achievement motivation in women and proposed the *Motive to Avoid Success Theory*.[10] This theory suggested that women show lower achievement motivation as compared to men because they had a greater 'Fear of Success' than men. This fear grew out of consideration of the consequences of success. For women success may have meant loss of friends, femininity and popularity. This theory seems to be irrelevant in the context of the present time when women are the dominant population in medical and other educational fields.
Janet T Spence (1978) tried to compare men and women on their achievement motivation and to study what does the achievement motive result in.[11] A questionnaire was designed for this purpose, which is called the Work and Family Orientation (WOFO) questionnaire. Results showed that men scored higher on mastery (desire for intellectual challenge) and competitiveness than women, whereas women scored higher than men on work (desire to work hard).[3, 11]

Attribution theory is concerned with how individuals interpret events and how this interpretation relates to their thinking and behaviour. Weiner and colleagues developed a theoretical framework that has become a major research paradigm of social psychology[12]. Weiner focused his attribution theory on achievement. He identified ability, effort, task difficulty, and luck as the most important factors affecting attributions for achievement. Ability is inferred from the number, percentage and pattern of success experiences that a person has had on prior achievement tasks.[3] Task difficulty is typically determined by the way others perform at the task.[3] Luck is inferred when the outcome is due to chance rather than skill.[3] Effort often affects whether we succeed or fail in meeting a goal.[3] Attributions were classified along three causal dimensions: locus of control, stability, and controllability (See Figure 2). The *locus of control* dimension had two poles: internal versus external locus of control. Internal locus of control comes from within an individual and external locus of control come from external factors. The *stability* dimension captured whether causes change over time or not. For instance, ability was classified as a stable, internal cause, and effort classified as unstable and internal. *Controllability* contrasts causes one can control, such as skill or efficacy, from causes one cannot control, such as aptitude, mood, others' actions, and luck. After this classification, intentionality i.e. an intentional or unintentional dimension was added to this 2x2 model.[12]

Figure 2 Classification scheme for perceived determinants of achievement behaviour (Adapted from Weiner 1974, Pg. 6)[12]

	Locus of control	
Stability	Internal	External
Stable	Ability	Task difficulty
Unstable	Effort	Luck

Deci and Ryan worked to propose *Self-Determination Theory* (SDT).[13-15] According to this theory, it is not only the level of motivation that is important, but also the nature or quality or type of motivation that determines behaviour. Two different types of motivation were specified: Intrinsic and Extrinsic. Intrinsic motivation made a person pursue an activity out of personal interest or for the pure joy of doing it. Extrinsic motivation made a person pursue an activity for obtaining a certain reward or avoiding a certain loss or punishment. Amotivation was the state in which a student lacked the intention to act. SDT puts forth intrinsic motivation as the desired type of motivation which leads to deep learning and better outcomes.[13-15] Intrinsic motivation was built on the inherent needs of autonomy, competence and relatedness. The need for *Autonomy* (self-determination) was about the need to feel that, “I am doing it because

I want to". The need for *Competence* was about feeling that one has the capability to achieve what he wants to achieve. The need for *Relatedness* was about a person being able to relate to the significant others in his life through his work or actions and achievement. Significant others could mean parents, teachers or even friends i.e. peer group. In medical education it could also mean patients. These three needs should be satisfied for a person to be intrinsically motivated. SDT steered the research on motivation towards quality of motivation.

According to the Social Cognitive Theory (SCT) by Bandura, people are neither driven by inner forces nor automatically shaped and controlled by the environment.[16] They function as contributors to their own motivation, behaviour, and development within a network of reciprocally interacting influences. The concept of self-efficacy is central to this theory. Judgements of self-efficacy determine how much time and effort an individual invests in an activity. According to the theory, people generally undertake and perform activities which they believe themselves capable of performing and avoid activities which they feel incapable of performing.

Goal Theory was first put forth by Pintrich.[17] It explained motivation of an individual on the basis of his goal orientation. In achievement motivation the two types of goals are: Mastery goals and Performance goals. Mastery goals are the goals when the individual is focused on mastering, learning and understanding the task, whereas performance goals are the goals when the individual is focused on being better in comparison to others at the task. There is also a 'work avoidant' or 'academic alienation' goal which is about avoiding work.

Because different motivation theorists believe and work on different theories summarized above, these theories of motivation are independent lines of research, but there are overlapping elements among them. Table 1 captures the major concepts of the major theories of motivation. The concept of mastery goal orientation (Goal theory) is very similar to intrinsic motivation (SDT) and performance goal orientation is close to extrinsic motivation, whereas work avoidant goal orientation (Goal theory) is similar to amotivation (SDT). Self-efficacy (SCT) driving motivation is similar to competence driving intrinsic motivation (SDT) and ability driving attribution to achievement (Attribution theory).

Table 1 Theories of motivation and major concepts

Theory	Author	Major concepts
Need to Achieve	Murray	Designed the Thematic Apperception Test (TAT)
Drive theory	Hull	Needs drive behaviour which results in satisfaction of these needs. Motivation or Behaviour=Drive X Habit
Hierarchy of Needs	Maslow	Basic needs and self-actualization need, when basic needs are satisfied self-actualization needs dominate the consciousness
	McLelland	Presence of a generalized motive predictive of behaviour in different situations, stable component of motivation
Expectancy-value theory	Atkinson	Proposed "Motivation to Avoid Failure" dimension to motivation. *Overall Motivation = f (Motive$_S$ x Expectancy$_S$ x Incentive$_S$)+ f$_1$(Motive$_{AF}$ x Expectancy$_F$ x Incentive$_F$)*
Motive to avoid success	Horner	Females had higher fear of success, hence were motivated to avoid success as compared to males
	Spence	Compared males and females on Work and family orientation questionnaire, females scored higher on desire to work and males scored higher on intellectual challenge and competitiveness
Attribution theory	Weiner	Ability, effort, task difficulty, and luck were identified as the most important factors affecting

		attributions for achievement
Social Cognitive theory (SCT)	Bandura	Motivation depended on feelings of self-efficacy. Judgements of self-efficacy in turn determined the time and effort an individual invested in an activity as well as the difficulty of the goals set.
Self-determination theory (SDT)	Deci & Ryan	Two types of motivation: intrinsic (for personal interest) and extrinsic motivation (for particular gain). Lack of motivation was called amotivation. Intrinsic motivation is dependent on fulfilment of the feelings of autonomy, competence and relatedness.
Goal theory	Pintrich	Motivation was explained on the basis of goals; mastery goals (for mastering a task) and performance goals (to perform better as compared to others)

Motivation as a dynamic entity

Motivation is not a personality trait. It is rather a dynamic entity. Murray (1938)[6] introduced this concept through the use of Thematic Apperception Test (TAT) which was based on the basic assumption was that a person would project his motivational orientation at that particular time in the stories that he wrote. Thus, Murray described a dynamic, time and context-dependent construct of motivation. McLelland did major work in achievement motivation training in young businessmen in different cultures and demonstrated that achievement motivation could be developed, changed, taught and inculcated.[8] This also supports the concept of motivation as a dynamic entity.

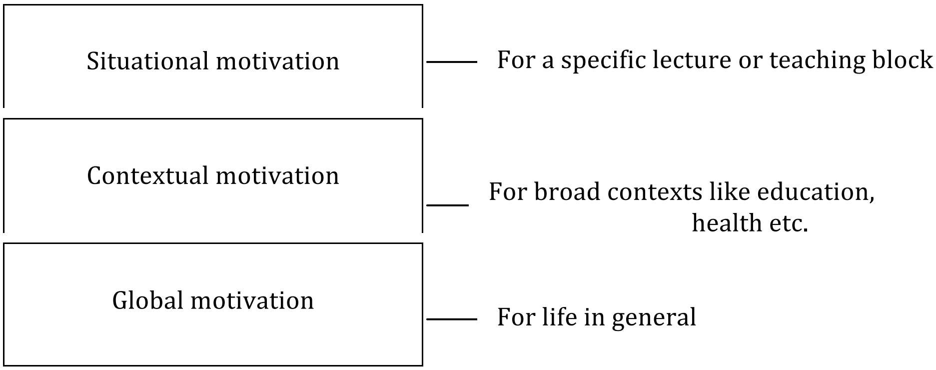
Development of motivation

Intrinsic motivation is based in the human need to be competent and self-determining in relation to the environment and it is innate.[18] Children are born with an intrinsic motivation to learn and master new tasks and information.[8, 18] Some of the motivation of every individual has been found to be determined by factors like age, religion and race.[8] Motivation related to personality traits tends to remain relatively stable. This concept of having a relatively stable motivation, which can predict behaviour in a wide variety of situations, was first put forth by McLelland.[8] The characteristics of motivation change as children grow up depending on their upbringing and their childhood experiences. McLelland demonstrated that parents and child-rearing practices play an important role in the development of a child's motivation.[8]

A hierarchical model which combines stable and dynamic motivation[19]

Vallerand et al.[19] have proposed a model for motivation which incorporates both, stable and dynamic dimensions of motivation. This is a three-tier hierarchical model for motivation, the three levels being: Global, Contextual and Situational (see Figure 3). Global motivation is the first tier signifying general stable motivation found in every individual for life in general. Contextual motivation is the second tier signifying motivation for broad contexts in life like education, sports, health, interpersonal relationships etc. This motivation is less stable than global motivation and can change, though not very quickly. Situational motivation is the third tier which signifies motivation in particular situations. Situational motivation changes from one situation to another and often very quickly.

Figure 3 Vallerand's hierarchical model of motivation[19]



Self-Determination Theory (SDT) of motivation

SDT of motivation, put forth by Deci and Ryan[13, 20-22] views motivation from a qualitative perspective and classifies motivation into mainly two types: intrinsic and extrinsic. Intrinsic motivation signifies genuine interest and extrinsic motivation signifies engagement in an activity due to external factors. Extrinsic motivation can be classified into 4 types depending on how self-determined it is, the different types arranged along a continuum of self-determination. Thus, internalised extrinsic motivation is at the most self-determined end of the continuum, followed by identified extrinsic regulation, introjected extrinsic regulation and external extrinsic regulation respectively (See Figure 4). In recent years, many studies have combined the scores on intrinsic motivation and identified regulation to give what is called as autonomous motivation as the individual perceives this type of motivation to originate from within his self.[23] Also, scores on introjected regulation and external regulation are combined to form what is called as controlled motivation and an individual perceives this type of motivation to be controlled by external factors. Autonomous motivation in comparison with controlled motivation is associated with better learning, performance and positive well-being.[23] Intrinsic motivation is the prototype of autonomous motivation.[13] SDT proposes that in order to stimulate or maintain intrinsic motivation, there are three basic psychological needs that should be satisfied. These three needs are autonomy, competence and relatedness. The need for autonomy is to perceive the locus of control to lie within oneself. The need for competence is to feel that one has the capability to perform a task. The need for relatedness is to feel that one has the support of the significant others in his or her life. These could be teachers, parents, peers etc.

Figure 4 Self-Determination theory continuum[22]

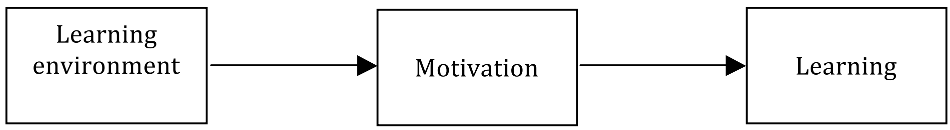
Amotivation	**Extrinsic motivation**				**Intrinsic motivation**
	External Regulation	Introjected Regulation	Identified Regulation	Integrated Regulation	

Least autonomous → Most autonomous

Motivation can change

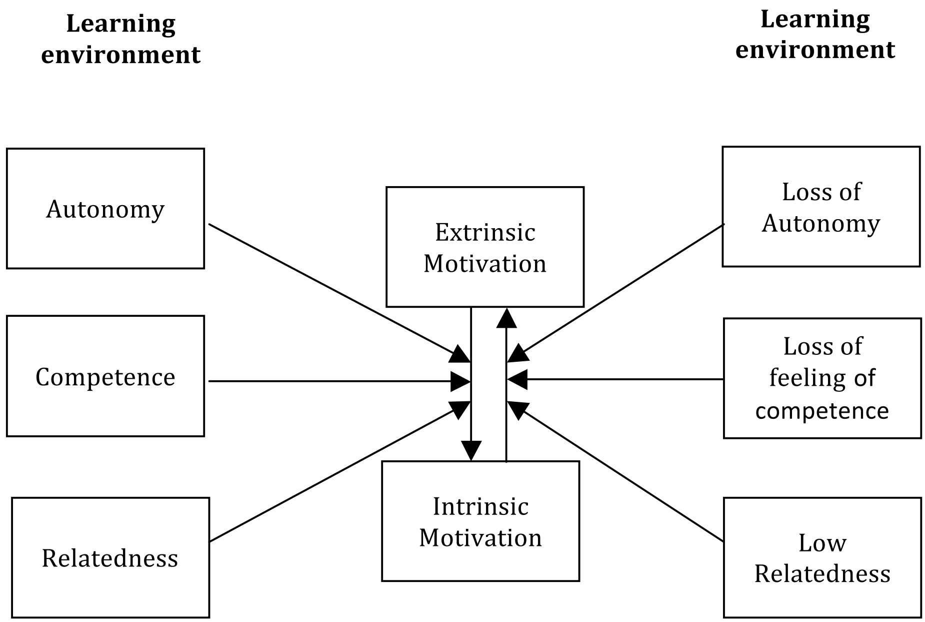
The quantity and/or quality of motivation can change with time, maturity and experiences in the environment.[8, 15, 18, 24] The experience dimension can be very important in learning, as it means that motivation can be influenced by the learning environment, and in turn motivation can influence learning (See Figure 5).

Figure 5 Interrelationships between learning environment, motivation and learning



SDT puts forth that intrinsic motivation could change to extrinsic motivation and vice verse depending on whether the three basic psychological needs of autonomy, competence and relatedness are satisfied or not (See Figure 6).[15, 21, 24, 25]

Figure 6 Change of motivation from extrinsic to intrinsic and vice verse



Intrinsic motivation is the desirable type of motivation, according to SDT, as it has been found to be associated with deep learning, better academic performance and positive student well-being as compared to extrinsic motivation which is associated with surface learning, lower academic performance and negative well-being (See Figures 7 and 8).[15, 24, 24, 26]

Figure 7 Outcomes of intrinsic motivation

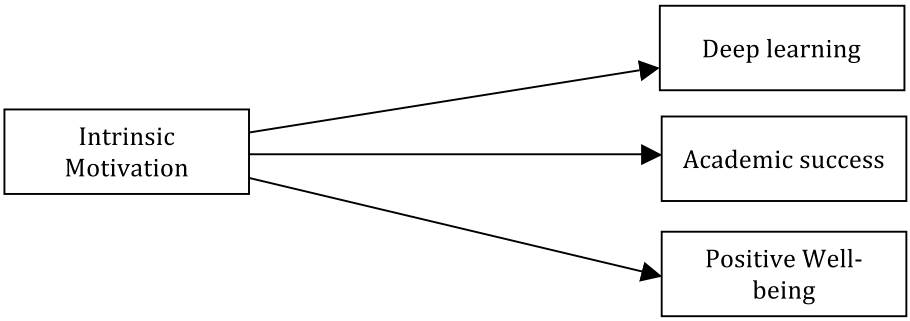
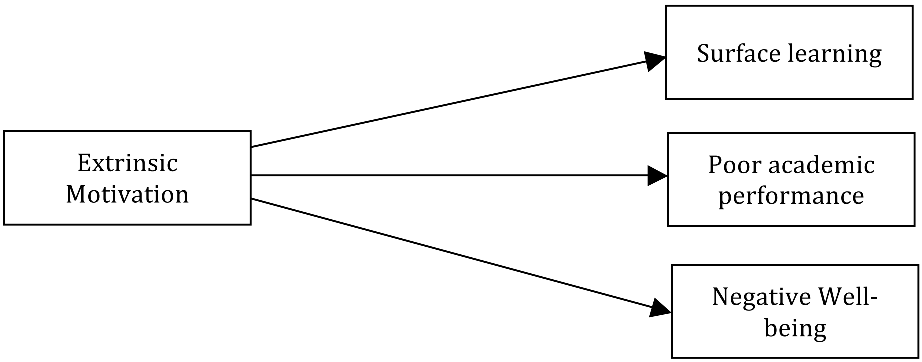


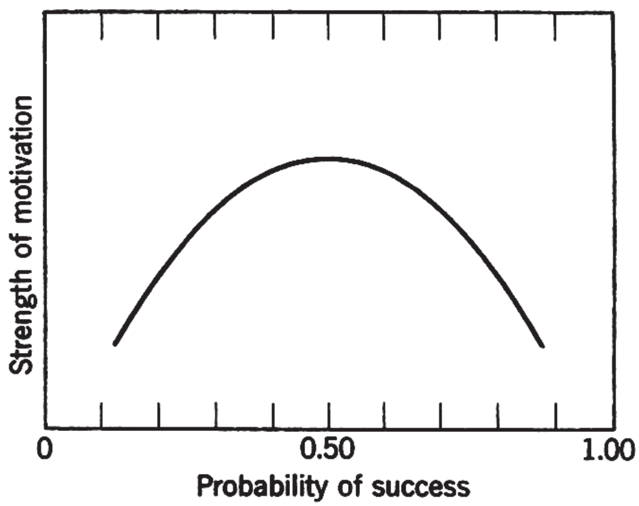
Figure 8 Outcomes of extrinsic motivation



Level of motivation

It is important to know however that to be optimally motivated, one needs to have optimal challenges.[9, 27] Atkinson proposed that motivation and efforts would be the strongest when the probability of success was moderate (reaching the target was neither too easy nor too difficult) (See Figure 9).

Figure 9 Motivation in relation to level of difficulty or probability of success



Introduction to this thesis

Human motivation seems to be a fascinating subject for all; student motivation especially for teachers. The role of motivation in student learning has been a fascinating topic for motivation theorists. The interest in student motivation for this thesis actually originated during teaching experiences with medical students; in the observations of different types of students, their different approaches to learning and their academic performances, which were sometimes in line with their motivations and sometimes these motivations failed to translate into good academic performances. There was an overarching observation that the curriculum, the learning environment, the teachers and the culture of the institution had influence on the attitudes and motivations of the students and their study methods. This thesis was a means to investigate these hypotheses.

Motivation and learning are integrally related.[28] The how and why of this relationship are not known and hence are very interesting to investigate. In general, motivation has been studied mainly among primary, secondary and high school children, studies on college or university students being few in number. The study of motivation in medical education seems to still be in its infant stages. The broad aims of this thesis are to gather insights and investigate some aspects of medical students' motivations and explore how these can be utilized and applied to make medical education better suited to support these motivations.

Broad research questions

1. Is motivation a predictor for learning and academic performance in medical students?
2. Can motivation be stimulated among students?
3. What factors affect motivation?
4. Do valid and reliable scales exist for measurement of motivation particularly in medical students?
5. Has motivation been considered as a variable affecting learning and performance in medical education?
6. If yes, has it been an important consideration in the arrangement of medical curricula?
7. Do theories in general education apply to medical education?

8. Can we derive learning from motivation research in general education and apply it to medical education?
9. Can teachers influence or stimulate student motivation? If yes, how?
10. How should motivation be studied in medical students?

This thesis explores the concept of motivation to create deeper understanding, establishes the relevance of studying and working with student motivation and discusses the applications of this understanding in the medical education context. It starts with how motivation has been an undervalued component in designing of medical curricula (Chapter 2) and proceeds to review all the research that has been conducted on motivation in medical education (Chapter 3). It establishes a gap in the literature on this issue and hence the need to actively study motivation both as a dependent and an independent variable in medical education. Then it establishes the validity evidence for measurement of quantity of motivation with the help of the questionnaire Strength of Motivation for Medical School (SMMS) (Chapter 4). Then it establishes the influence of motivation as an independent variable on dependent variables like study effort, study strategies, academic performance and well-being of students through two different and novel approaches and types of analyses, i.e. motivational profiling (Chapter 5) and structural equation modelling (Chapter 7). It then puts forth a new approach towards studying motivation which combines quality and quantity of motivation (Chapter 6). Then it explores motivation as a dependent variable and the importance of the factors of age, maturity, gender and educational background in influencing motivation (Chapter 8). Towards the end it gives applications of Self-Determination Theory of motivation in medical education (Chapter 9) in a variety of situations and practical tips (Chapter 10) on how to enhance intrinsic motivation in medical students.

The specific research questions addressed in this thesis are:

1. Is enough consideration given to student motivation during development of medical curricula? (Chapter 2 - A literature review)
2. How has motivation been studied in medical education research? What are the specific research findings on medical student motivation? (Chapter 3 - A literature review)
3. What is the validity and reliability evidence for Strength of Motivation for Medical School (SMMS) questionnaire, which is a questionnaire measuring particularly motivation for medical school? (Chapter 4 – Empirical research)
4. Which motivational profiles exist among medical students? How are they associated with study strategy, study effort, academic performance and exhaustion from study? (Chapter 5 – Empirical research)
5. What is the value of studying motivation as a combination of quality and quantity? What are the implications of this approach in research and practice? (Chapter 6 – A literature review and perspective paper)
6. How does motivation affect academic performance in medical students? What are the interrelationships between motivation, study strategy, study effort and academic performance? Are they similar in subgroups such as males and females and students admitted to medical study through qualitative selection and those admitted through weighted lottery selection? (Chapter 7 – Empirical research)
7. What are the effects of age, gender and educational background of medical students on their strength of motivation for medical school? (Chapter 8 – Empirical research)
8. How Self-Determination Theory (SDT) of motivation can assist our understanding of the teaching and learning processes in medical education? (Chapter 9 – A literature review and perspective paper)

9. What are the practical tips for medical teachers to stimulate intrinsic motivation among their students? (Chapter 10 – A perspective paper based on SDT literature)

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Chapter 2

Development of motivation theories and how they relate to development of medical education

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Abstract

Background

Educational psychology tells us that learning processes can be mapped on three dimensions: cognitive (what to learn), affective or motivational (why learn) and metacognitive regulation (how to learn). In a truly student-centred medical curriculum, these dimensions should all guide curriculum developers in constructing learning environments.

Aim

The authors explored how the motivation dimension of learning has guided curriculum developments in medical education.

Method

The authors reviewed the literature on motivational theory related to education and on curriculum developments in medical education to determine the extent to which motivation theory has guided curriculum developers.

Results

Major developments in understanding the field of motivation related to education have been that motivation drives learning and influences academic performance, that gender differences exist in motivational mechanisms, and that a shift of focus has occurred from quantity to quality of motivation and its determinants, and how they stimulate academic motivation.

Major developments in medical curricula have been the introduction of standardized, regulated and licensed, problem-based, learner-centred, integrated teaching, outcome-based and community-based education approaches. All these curricular developments have been more based on improving either cognitive processing of content or metacognitive regulation, or both, than on stimulating the motivational component.

Conclusion

Recognizing motivational processes may be a substantially undervalued factor in curriculum development. Building curricula to specifically stimulate motivation may powerfully influence the outcomes of curricula. The elements essential for stimulating intrinsic motivation in students, including autonomy support, adequate feedback and emotional support, appear lacking as a primary aim in many curricular plans.

Development of motivation theories and how they relate to development of medical education

Introduction

Medical education has changed dramatically over the years, including the way medical educators view curricula, the methods and content of teaching and learning, the assessments and the competencies required for doctors.[1, 2] Educational psychology tells us that learning processes can be mapped on three dimensions: a cognitive dimension (what to learn), an affective or motivational dimension (why learn) and a metacognitive regulation (how to learn) dimension.[3] The cognitive component of learning involves those thinking activities that people use to process learning content including selecting, relating, concretizing and applying information.[3, 4] The affective component of learning involves coping with the feelings that arise during learning, and may positively, neutrally or negatively affect the progression of a learning process[3, 4]; motivational aspects are included in the affective component. The metacognitive regulation component of learning involves orienting, planning, monitoring, testing, diagnosing, adjusting, evaluating and reflecting one's learning behaviour and approach.[3, 5, 6] In a truly student-centred medical curriculum, these dimensions should all guide curriculum developers in constructing learning environments.[7] The Learning-Oriented Teaching Model (LOT) model describes these three components of learning, cognitive, affective and metacognitive, in medical education.[7]
Curriculum developments in medicine have been guided much by content concerns. The curriculum should cover the topics and issues that align with the intended outcomes and serve the needs of society, content experts and students. The 'what to learn' dimension has dominated curriculum reform for a very long time. A variety of educational theories

have influenced curriculum developments. Questions on how to best present materials, structure and integrate elements of the curriculum, sequence topics, apply methods, and assess students have been important issues of deliberation.[8] Each of these appears to serve predominantly the processing of information.[6] The style of learning in medical education has been affected by the introduction of problem-based learning and related methods, focusing on the 'how to learn' dimension.[9-11] The affective or 'why learn' level has received some attention. For example, studies have shown that students "like" problem-based learning better than traditional teaching methods.[12-14] This appears to be a by-product of particular curricula, rather than a systematic approach to build a curriculum that predominantly focuses on motivation to learn.

We believe that for individual students, their level and type of motivation may be a larger determinant of their outcome than particular methods of teaching and should deserve serious attention by curriculum developers.[15] As motivation can be influenced by the construction of a curriculum[16], in this paper we aimed to explore and analyze how motivational theory has affected curriculum development in medical education.

Motivation determines thought and action - it influences why behaviour is initiated, persists and stops, as well as what choices are made.[17] Motivation (academic) and learning are integrally related[18], meaning that for learning to take place, motivation is important.[19] We would like to focus in this paper on motivation in education, particularly medical education. Motivation in education is important for deep learning, good academic performance, positive learner well-being and satisfaction.[20-22] In the case of medical education these are expected to contribute towards students becoming good doctors. In spite of the implicit understanding of motivation's importance, research directly studying motivation in medical

education is scarce.[23] This review was performed to answer the following research question:
Has student motivation been an important element in guiding curricular changes and reforms in medical education?

Method

To examine our question, we reviewed selected sources in the literature of both motivation and curricular development in medical education.
We first searched Google Scholar database using the keywords “motivation theories”, time period up to 2010, to identify all published theories in motivation. We then searched the texts on motivation and motivation theories[24, 25] which we found in the references of the articles from Google Scholar. RAK conducted all the searches and made a comprehensive list of all the theories. The theories relevant to student motivation were then identified and after discussions with GC, KVM, EC and ThJtC included by consensus among the authors.

To identify the literature on curriculum developments in medical education, we relied on the expertise and experience of the authors (EC, KVM and ThJtC) in this subject and made a comprehensive list of the major curricular reforms. RAK searched for the first articles published on each curricular reform in PubMed and Google Scholar. This search was conducted from June-July 2011, entering each curricular reform as the keyword. More articles describing more details of these curricular reforms were added through suggestions by KVM, ThJtC, EC and GC. This review was not performed as a comprehensive, systematic review as our goal was to answer a focused research question which was to particularly find out the extent to which motivation theory has guided curriculum developers in medical education.

The Learning-Oriented Teaching model (LOT model) was selected as a framework within which to view the various curricular developments, since it is derived directly from the three components of learning processes described in educational psychology.[3, 7] RAK rated the curricular reform articles according to how much they were oriented towards cognitive, motivational and metacognitive elements. The motivational element was scored on the basis of implicit or explicit mention of consideration of student motivation in the design of the model. KVM and ThJtC confirmed the conclusions or suggested changes which were finalized after consensus.

Results

The results are presented as a narrative of the development of motivation theories and the recommendations that can be derived from these theories for education; this is followed by a summary of the history of medical education, and which components of the Learning-Oriented Teaching model have been captured by different curricular developments, with the main focus on the motivational component.

Short history of motivation theory

The development of theories of motivation is a fairly recent phenomenon dating back only to the twentieth century. *Need to Achieve theory* by Henry Murray (cited by[24]) (1938) was based on his observation that people have differing tendencies, called “the need to achieve” to “overcome obstacles, to exercise power, to strive to do something difficult as well as and as quickly as possible”. Murray devised the Thematic Apperception Test (TAT) to measure variations in human motivation. Murray describes a dynamic, time and context-dependent construct of motivation. This description did not view motivation as a fixed trait but as one that could be manipulated to enhance learning.

Clark Hull's (cited by[25]) (1943) theory of learning, the *Drive theory,* proposed that needs drive behaviour in a way that results in fulfilment of these needs, thus maintaining a steady state in the body. He even developed a formula for calculating motivation.[25]

The *Theory of hierarchy of needs* by Maslow[26] (1943) was based on the relative importance of the different needs in a person's life.[26] Maslow proposed that basic human drive or motivation ultimately reflects a need for self-actualization, i.e. the fulfilment of one's potential, which comes into action only if the underlying basic needs, physiological, safety, love and belonging and esteem needs, are satisfied. The need for education and academic achievement can be viewed as reflective of the wish to develop as an individual, and thus would fall into the self-actualization level of needs.

In 1953, McLelland[27] developed a precise method for scoring achievement motivation. He demonstrated that a generalized motivation does exist in every individual that can predict the behaviour of that individual in a wide variety of situations. The underlying motivational construct seems stable and predictive for behaviour.

Atkinson's[28] (1966) *Expectancy-value theory* proposed that every individual has both a 'motivation to succeed' and a 'motivation to avoid failure' and that the overall motivation of an individual is a resultant sum of the above two dimensions. He also found that motivation is dependent on motive, expectancy of success or failure and incentive value of success or failure, and devised a formula to approach motivation of an individual in a quantitative way. He also proposed that motivation and effort would be the strongest when reaching the target was neither too easy nor too difficult.

Motive to Avoid Success Theory by Martina Horner[29] (1968) added a gender aspect to motivation by suggesting that women showed lower achievement motivation than men because of a greater "Fear of Success" than men, which grows out of consideration of the consequences of success. For women, according to Horner, success may mean loss of friends, femininity and popularity.[29] Janet Spence[30] (1978) compared men and women on their achievement motivation and showed that men scored higher on a desire for intellectual challenge, and competitiveness, whereas women scored higher on a desire to work hard. This paved the way for establishing gender differences in motivation, also observed in current research.[31, 32]

Attribution theory (1974) is concerned with "how individuals interpret events and how this interpretation relates to their thinking and behaviour".[33] Weiner identified ability, effort, task difficulty, and luck as the most important factors affecting attributions for achievement.[33]

Social Cognitive Theory (SCT), by Bandura (1977), proposed that people function as contributors to their own motivation, behaviour, and development within a network of reciprocally interacting influences.[34] The concept of self-efficacy is central to SCT[34], meaning that judgements of self-efficacy determine how much time and effort an individual invests in an activity. Thus, people generally undertake, perform and persist at activities which they believe themselves to be capable of performing and avoid activities which they feel incapable of performing.[34]
Self-Determination Theory (SDT), by Deci and Ryan[20-22, 35], proposed that it is not only the level of motivation that is important, but also the quality or type of motivation that determines behaviour. Two different types of

motivation were elaborated: intrinsic motivation, which made a person pursue an activity out of personal interest, and extrinsic motivation, which made a person pursue the activity to obtain reward or avoid loss or punishment. SDT puts forth intrinsic motivation as the desired type of motivation as it was found to lead to deep learning and better outcomes.[20-22] Intrinsic motivation is built on the inherent needs of autonomy, competence and relatedness. The need for *Autonomy* describes the need to feel that, "I am doing it because I want to". The need for *Competence* is about feeling that one has the capability to achieve one's desired goals. The need for *Relatedness* describes being able to relate or matter to significant others, i.e. parents, teachers, friends and peer group, in one's life through work, actions and achievement. In medical education patients could also be "significant others".[15] These three needs must be satisfied for a person to be intrinsically motivated. SDT steered the research on motivation towards quality of motivation. We have explained SDT in more detail than the other theories as it is considered to be very relevant in medical education[15, 23, 36-38] and we have expanded on applications of this theory in the discussion.

Goal Theory, made popular by Pintrich[39], explains motivation of individuals on the basis of their goal orientation: mastery goal orientation and performance goal orientation. Mastery goals are those goals when the individual is focused on mastering, learning and understanding the task, whereas performance goals are those goals when the individual is focused on performing better in comparison to others at the task.

Conclusions and recommendations which can be derived from these different theories for education are summarized in Table 1.

Table 1 Recommendations and conclusions for education derived from different theories of motivation

Theory and Author	Year	Conclusions	Recommendations derived by the authors for education
Need to Achieve Theory[24], Murray H	1938	Motivation of students is context and time dependent.	It is important to consider student motivation for learning to occur because it can be enhanced by educators.
Drive theory[25], Hull C	1943	Needs drive behaviour which results in satisfaction of these needs.	Understanding the needs of the students can help educators to arrange education in a way that enhances student motivation.
Theory of Hierarchy of Needs[26], Maslow A	1943	“Self-actualization” i.e. fulfilling one’s potential is a need, which comes into action only if one’s basic needs are satisfied.	If we desire students to work up to their potential in education, their physiological, safety, love and esteem needs should be satisfied.
McLelland J[27]	1953	There is a generalized motivation which is stable in all situations. It is inborn or depends on experiences during childhood.	It is important to focus on motivation during childhood and school years.
Expectancy value Theory[28], Atkinson J	1966	Overall motivation of an individual is a sum of motivation to succeed and motivation to avoid failure. Motivation is dependent on motive, incentive value of success/failure and expectancy of success/failure.	It is important to provide optimal challenges to students in learning, as the efforts are strongest when the task is neither to easy nor too difficult.

Fear of success[29], Horner M	1973	Women have an additional dimension in motivation which is called "Fear of Success".	Gender differences in motivation should be given due consideration while planning education.
Attribution Theory[33], Weiner B	1974	Individuals attribute their successes and failures to different factors, both internal and external to them. These attributions determine their further motivation and behaviour towards the task.	To be able to motivate students, we need to understand what they attribute their successes or failures to.
Social Cognitive Theory[34], Bandura A	1977	Individuals control their own motivations and behaviour within the network of their social environment	To be motivated for a task, including learning, an individual needs to feel self-efficacious at this task.
Self-Determination Theory[20-22, 35], Deci & Ryan	1985	An individual can have two types of motivations: intrinsic and extrinsic. Intrinsic motivation is the desirable type of motivation for all activities including learning/education. Rewards drive extrinsic motivation and reduce intrinsic motivation.	In order to enhance intrinsic motivation among students their needs for autonomy, competence and relatedness should be satisfied.
Goal Theory[39], Pintrich P	2000	Motivation of an individual, also in education, is driven by goal orientation, which can be of two types of goals: mastery and performance. Mastery goal orientation	Mastery goal orientation is the preferred type of orientation in students.

	focuses on mastering a task, whereas performance goal orientation is towards being better than others.	

Thus, during the development of motivation theories, the focus shifted from consideration of only the quantity of motivation[24, 25, 27, 28] to consideration of the quality of motivation[20, 33, 34, 39]. A large body of literature exists in general education about intrinsic and extrinsic motivation and how to enhance intrinsic motivation. This change is also reflected in the fact that SDT, SCT, Goal theory and Attribution theory, which focus on a qualitative approach, are currently considered most relevant in addressing motivation. Thus, in keeping with current understandings, the focus should not be solely on enhancing the quantity of motivation in our students, but also on its quality.

History and development of medical education

In this section, we turn to selected developments in medical education that have been significant. At the outset, we would like to note that all of the developments mentioned below are not seen uniformly in all medical schools or all countries. Within agreed upon standards of quality, each medical school follows its own philosophy and mission and integrates some of the changes mentioned above which are suitable for its ideology and context. Also, these changes may not have been brought into practice completely, and some may still be in stages of development.

Most of the written history of the development of medical education dates back to the eighteenth century in the USA[40] and earlier in Europe[41]. Medical education in the USA started mainly as an *Apprenticeship Model*[40] which was dependent on the practitioner-teacher under whom the apprentice obtained training and was not regulated by any authoritative body. This model seems to be based on improving the cognitive and metacognitive regulation components of learning. Licensure became the norm in Europe in the 1800s[41] and in 1910, the USA[2, 42] decided to require all medical teaching schools to meet requirements for common standards of quality. In the USA, this curriculum reform strongly took this direction after the Flexner report was published.[2, 43] Flexner recommended to the Carnegie Foundation that the entry qualifications for medical study should be a bachelors' degree in science, and that the medical curriculum should consist of two years of basic sciences followed by two years of (practical) clinical education which should involve close contact with patients.[42] This curricular change was based again on bettering the cognitive component of learning. Flexner's view of the importance of basic sciences in the medical curriculum influenced medical education not only in the USA, Canada and some parts of Europe[44], but also Asia[45]. Following the Flexner report, the separation of basic sciences and clinical education grew so profound[40] that reports emerged that students found it difficult to see the relevance of studying basic sciences to their goal of becoming a doctor, thus losing their interest in the study of medicine.[8, 46]

In 1952, Case Western Reserve University, USA, adapted an integrated approach in medical education; the central themes included teaching based on problem solving, students accepting responsibility for their own education, curriculum designed as a continuum by faculty subject committees instead of departments, interdisciplinary teaching and integration of basic sciences with clinical sciences.[8, 47, 48, 49] The concepts of problem solving and integration of disciplines were developed further in other universities at a later time.[8]

A major development in curricular approaches to learning medicine was the introduction of a *Problem-Based Learning* Model (1968), based on the assumption that problem-solving skills form the basis of being a good diagnostician and health care provider.[50] One important theme underlying PBL is elaborating students' prior knowledge.[37, 51, 52] In this model, information is presented to the students in the form of clinical cases or health-related problems and they are asked to delve into the relevant information from basic, clinical and social sciences and connect this with their existing knowledge. PBL asserts claims that students should own the responsibility for learning; further, teachers in PBL are expected to make a transition from disseminating information to facilitating learning.[37] Thus, problem-based learning was also built around the concept of self-directed learning, which serves the metacognitive regulation of learning.[6, 50, 53] The goals of this type of model or the original description do not include any consideration of student motivation, except as a part of the selection procedure for admission.[37, 50] Motivation of students has been mentioned in this context as an advantage.[50] We conclude that consideration of motivational processes, especially in the context of small group and application-oriented learning, was implicit. Thus this model was based on improving the cognitive and metacognitive components of learning and the improvement of the motivational component became apparent as the model was implemented.[37, 51]

Integrated Curricula (1995) were established with the aim of placing each discipline and the matter taught by it in the context of all other disciplines or in the broader context of medical education.[54] Within this approach, horizontal integration meant integration across the medical subjects taught in a particular year or phase of the program and vertical integration meant integration of pre-clinical and clinical sciences.[54-56] *Vertically Integrated Curricula* were introduced with the aim of placing basic sciences in the context of clinical practice and to introduce early contact with patients.[54, 56-58] One of the stated advantages of early contact with real patients is stimulating student motivation for learning.[54, 59, 60]

Outcome-Based Education (1998) takes the desired outcomes of the educational program as the basis of developing a curriculum.[61] The development of curriculum is thus based on the question "What sort of doctors do we want to produce?"[62] This type of model was able to better address outcomes beyond the individual learner, such as meeting the health needs of society. CanMEDS[63] and ACGME (Accreditation Council for Graduate Medical Education, 1998) competency frameworks[64] provided further tools to establish outcome-based education in practice and ways to assess this model objectively. Although developed to guide medical education at the postgraduate or graduate level, they have provided important models for undergraduate programs as well.[65]

In 1999, Harden described how a spiral curriculum, first described by Bruner in 1960, can be created in medical education.[66] This approach was described to highlight especially that the repetitive organization of content and the overall structure of the curriculum are neglected in medical curricula. A spiral curriculum allows for building of knowledge in layers, i.e. moving from simple facts to more complicated understanding, thus an iterative revisiting of topics. More recently, we find the description of Z-shaped curricula[58, 67] which are based on vertical integration of basic and clinical sciences.

The *Experience-based Learning Model* (first described by Eraut[68] as learning in the workplace) is based on the concept of "participation in practice". It is related mainly to clinical learning, and the learning spectrum ranges from passive observation to performance of the tasks of a doctor.[58] Students are given responsibility of patients in a graded manner. This helps to give students hands on experience in context-based scenarios and also confidence in their competence, as well as allowing them to learn from their peers, and from others in the environment. The model is consistent with an emphasised metacognitive component of learning and the motivational component is considered.[60]

A very recent curricular development in medical education has been *Longitudinally Integrated Clerkships (LIC)* Model[69], designed with the aim of creating doctors who are broadly educated across the key competencies of medicine, have the knowledge and skills to enter graduate training and exhibit high levels of professionalism and patient-centered orientation. LICs combine patient care in various disciplines, in the way patients experience it; the focus is on following patients, so as to understand the course and complexity of their illness, and to enable formation of continuity in relationships. The consideration of motivation in this model is implicit; however it assumes that relationships and connections will be enhanced for learners. This model is still in the development and testing stages, as the first cohorts of students from this model of curriculum have graduated very recently. Thus, the effects and effectiveness of this curricular model remain yet to be demonstrated.

The SPICES model, described by Harden et al.[70], analyses curricular structures on the basis of the following characteristics: student-centred (S); problem-based (P), integrated (I); community-based (C); with electives (E) and with a systematic approach to clinical education (S).[70]
Although this model precedes some of the other models we have presented, it offers a helpful framework to sum up the major developments in medical education curricula, which are:

1. Practitioner teacher-dependent teaching has changed to more standardized teaching formats.[44, 70]

2. Unregulated, subjective teaching or training approaches have changed to more standard objectives-based teaching, which followed a curriculum.[44]
3. Specialty and discipline based educational approaches have changed in some medical schools toward more integrated approaches.[8]
4. Teacher-centred curricula and approaches have changed to an emphasis on learner-centred teaching approaches.[2, 70]
5. Isolated teaching of basic and clinical sciences is being replaced by integrated teaching approaches.[70]
6. The view that competence required only diagnostic and management skills has evolved to a more broad-based educational approach which includes other competencies like communication skills, collaboration skills, professionalism etc.[44]
7. Knowledge-based assessment has evolved toward competency-based assessment.[44]
8. In some medical colleges, hospital-based training education has changed to include community-based or rural practice-based education.[70]

It is helpful to view each of the models in relation to the LOT framework, involving cognitive, affective and metacognitive aspects of learning; this has been outlined in Table 2.

Table 2 Curricular trends in medical education and how they are oriented towards different components of learning, as suggested by the LOT model

Year of origin	Curricular trends	Oriented to cognition	Oriented to motivation	Oriented to metacognitive regulation
18th &19th century	Apprenticeship model[40]	++	--	+
1910	Flexner model[2, 43]	++	--	--
1952	Case Western Reserve University model[47]	++	+, implicit	++
1968	Problem-Based Learning model[48]	++	+, implicit	++
1995	Integrated curricular model[52-55] – Horizontal & Vertical	++	+, implicit	++
1998	Outcome-Based Education[59]	++	--	++
1999	Spiral curriculum model[64]	++	+, implicit	++
2004	Experience-based Learning model[58]	++	++, still in the process of development	++
2005	Longitudinally Integrated Clerkships (LIC) model[67]	++	+, implicit	++

+ low, ++ high

Motivation and Medical education

The LOT model describes three components of learning: cognitive, affective and metacognitive regulation.[7] If we view curricular developments in medical education from the perspective of this LOT model, we observe that, in general, curricular developments have been largely based on improvement of the cognitive component of learning (see Table 2). Some developments like PBL, integrated curricula, outcome-based education, experience-based learning and community-based education are also based on expected improvement of the metacognitive regulation component of learning and most of these approaches incorporate affective outcomes. Consideration of the motivational component in many curricular changes has however been either implicit or recognized in retrospect or is still in development (experience-based learning model[60]). It appears that student motivation has not been a predominant driver of curriculum reform. Mainly it has implicitly been assumed as a natural by-product and outcome in medical education. Not many explicit writings on student motivation are found in the medical education literature; one of the most elaborate ones that considers motivation dates back fifty years.[71] We could not establish that medical curriculum developers have often deliberately used motivation as a focus of attention. Nevertheless, some of the developments in medical education have resulted in stimulation of student motivation[55, 59] as a side-benefit. In these cases, the motivational aspect has been explicitly adopted, and is now considered an aspect of those developments.

We suggest that specifically integrating stimulation of student motivation, both quality and quantity, into the way education is planned, delivered and assessed, could be a useful educational philosophy for the future.

Discussion

In our current paper we found that student motivation has not been a predominant driver of curriculum reform. Examining the concepts described in the different motivation theories, we find that motivation theorists have often emphasised the importance of motivation in learning and education. However, developers of medical education have appeared to undervalue the importance of deliberate attention to motivation.
Concepts in student motivation are important as an integral part of the foundation of medical curricula. In particular, the concept of stimulating intrinsic motivation among medical students, i.e. learning for the sake of learning and patients, rather than extrinsic motivation, and learning for good grades or honours or success or money, is important. Intrinsic motivation has been shown to lead to better learning, performance and well-being in medical education.[32, 72]

According to SDT, it is essential to support the needs of autonomy, competence and relatedness of students in order to stimulate intrinsic motivation and inculcate a true love for learning and practice.[21, 22] Non-fulfilment of these needs was found, in a Netherlands based study which interviewed post-graduate doctors in training, to lead to consideration of withdrawing from specialist training.[74] Curricular models like PBL, vertical integration, workplace learning and LIC do address issues of student interests and motivations. What appears to be given less attention in curricular planning is enhancing student autonomy, providing emotional support to the students and giving importance to effectively provided feedback[71] on learning. Feedback needs to address the issue of the gap between what students have understood and what is expected, i.e. feedback on the process of learning and not just in the form of grades.[73] Hattie and Timperley outline how feedback maybe provided to students but may not be effective and also describe a model for giving effective feedback.[73] The Cleveland Clinic Lerner College of Medicine curricular model is an example of a 'feedback rich' model which is aimed at improving student competence with formative feedback, as no summative grades are given.[75] One of the challenging issues for stimulating student motivation is the existence of control-oriented teaching[37] and assessment systems stemming from the (perhaps too narrow) understanding that "Assessments drive learning"[76]. It is important to use assessments to give feedback on performance and gaps in knowledge and skills, if the ultimate objective is indeed to foster student learning.[6] If feedback is not given on these assessments in an effective way, we actually risk stimulating greater extrinsic motivation among students which is driven by grades. Thus the current medical education system through some means fortifies students' motivation, but also erodes their motivation through other means. In particular, not much attention is paid to stimulating the desired kind of motivation, as recommended by SDT, which is intrinsic motivation[22]. Thus quality of motivation suffers in the trade-off.

It is time to ask ourselves to reflect upon what kind of students and future doctors we would like: those who are intrigued and interested in medicine and thus in lifelong learning or those who carry superficial concepts and need incentives and regulations to keep up with new advances in the science and practice of medicine. What medical educators[77], patients and society[77] desire are doctors who are interested in the study and practice of medicine and who like caring for and relating to patients, not doctors whose main goal of practice is to achieve external reward and recognition. We predict that intrinsically motivated doctors and the philosophy of teaching which is geared to stimulate intrinsic motivation could lead to doctors who engage in lifelong learning (autonomously instead of being controlled by licensure and rules), which is so important in medicine. Even if society and the working conditions of the health care system are not geared toward stimulating intrinsic motivation of doctors, we as educators may at least shape our education to contribute to it.

In two recent publications[15, 16] we have provided many suggestions how to apply motivation theory (Self-Determination Theory) in practice in medical education and curriculum development.

Limitations

The most important limitation of our review is that we have been able to reach the stated conclusions based only on the published literature on curricular reform. It is possible that curricular reforms taking place at individual schools, which are unpublished, have incorporated elements of student motivation.

We are also aware that we have been unable to elaborate fully all the theories of motivation or the rich history of medical education, both because the topics are complex, and, secondarily, because our intention was to include only the details relevant to motivation in medical education.

Conclusion

Curriculum development has focused on educational development that fosters the cognitive component of learning, sometimes fosters the metacognitive regulation component of learning; however, developments in medical education appear to have undervalued student motivation. Attention to student motivation is important to include as an integral part of the foundation of medical curricula. The elements essential for stimulating intrinsic motivation in students which should be included in curricular planning are student autonomy, adequate feedback on learning and emotional support.

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Chapter 3

Motivation as an independent and a dependent variable in medical education: A review of the literature

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Abstract

Background

Motivation in learning behaviour and education is well-researched in general education, but less in medical education.

Aim

To answer two research questions, "How has the literature studied motivation as either an independent or dependent variable? How is motivation useful in predicting and understanding processes and outcomes in medical education?", in the light of the Self-determination theory (SDT) of motivation.

Methods

A literature search performed using the PubMed, PsycINFO and ERIC databases resulted in 460 articles. The inclusion criteria were empirical research, specific measurement of motivation and qualitative research studies which had well-designed methodology. Only studies related to medical students/school were included.

Results

Findings of 56 articles were included in the review. Motivation as an independent variable appears to affect learning and study behaviour, academic performance, choice of medicine and specialty within medicine and intention to continue medical study. Motivation as a dependent variable appears to be affected by age, gender, ethnicity, socioeconomic status, personality, year of medical curriculum and teacher and peer support, all of which cannot be manipulated by medical educators. Motivation is also affected by factors that can be influenced, among which are, autonomy, competence and relatedness, which have been described as the basic psychological needs important for intrinsic motivation according to SDT.

Conclusion

Motivation is an independent variable in medical education influencing important outcomes and is also a dependent variable influenced by autonomy, competence and relatedness. This review finds some evidence in support of the validity of SDT in medical education.

Motivation as an independent and a dependent variable in medical education: A review of the literature

Introduction

The importance of motivation in learning behaviour and education is well-researched and proven in general education, but much less in medical education. White & Gruppen highlight that research relevant to motivation needs to become a greater focus in medical education.[1] The interest of medical educators in motivation is on the rise, especially in the last decade. Three major viewpoints[2-4] bring to light the issues that form the starting point for the current review: To what extent are medical students intrinsically or extrinsically motivated? Why do we need to know? Which type of motivation is useful in medical education?

Research in medical education can derive a lot from the wealth of literature in general education, where motivation has been shown to be a predictor for learning, academic success, persistence or continuation in a study and well-being.[5-7] There are several reasons why motivation of medical students could be different from general education students. Medical education is not typical for higher education because of the intertwining with clinical work. Unlike general education, where students have a wide variety of choices to do different things and create unique profiles for themselves, medical education works toward one restricted and clearly defined profession. The environment within which teaching and learning occur is highly specific. Also, medical students are considered highly motivated from the outset having gone through considerable effort

to enter medical school. These arguments underlie the rationale for studying motivation particularly in medical students.
Looking into the basic foundation of motivation research, there are many different theories of motivation, the major ones being Hierarchy of needs theory[8], Need to Achieve theory[9] (Murray, cited by[9]), Expectancy-value theory[10], Attribution theory[11], Social Cognitive Theory (SCT)[12, 13], Goal Theory[14] and Self-determination theory (SDT)[15].

Most of the abovementioned theories explain issues on the basis of the level of motivation. Self-determination theory (SDT) explains issues based on the quality of motivation. It argues that even if the level of motivation in an individual is high, different qualities of motivation will result in very different outcomes[4]. SDT is a general motivation theory which holds true for different aspects of motivation in an individual's life, including education and learning.

SDT postulates that human beings have a natural tendency to develop towards self-determination.[15] Motivation is a continuum (Figure 1) with intrinsic motivation at one end of the spectrum and amotivation (lack or absence of motivation) at the other. Intrinsic motivation makes a person pursue an activity for personal interest or enjoyment. It is the most autonomous/self-determined form of motivation. Extrinsic motivation makes a person pursue an activity for a separable outcome i.e. to obtain a reward or to avoid a loss. Extrinsic motivation has different levels of self-determination, hence is composed of four different stages: external regulation, introjected regulation, identified regulation and integrated regulation. "External regulation", in the case of education, means studying because of pressure or expectation of others, without interest in the study. "Introjected regulation" means there is realization of the importance of the study but the causation is perceived as external. "Identified regulation" means that the importance of study is valued, has been identified with and the regulatory process has been accepted. “Integrated regulation” means that the acceptance of the importance ascribed to the study has been fully integrated into the individual’s coherent sense of self; the locus of causation is now internal. Self-determination, the regulation type that fits with intrinsic motivation, means that one determines one’s own motivation; the motivation is self-generated and autonomous. External regulation is the least and integrated regulation is the most self-determined regulation of extrinsic motivation.

Figure 1 The Self-determination continuum

Amotivation	**Extrinsic motivation**				**Intrinsic motivation**
	External Regulation	Introjected Regulation	Identified Regulation	Integrated Regulation	

Least autonomous $\longrightarrow$ Most autonomous

Many studies have combined intrinsic motivation, integrated and identified regulation as autonomous motivation and introjected and external regulation as controlled motivation.[16] Amotivation signifies the state in which a person lacks the intention to act.[16-18] Intrinsic motivation is built on the inherent needs for “autonomy”, “competence” and “relatedness”. The need for autonomy or self-determination is related to the feeling of volition in one’s actions. The need for competence is related to one’s feelings of capability in achieving the target. The need for relatedness concerns the desire to relate to the significant others in one’s life through work and achievement. Significant others could be parents, teachers, colleagues, peers or others; in medical education and practice it could even mean patients. Fulfilment of these three basic psychological needs makes a person intrinsically motivated for a particular activity. SDT puts forth autonomous motivation as the desired type of motivation leading to more deep learning[6, 19], less superficial information processing[7], higher achievement[20, 21], decreased drop-out intention and behaviour[22, 23], greater creativity[24] and enhanced well-being or adjustment[25, 26]. SDT also postulates that motivation can change from extrinsic to intrinsic and vice versa depending on the feelings of autonomy, competence and relatedness a student experiences in his or her study.[27] Williams et al. describe how SDT is important in medical education.[4]

According to the general education literature, motivation influences learning and outcomes of learning for example performance.[5-7] Motivation therefore is an independent variable influencing variables like learning, academic success[5-7] etc. which become the dependent variables. Changes in the quality of motivation into more or less self-determined forms, depending on the learning experience (SDT), and level of motivation altering, depending on the feelings of self-efficacy (SCT), attributions of successes and failures (Attribution theory), expectation of success or failure and incentive value of success or failure (Expectancy-value theory), suggests that motivation is also a dependent variable. Thus, there are independent variables that influence the dependent variable 'motivation'.

This review was performed to answer these research questions:

a. How has the literature studied motivation as either an independent or dependent variable?
b. How is motivation useful in predicting and understanding processes and outcomes in medical education?

With the increasing awareness that findings in medical education research should draw on relevant educational theory[28], we have tried to understand how these variables influence motivation in the light of SDT as applied to medical education.

Methods

A literature search was designed by RAK, TJC and GC with the aim of identifying outcome variables that result from high motivation and variables that affect the quality and strength of motivation. In the first case motivation is the independent variable, in the second case the dependent variable. The inclusion and exclusion criteria were formulated by RAK, TJC and GC as described in Table 1.

Table 1 Inclusion and exclusion criteria for studies to be included in the review

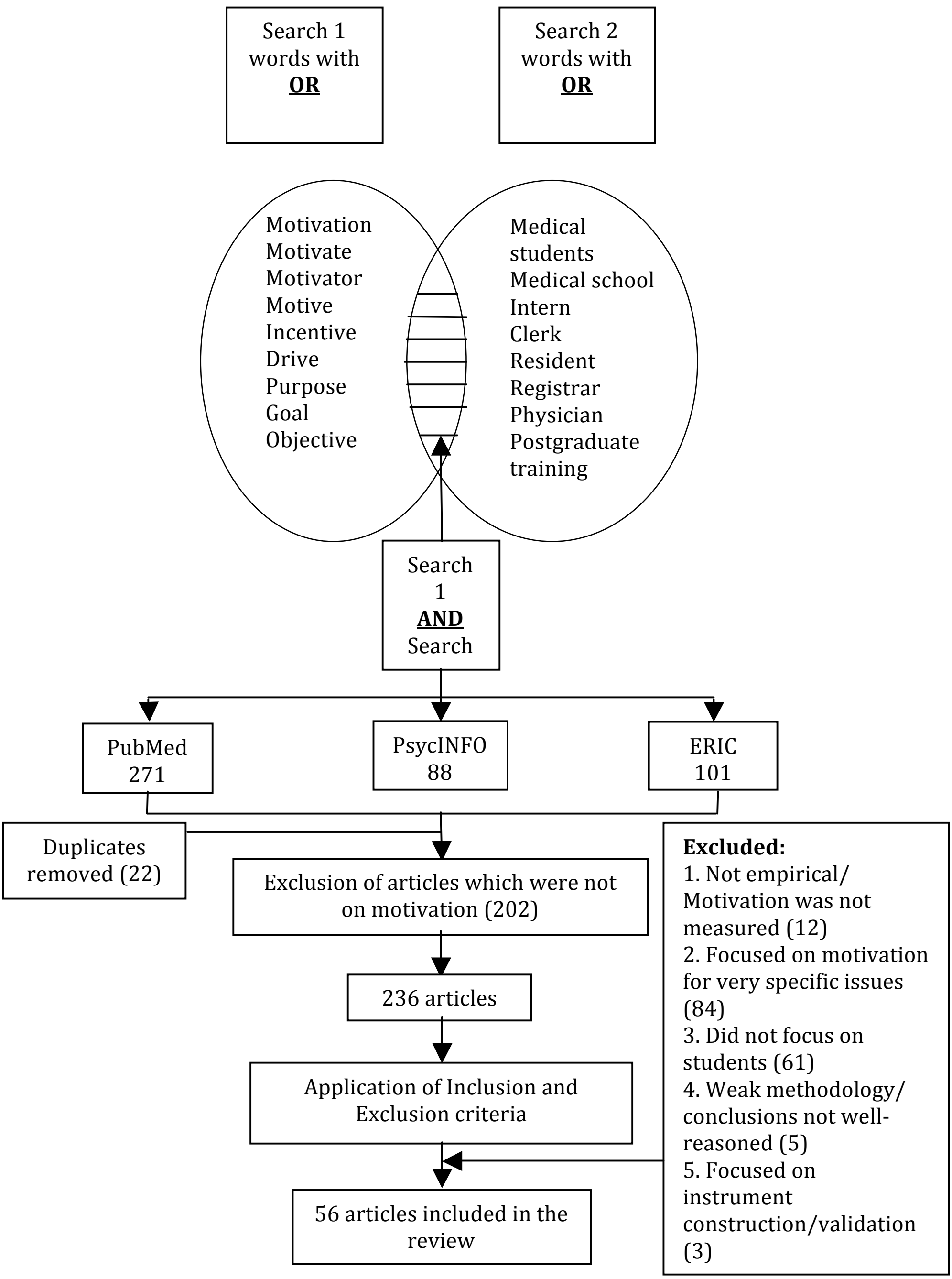
Inclusion criteria	Exclusion criteria
1. Studies/reviews on motivation which report empirical research on pre-medical, undergraduate, graduate, post-graduate medical students	1. Studies which were not empirical in nature like viewpoints
2. Studies identifying motivation for medical school/medicine/branches of medicine	2. Studies on populations other than on pre-medical, undergraduate, graduate, post-graduate medical students
3. Quantitative research studies with well-formulated definitions and operationalization of concepts, analysis of data, specific measurement of motivation	3. Studies which did not measure motivation with a valid method
4. Qualitative research studies with well-defined concepts, reliable methods (2-3 coders and consensus reached), well-reasoned conclusions and analysis.	4. Studies which measured motivation for very specific aspects like reading etc.
	5. Quantitative studies which did not have complete statistical analyses

The first literature search on motivational aspects in medical education was conducted by RAK in April 2009, but it was recently updated to include all papers from 2009 up to September 2010. This search was performed using the PubMed, PsycINFO and ERIC databases, which we expected would cover all relevant articles, and searching for the keywords 'motivation', 'motivate', 'motivator', 'motive', 'drive', 'incentive', 'purpose', 'goal', 'medical students', 'medical school', 'intern', 'resident', 'clerk', 'registrar', 'postgraduate training' (Figure 2) and using the 'explode' function for relevant terms included under these terms. Additional limits set were 'items pertaining to humans', 'in English' and '1979-2010'. Papers published in journals as well as presented at conferences were included. In the first step, RAK and MVA read the titles and abstracts, and excluded the studies which were not actually about motivation (202). In step two, since the aim was to look specifically at papers which studied factors affecting motivation and outcomes of motivation, RAK and MVA separately made further selection of papers according to the inclusion and exclusion criteria in Table 1. Any differences of opinion were debated and consensus was reached on which papers to include/exclude. A thematic analysis of the papers which were to be included was conducted. RAK and MVA coded the papers separately according to the different themes and reached consensus on the inclusion of papers under relevant themes. All authors agreed on the themes described in the results. After the thematic analysis a higher level analysis was performed by all authors to combine the themes and describe the findings in the light of the SDT.

Results

The total number of papers found initially was 460; 271 from PubMed, 88 from PsycINFO and 101 from ERIC (Figure 2). Out of these 460 articles, 202 were excluded because they were not studying motivation.

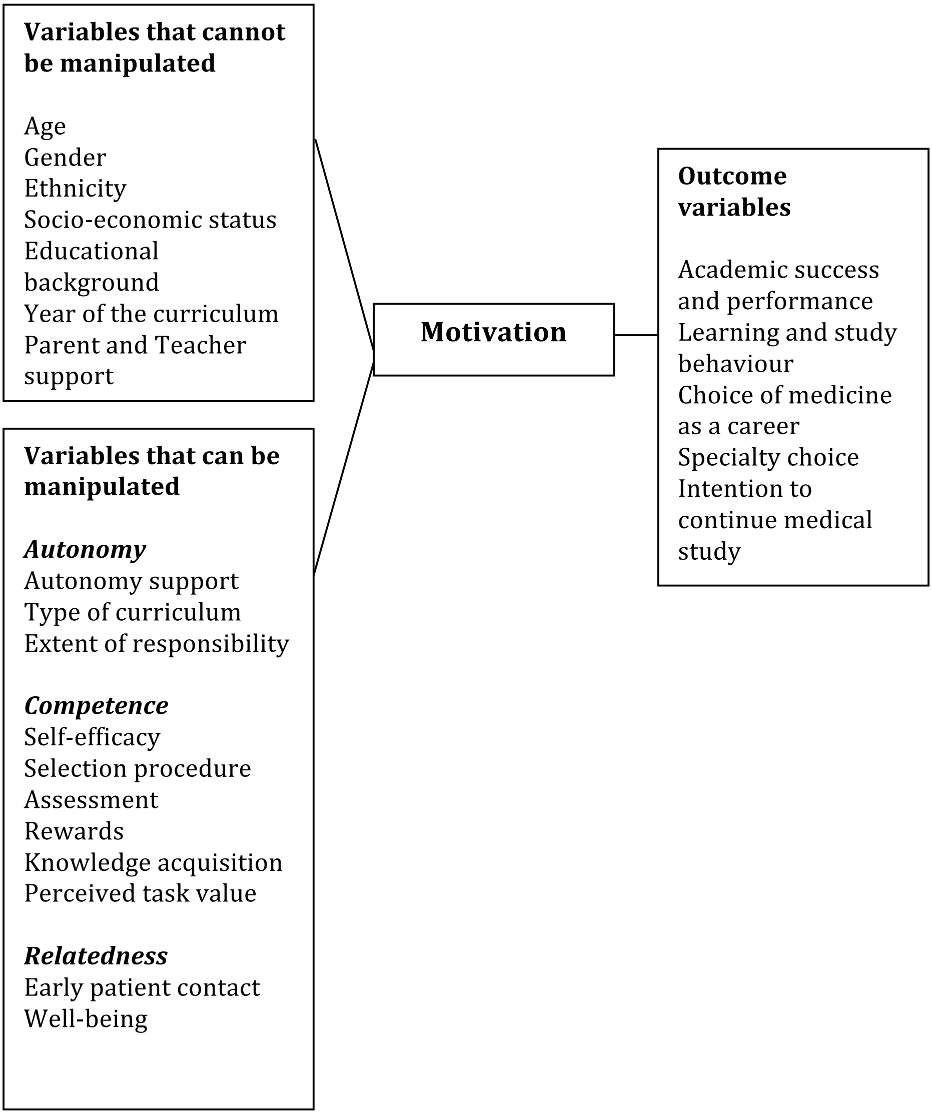
Figure 2 Scheme of literature search and results



After removing duplicates (22) from different databases, 236 articles remained for review. Studies were excluded because they deviated from the focus of the review in the following respects: Not empirical/Motivation was not measured (12) (e.g. Misch 2002[2] - viewpoint article), focused on motivation for very specific issues (84) (e.g. Bobo et al. 2009[29] – motivation for rural practice), did not focus on students (61) (e.g. Cvek et al. 2009[30] – on medical faculty), weak or inadequately described methodology or analyses or reasoning (5) (e.g. Wormwald et al. 2009[31] – conclusions not based on findings and not well-reasoned), focused on instrument construction/validation (3) (e.g. Lonka et al. 2008[32]), full text not available (15) (e.g. Odusanya, Alakija & Akesode 2000[33]).

Thus, a total of 56 articles were finally included in the review. Papers have been described in the results section that employed motivation as an independent variable and those that used it as a dependent variable.

Figure 3 Diagrammatic representation of empirically found variables that affect motivation or that are affected by motivation



Motivation as an independent variable

Motivation not only controls action being taken, but also how well it is taken. This supposes a relationship with success in achieving the target. Here motivation is the controlling variable, i.e. it behaves as an independent variable and influences other variables. Studies have been conducted in medical education to determine the possible outcomes of strength and quality of motivation and type of goal contents. Goal contents according to SDT are of two types: intrinsic, e.g. community contribution, personal growth, health, affiliation, because they provide inherent satisfaction of the basic psychological needs; and extrinsic, e.g. fame, status, money, because they provide external manifestations of self-worth.[34] These outcomes can be subsumed in six categories:

Learning and study behaviour Motivation has been reported to influence study behaviour and learning in medical students. An achieving motive and strategy and having motivation for a career in medicine were found to correlate with greater time investment in study.[35] Autonomous motivation was found to be positively correlated with deep approach and reflection in learning and also the intention to continue studies; whereas it was negatively correlated with surface approach.[36] Amotivation was found to be correlated negatively with reflection in learning and deep approach and positively with surface approach.[36] Motivation was reported to directly influence a tutorial group's cognitive processes.[37] On one hand having higher motivation enhances learning; on the other hand it was also found that in small group teaching the lack of motivation in a group member is perceived as inhibiting the learning process of other students in the group.[38] A study in UK found that motivation to be a good doctor and avoid harm to patients is related to a vocational approach to study in medical students[39]. This means that students are stimulated to gain knowledge that will help them in their practice of medicine. This study also reported that different intrinsic motivations, viz. interest in medicine and learning, achievement and workplace utility, and extrinsic motivations, viz. social competition or pressure and assessment, stimulate learning in medical students.[39]

Concerning study-related behaviour intrinsically motivated medical students tended to take more optional credit courses and peer-tutoring activities.[40] Apart from academic activities, motivation was also positively correlated to health-related extracurricular activities like working in an old-age home.[41]

Academic success/performance Studies on strength or quality of motivation as a predictor of academic success have found both conclusive and inconclusive evidence. Higher motivation[42] and also specifically higher intrinsic motivation[36] have been found to correlate with higher academic grades in both pre-clinical[36] and clinical years. Motivation was found to predict performance in only one school in a US based study, performed in two medical schools.[43] Strength of motivation to study medicine was found to be predictive of GPA in the third year, but not the first two years of medical study, in another study.[44] Tutorial group productivity was found to be significantly higher in the groups having students with higher motivation as compared to those with lower motivation.[37, 45] Students entering medicine with intellectual challenge (SDT intrinsic goal content) as the most important motive were found to have higher GPAs.[46] Academic performance other than grades/GPAs has also been studied. Strength of achievement motivation was found to be a better predictor of professional attainment in males than females.[47] Defining academic success as how far a student had progressed in his/her doctoral thesis in the final year of medical school, having higher extrinsic career motivation (striving for promotion, income, prestige etc.) was found to predict greater advancement in the thesis.[48]

There were other studies that failed to find significant correlations. A Netherlands based study found no significant correlation between motivation and academic success.[41] Neither extrinsic nor intrinsic motivation was significantly correlated with academic performance in a UK study.[49] On analyzing admission interviews data of academically at-risk medical students, there was no significant difference in motivation of successful and unsuccessful students.[50] No significant difference was found in performance between students with high and low motivation (conditions created by using external motivators) and controls when tested on clinical case processing and recall of differential diagnosis.[51] Intrinsic motivation, which was measured by only one item, was found to be significantly negatively correlated (r=-0.17) with academic success.[52]

Choice of medicine as a career Studies have been conducted to understand what kind of motivation or motives drive students to enter medical school. Four major underlying dimensions appeared, as found using the Medical Situations Questionnaire in the UK: helping people, being respected, being indispensable and becoming a scientist.[53] Similar motives[54] and intellectual content were found in other studies on pre-medical and medical students.[55-63] The ability to help people appears to be the strongest motive.[46, 56, 59-61, 63, 64] Women over thirty chose medicine to find intellectual motivation, develop competence and feel achievement.[65] Medical students, who had a background in nursing education, chose medicine mainly out of the desire for increased patient care responsibility, medical knowledge, personal challenge and status.[66]

Choice of a specialty within medicine Motivation also influences the choice of a specialty. Students choosing primary care[59, 67, 68] and psychiatry[59] were driven by a people-oriented motive or diversity in diagnosis and treatment[55] as compared to students choosing high technology or non-primary care specialties, who were driven by science-oriented motive[59] or working with new technology[55]. Other motives for choosing non-primary care specialties were better lifestyle, monetary rewards and prestige.[68] Strong career motivation[69] or higher intrinsic career motivation[48] were found to be independent predictors of choice of speciality. Students not considering any primary care specialties showed significantly higher achievement and power motives.[69]

Intention to continue medical studies Autonomous motivation was found to correlate significantly positively with intention to continue studies, i.e. not dropping out of medical school, and amotivation was negatively correlated with intention to continue studies.[36]

Our belief that motivation is an independent variable in medical education was confirmed by the findings of this review. This sets the foundation for the merits of studying motivation as a dependent variable because if motivation is an important determining variable of learning and academic and professional success, and if it can be manipulated by arrangements in the curriculum and by teachers' actions, then it is of great importance that we map such variables.

Motivation as a dependent variable

Motivation for medical study may be influenced by a variety of factors in the individual student and the learning environment and curriculum. McLelland et al. found that factors like race, religion, environment and child-rearing practices had direct influence on achievement motivation and factors like family structure, slavery, occupational status and climate had indirect influence.[70] The hierarchical model of motivation by Vallerand and Ratelle has proposed and empirical evidence has been gathered to support the view that motivation can change and be manipulated, hence is a dependent variable.[71] Within such factors in medical education we made a distinction between factors that cannot be manipulated and factors that can be manipulated.

Variables that cannot be manipulated

Some variables influencing motivation for medical study were found which cannot be manipulated.

Age Age influences motivation for medical study. In an Australian study, differences in motivations for choosing medicine were found between mature-age (approximately 41 years) and normal-age entrants (approximately 34 years). Most mature age-entrants cited intellectual satisfaction as their main reason followed by working with people and desire to help others. Most normal-age entrants cited desire to help others followed by enjoyment through working with people and intellectual satisfaction.[62]

Gender Studies which look into gender differences in motivation for medicine were found. Males report interest in science[53, 59, 72], being indispensable[53], helping people[59] and having a career[72] as the most important reasons motivating them for medicine. Females report helping people[57] and having a career, as the most important reasons[59, 72]. Other studies found that ranking of motives like opportunity to help people[63], scientific nature of medicine and intellectual challenge, in that order, by males and females was similar[46, 60, 61, 63]; however more females than males were oriented towards altruistic motives and more males than females were oriented towards financial security[46, 63] or prestige/status[57]. Others found that female medical students scored higher on the person-oriented motive[53, 59], lower on natural science motive[53] and opportunity for higher income[59] and equal to male medical students on status-oriented motive[59]. Apart from gender differences in goal contents for medicine, gender differences in generalized motivation have also been studied. Males were found to have higher extrinsic career motivation than females.[48] Female medical students have been found to be significantly more achievement oriented as compared to male medical students.[73] Among tutorial groups, motivation of female students was also found to be significantly higher than male students.[45]

Ethnicity Ethnicity plays a role in motivational orientation. In a study carried out in the US with high school students who were considering medicine as a career option; white students were predominantly motivated by the "challenge of the medical profession", whereas black students by the "chance to help people"[74]. Black students rated "monetary benefits" of the profession and status significantly higher than white students.[74] This was in contrast with a UK based study which found that non-white students score significantly higher on "Science" and significantly lower on "Helping people" as compared to white students.[53]

Socioeconomic status Socioeconomic status, rather than ethnicity or gender, was found to play a definitive role in the perceptions of high school students about medical school and their motivation to apply, in a study in the UK.[75] Students from higher socioeconomic status tended to focus on intrinsic factors like challenge, achievement and fulfilment in medicine, whereas students of lower socioeconomic status tended to focus on the extrinsic rewards like expected income.[75]

Personality Traits The temperament dimension of persistence and the character dimensions of self-directedness and self-transcendence (which are expected to enhance the learning process) are associated with intrinsic academic motivation in medical students.[76]

Educational background A study in Finland found that non-graduate entry students had higher achievement motivation as compared to graduate entry students.[77]

Year of medical curriculum Year of medical curriculum was also found to influence motivation for joining and continuing medical study. Contrary to common beliefs and other studies mentioned above, a UK based study found that first year medical students were more oriented towards prestige, money and success; whereas final year students were more oriented towards relief of suffering and importance for mankind.[78] Another study, based in the US, found that first year medical students had higher achievement orientation than students after their third year. This finding was attributed to a shift in the motivational structure from achievement to self-gratification needs.[79]

Teacher and parent support A qualitative study in the UK among first and second year medical students to identify factors influencing students' motivation to apply to medical school showed that parent support and encouragement had a positive effect and lack of teacher support had a negative effect.[80]

These are variables which cannot be manipulated by medical educators.

Variables that can be potentially manipulated

Other independent variables influence motivation and can potentially be manipulated. We have classified these variables under the three basic psychological needs for intrinsic motivation viz. autonomy, competence and relatedness.

Autonomy Autonomy support for learning is like a corner stone for developing intrinsic motivation for learning according to SDT. Autonomy in learning means that the students can plan their educational activities of their own volition, within the boundaries of defined limits. We found evidence of this in a few studies in medical education. The different themes that can be ascribed to this particular variable are:

Autonomy support **-** A study done on US medical students found that autonomy support by instructors during clerkships enhanced students' motivation to select a residency in that particular field of medicine.[81] The choice of internal medicine (r=0.29) and surgery (r=0.34) clerkships in this study were significantly correlated with the students' perceptions of autonomy support on these corresponding clerkships. Autonomy support by teachers was a significant predictor for both, students' autonomous motivation and competence for a study course in another study.[82] Intrinsic motivation for a course was positively correlated with autonomy in learning (r=0.354) in a study in France.[83] Students in a PBL curriculum found themselves to be intrinsically motivated because of autonomy in their learning, as opposed to students in a traditional curriculum who found themselves to be extrinsically motivated because of a controlling learning environment.[84]

Curriculum **-** A problem based learning (PBL) curriculum was found to motivate students to learn for learning's sake, i.e. intrinsic motivation, because of autonomy in their learning. Traditional curriculum motivated students towards obtaining high grades i.e. extrinsic motivation. These students' perceived a controlling learning environment.[84] A German study found that students' motivation is higher in blended PBL as compared to traditional PBL, both through quantitative and qualitative data.[85] Blended learning carefully complements face-to-face classes with e-learning modules and when incorporated into a PBL curriculum gives higher autonomy to students in their learning.

Patient responsibility **-** Interns perceived greater responsibility for patient care in a general practice learning environment and this was responsible for their greater motivation for learning.[86] Greater responsibility also means more autonomy in patient handling and treatment.

Competence Feeling competent in learning stimulates intrinsic motivation for it. We found studies on medical students which substantiated this claim.
Self-efficacy - Intrinsic motivation was found to be positively correlated with perceived self-efficacy or competence (r=0.419).[83]
Selection procedure - Students entering medicine through a selection procedure were found to have significantly higher strength of motivation and lower certificate orientation (extrinsic goal content) than students entering through either weighted lottery or outstanding high school GPA.[41] Awareness of having been chosen through a demanding selection procedure might have a positive effect on students' self-efficacy beliefs and identity formation, inspiring them to develop a strong level of commitment to medical study and health care. Though this selection procedure did not necessarily make students achieve higher grades than the others, they engaged more in health-related extra-curricular activities[41], which appears to be intrinsic goal content and the motivation appears to be autonomous.
Type of assessment - Standards-based assessment system was found to be associated with beneficial effects on deep motive and deep strategy for learning and professional identity.[87] Thus, students were motivated to use deep approach to learning when evaluated against pre-set standards as opposed to when evaluated against each other. Comparison with pre-set standards and meeting those standards could stimulate feelings of competence in learning as opposed to comparison with peers which could result in feelings of personal failure and incompetence.
Rewards - It was found that nearing the end of the medical study, the percentage of students agreeing that a degree with honours was a

motivator for learning and not a demotivator was significantly lower than students in the beginning of the study. An honours system does not necessarily motivate students and may demotivate a significant number of them over the time-course of the study.[88] An honours system could work in a negative way for students who know that they are not likely to get honours, by making them feel incompetent in learning.

Knowledge acquisition - A study on small group learning found that increase in knowledge and understanding of subject matter increases students' motivation for the study and interest in the course content.[89] This means that the students were more motivated for learning when their feelings of competence in their learning were strong.

Task value - Intrinsic motivation was found to be positively correlated with perceived task value of training (r=0.546) in a study in France.[83] Similarly, in a study from UK, students in PBL groups felt motivated for group working as they perceived that it was responsible for delivering their learning.[90] So, the perceived task value of training periods in the former study and PBL group working in the latter study was high and led to feelings of competence in learning.

Relatedness Relatedness could have a special significance in medical education. Significant others could not only be parents, teachers, peers, but could also be patients. Contact with patients could help students relate to their identity as future doctors and strengthen their beliefs about why they are in medical education in the first place. Evidence for this was found in some studies in medical education.

Early patient/clinical contact – Early contact with patients stimulates students' motivation for biomedical and further study by connecting theory to clinical practice.[91, 92] Thus, students were inspired towards their future work as doctors.

Well-being - Well-being was found to affect motivation in daily work and overall career; lower well-being lead to feelings of ambiguity in career choice and higher well-being lead to greater zeal towards purpose in medicine and intrinsic passion for work.[93] Well-being in this study was defined as "a balance among multiple parts of residents' personal and professional lives, including professional, family, social, physical, mental, spiritual and financial domains". This could be thought of as a doctor who has strong feelings of relatedness with his family and colleagues would have higher motivation. Autonomous motivation has been found to lead to enhanced well-being in general education studies.[25, 26]

Summary of findings

The summary of the findings of this review is portrayed in Tables 2 & 3 and Figure 3.

Table 2 Summary of findings - Motivation as an independent variable

Sr. no.	Motivation as an independent variable influences	Total no. of papers (Reference nos. of papers included as per the table in the appendix)	Major findings
1.	Learning and study behaviour	7, size of correlations some small and some moderate (Papers 7, 9, 16, 26, 40, 41, 51)	- Autonomous motivation was positively correlated with deep approach to study, reflection in learning and intention to continue studies - Motivation influenced learning in small groups - Motivation to be a good doctor stimulated vocational approach to learning - Motivation correlated positively with peer tutoring, extra-curricular activities, academic and others
2.	Academic success/ performance	14, small size of correlations (Papers 1, 5, 6, 9, 11, 15, 16, 23, 30, 33, 35, 41, 42, 48)	- 9 studies found positive relation between higher motivation and academic performance - The other studies either did not find significant correlations or one found significantly negative

			correlation, but in this study intrinsic motivation was measured with only one item in the questionnaire.
3.	Choice of medicine as a career	14 (Papers 13, 14, 17, 18, 20, 22, 25, 29, 28, 35, 39, 44, 45, 50)	- Motives – helping people, being respected, being indispensable and becoming a scientist - Helping people is the strongest motive - Women over 30 and nurses join medicine for personal challenge
4.	Choice of specialty within medicine	6 (Papers 1, 2, 19, 20, 38, 45)	- Primary care specialities are chosen for people-oriented motive - High technology specialities are chosen for science oriented motive
5.	Intention to continue medical studies	1, moderate size of correlations (Paper 41)	- Autonomous motivation positively correlated with intention to continue studies and amotivation correlated negatively.

Table 3 Summary of findings - Motivation as a dependent variable

Sr. no.	Motivation as a dependent variable is influenced by	Total no. of papers (Reference nos. of papers included as per the table in the appendix)	Major findings
	Cannot be manipulated		
1.	Age	1 (Paper 14)	- Mature-age and normal-age entrants had differences in motivations for choosing medicine
2.	Gender	10 (Papers 1, 5, 22, 24, 28, 35, 37, 44, 45, 50)	- Males and females had different type of motives for joining medicine, also some similarities - Females were found to have higher strength of motivation and males were found to have higher extrinsic motivation
3.	Ethnicity	2 (Papers 28, 41)	- Predominant motives of black and white students for joining medicine were different and the findings of the

			two studies were contradictory
4.	Socioeconomic status	1 (Paper 12)	- Higher socioeconomic status students were found to focus on intrinsic factors for choosing medical study whereas lower socioeconomic status students chose medical study for extrinsic rewards
5.	Personality traits	1 (Paper 43)	- The temperament dimension of persistence and the character dimensions of self-directedness and self-transcendence are associated with intrinsic academic motivation in medical students
6.	Educational background	1 (Paper 21)	- Non-graduate entry students had higher achievement motivation as compared to graduate entry students
7.	Year of medical curriculum	2 (Papers 3, 34)	- In one study, first year students were more oriented towards extrinsic rewards of the medical profession, whereas final year students were more oriented towards helping mankind - In the other study, first year students had higher achievement motivation than third year students
8.	Teacher and parent support	1 (Paper 27)	- Having parent and not having teacher support play a positive and negative role respectively in students choosing for medical study

Sr. no.	**Motivation as a dependent variable is influenced by**	**Total no. of papers (Reference nos. of papers included as per the table in the appendix)**	**Major findings**
	Can be manipulated		
9.	Autonomy		
	- Autonomy support	4 (Papers 32, 49, 54, 55)	- Autonomy support in medical study was found to stimulate choice of a particular specialty and intrinsic motivation for learning

	- Curriculum	2 (Papers 49, 56)	- PBL curriculum was found to stimulate intrinsic motivation and traditional curriculum was found to stimulate extrinsic motivation - Blended PBL increases students' motivation as compared to traditional PBL
	- Greater patient responsibility	1 (Paper 4)	- Greater patient responsibility was responsible for greater motivation for learning
10	Competence		
	- Self-efficacy	1 (Paper 32)	- Intrinsic motivation was positively correlated with self-efficacy
	- Selection procedure	1 (Paper 16)	- Students entering through medical entrance exam have higher motivation
	- Assessment	1 (Paper 52)	- Type of assessment influences type of motivation for study
	- Rewards	1 (Paper 31)	- Rewards may demotivate significant number of students
	- Knowledge acquisition	1 (Paper 10)	- Perception of increased knowledge increases motivation
	- Perceived task value	2 (Papers 32, 55)	- Intrinsic motivation was found to be positively correlated with perceived task value - Perceived task value of PBL groups increased the motivation for group working
11	Relatedness		
	- Early patient/ clinical contact	2 (Papers 8, 46)	- Early patient contact stimulates student motivation
	- Well-being	1 (Paper 36)	- Feeling of well-being enhances motivation

Discussion

Motivation is correlated with learning through approach to study and study behaviour. Most studies in medical education have found evidence in favour of 'Motivation correlates with academic performance'. The other studies did not find significant correlations, two of which have small sample size, hence may have lacked the power to find significant differences[50, 51]. Tan & Thanaraj (1993)[52] found significantly negative correlation, but in this study intrinsic motivation was measured with only one item in the questionnaire. We were not always able to confirm the reliability of the outcome measures, so these findings should be interpreted with caution. The relationship between motivation and learning success has been well-substantiated in general education.[5-7, 94]

Altruistic motives, intellectual content and interest in the study are all intrinsic goal contents (SDT) that drive students towards medical study and profession and the motivation that such students exhibit in their choice of medicine is autonomous. Parental pressure, status, income and prestige are extrinsic goal contents (SDT) and the motivation exhibited by such students in their choice of medicine is controlled. Thus, we can conclude that most medical students enter medical study and profession for intrinsic goal contents and thus exhibit autonomous motivation in their choice of medicine.[34]

Overall, students choosing primary care specialities seem to be driven by intrinsic goal contents and hence autonomous motivation; whereas students choosing non-primary care specialities seem to be driven partly by intrinsic goal contents, i.e. science oriented motive/ working with new technology, and partly by extrinsic goal contents, i.e. lifestyle, money, prestige. The dominant motivation, i.e. autonomous or controlled, in these students may vary from individual to individual.

Autonomous motivation being correlated with decreased dropout intentions among medical students is consistent with the finding in general education research.[22, 23] However, there was only one study in medical education with this finding, so it has limited generalizability.

There was only one study that found that age influences motivation. Though this finding has been observed in general education research by McLelland et al.[70] in school children, in this study this difference was found between entrants who were 35 v/s 45 years of age. In most countries the average age at entry into medical study is around 17 years, except in the US and Australia where it is around 23 years. In the light of this, the study by Harth 1990[62] seems irrelevant to most of the medical student population and the findings do not have any explanation of confirmation in theoretical background.

Concerning gender differences in motivation there is considerable evidence that female medical students seem to have higher strength and better quality of motivation than male medical students.

Ethnicity and socioeconomic status also have not been explored in enough detail and because of contradictory findings have limited generalizability. Similarly, variables like educational background, personality traits, year of curriculum, teacher and parent support have too little number of studies to be generalizable. Further research needs to be done on these variables because the findings can have an impact on the selection procedures for admission to medical schools.

Variables which can be used to manipulate motivation and have been uncovered in this review have a strong theoretical background in SDT though the absolute number of studies is not too high. But these findings are easily substantiated by the literature in general education.[71]

Satisfaction of the basic needs of autonomy[20, 23, 25, 94], competence[20, 95] and relatedness (a more distal relation[96]) has been found to enhance intrinsic motivation in general education students.

The merits in viewing motivation from the point of view of a dependent and an independent variable in medical education were supported by this review. Having support that motivation is an independent variable, influencing important outcomes like learning and academic performance, is important in order to look at motivation as a dependent variable and explore variables influencing it. There seems to be a fair amount of research on motivation as an independent variable, but research on motivation as a dependent variable is scarce. This review identifies a gap in literature on this particular issue, especially because identifying factors influencing motivation could help medical educators incorporate them into design of a curriculum or development of their institute's teaching culture and learning environment. There is one major flaw in the research designs of most of the studies included in the review, which is that motivation should ideally be studied using a longitudinal study design as it is expected to be dynamic. But most studies employ a cross-sectional design probably for ease in carrying out the research.

This review also leads us to some research questions:

Motivation as an independent variable –

- If motivation does influence performance, then what are the mechanisms that cause this relationship?

Motivation as a dependent variable –

- Do the strength and quality of motivation change over the course of medical study (in a longitudinally designed study)?
- To our knowledge, this has not been previously reported. If there are changes, what are the causes for these changes?

- Are these causes related to curriculum structure or learning environment?
- Can they be influenced or manipulated?

If and whenever these questions are answered, we would have concrete means of enhancing motivation of our students.

Further implications

The Self-determination theory is a general theory of motivation which can be a good foundation for medical educational curricular reforms, structuring of the medical learning environment, continuing medical education (CME) and lifelong learning. Curricular reforms need to take into account the effects on student motivation produced by these changes, short-term and long-term. Designing of curricula could benefit from keeping in mind that motivation of students can be enhanced by incorporating teaching methods like PBL, small group working etc. Learning environments inculcating autonomy-supportive behaviours by teachers, supporting students' feelings of competence through regular and constructive feedback and enhancing feelings of relatedness through mentoring support, positive role models, small group working and early contact with patients, can go a long way in stimulating students' autonomous motivation. Autonomously motivated students' would experience greater satisfaction with the profession, leading to lowering of stress and burnout possibilities. Integration of values of the medical profession into the culture of medical institutions could also help in shifting extrinsic goal contents to intrinsic goal contents, changing the focus from money, status and power to community service. SDT applied to medical education could perhaps be the answer to medical educators' dreams of intrinsically motivated students and doctors.

This review has a few limitations. In spite of the well-designed search strategy, it is possible that we missed a few papers where motivation was not the main variable under investigation, but was an incidental finding. We expect this to have happened for qualitative studies, not quantitative, as we had strict criteria for reliable measurement of motivation and we expect that any studies with these inclusions would be classified under the category of motivation in the different databases. We expected to find a few studies on “assessments drive learning”, but found only one, which was excluded for poor quality. The reason for this could be that in such studies motivation is not measured per se, but is an incidental finding. The inaccessibility to full-text versions of 15 papers (some were only dissertational abstracts not full papers, some authors did not respond even after contacting them through their information from the internet, other authors could not be found on the internet to contact and there was no external library access to these papers) is also a potential limitation of this review.

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86. Cantillon P, MacDermott M. Does responsibility drive learning? lessons from intern rotations in general practice. *Medical Teacher*. 2008;30:254-259.
87. Wilkinson TJ, Wells JE, Bushnell JA. What is the educational impact of standards-based assessment in a medical degree? *Medical Education*. 2007;41:565-572.
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the process of working in small groups and its assessment. *Medical Teacher*. 2002;24:495-501.

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96. Deci EL, Ryan RM. The "What" and "Why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*.2000;11:227-268.

Appendix - Table of research papers included in the review

No.	Study Reference	Country setting, N	Research objectives	Findings relevant to the review	Type of study
1	Buddeberg-Fischer, B., Klaghofer, R., Abel, T. & Buddeberg, C. (2003) Influence of gender and personality traits on the career planning of Swiss medical students, Swiss Medical Weekly, vol. 133, pp. 535-540.	Switzerland, 719 medical graduates	How do gender and personality traits contribute to their academic achievement and further career planning?	Women plan their career more purposefully than men. Gender, personality traits and career motivation play an important role in academic achievement and career planning.	Questionnaire-based, Quantitative
2	Buddeberg-Fisher, B., Klaghofer, R., Abel, T. & Buddeberg, C. (2006) Swiss residents' specialty choices – impact of gender, personality traits, career motivation and life goals, BMC Health Services Research, vol. 6:, pp. 137.	Switzerland, 522 residents	To investigate the influence of gender, personality traits, career motivation and life goal aspirations on the choice of medical speciality.	Gender, career motivation and life goals are predictors for speciality choice.	Quantitative
3	Burstein, A.G., Loucks, S., Kobos, J., Johnson, G., Talbert, R.L. & Stanton, B. (1980) A longitudinal study of personality characteristics of medical students, Academic Medicine, vol. 55, no. 9, pp.	USA, 246 medical students	To study characteristics of medical students as a product of professional maturation and personality as opposed to sampling errors.	A shift in the motivational structure from achievement to self-gratification needs was found from year 1 to year 3.	Questionnaire-based, Quantitative

	786-787.				
4	Cantillon, P. & MacDermott, M. (2008) Does responsibility drive learning? Lessons from intern rotations in general practice, Medical Teacher, vol. 30, pp. 254-259.	Ireland, 4 interns, 4 staff involved in the programme	To determine the factors that contribute most to motivating effective learning in a general practice setting.	Interns perceived greater responsibility for patient care in a general practice learning environment and this was responsible for their greater motivation for learning.	Qualitative. This study had a very low sample size, i.e. 4 interns, though the quality of the study and interpretations were sound.
5	Carlo, M.D., Swadi, H. & Mpofu, D. (2003) Medical student perceptions of factors affecting productivity of Problem-based Learning tutorial group: Does culture influence the outcome?, Teaching and Learning in Medicine, vol. 15, no. 1, pp. 59-64.	Canada, 115 first year medical students	To explore student perceptions and gender differences in perception about effect of motivation, cohesion, sponging, withdrawal, interaction and elaboration on group productivity.	Tutorial groups were found to be more productive if the students in the group had higher motivation as compared to those with lower motivation. Female students had significantly higher motivation than male students.	Questionnaire-based, Quantitative
6	De Bruin, A.B.H., van de Wiel, M.W.J., Rikers, R.M.J.P. & Schmidt, H.G. (2005) Examining the stability of experts' clinical case	The Netherlands, 24 fourth year medical students and	To determine the possible influence of motivation on clinical case processing and recall	There were no differences between the control, low and high motivation conditions in diagnostic accuracy, number of	Quantitative

	processing: An experimental manipulation, Instructional Science, vol. 33, pp. 251-270.	24 expert doctors		summaries in recall, and study time on the cases. These conditions were produced by using external motivators.	
7	De Grave, W.S., Dolmans, D.H.J.M. & Van Der Vleuten, C.P.M. (2002) Student Perspectives on Critical Incidents in the Tutorial Group, Advances in Health Sciences Education, vol. 7, pp. 201-209.	The Netherlands, 200 medical students from year 1 to 4	To explore students' perceptions of incidents in tutorial groups and of the tutor's role in these incidents. Students perceive that lack of motivation in a group member in small group teaching inhibits the learning process of others.	Motivational influences have a particularly strong impact on tutorial group function.	Questionnaire-based, Quantitative
8	Diemers, A.D., Dolmans, D.H.J.M., Verwijnen, M.G.M., Heineman, E. & Scherpbier, A.J.J.A. (2008) Students' opinions about the effects of preclinical patient contacts on their learning, Advances in Health Sciences Education, vol. 13, pp. 633-647.	The Netherlands, 24 year 3 medical students	To explore what effects early patient contacts have with regards to knowledge construction and development of clinical reasoning skills.	Early patient contacts motivate students for medical study.	Qualitative

9	Dolmans, D., Wolfhagen, I.H.P. & Van der Vleuten, C.P.M. (1998) Motivational and cognitive processes influencing tutorial groups, Academic Medicine, vol. 73, no. 10, pp. S22-S24.	The Netherlands, 39 tutorial groups of students	To expand understanding of cognitive and motivational influences on tutorial group processes.	Tutorial group productivity is significantly higher in groups with higher motivation. Motivation also influences cognitive processes in the group significantly.	Questionnaire-based, Quantitative
10	Draskovic, I., Holdrinet, R., Bulte, J., Bolhuis, S. & Van Leeuwe, J. (2004) Modeling small group learning, Instructional Science, vol. 32, pp. 447-473.	The Netherlands, 89 first year medical students	To explore the relations between the variables comprising learning mechanisms in small groups.	If students feel that the group sessions have brought about a positive change in their knowledge and understanding of subject matter, their motivation for the study and interest in the course content will increase.	Questionnaire-based, Quantitative
11	Elam, C.L., Wilson, J.F., Johnson, R., Wiggs, J.S. & Goodman, N. (1999) A retrospective review of medical school admission files of academically at-risk matriculants, Academic Medicine, vol. 74, no. 10, pp. S58-S61.	USA, 51 at-risk medical students	To determine retrospectively the predictive values of cognitive and non-cognitive variables collected during admissions.	There was no significant difference between motivations of academically successful and unsuccessful students on t test.	Mixed methods research, Qualitative data quantitatively scored and analyzed

12	Greenhalgh, T., Seyan, K. & Boynton, P. (2006) "Not a university type": focus group study of social class, ethnic and sex differences in school pupils perceptions about medical school, British Medical Journal, vol. 328, pp. 1541.	UK, 68 high school students	To investigate what going to medical school means to academically able 14-16 year olds from different ethnic and socioeconomic backgrounds	Pupils from higher socioeconomic groups viewed medicine as having high intrinsic rewards like personal fulfilment and achievement and those from lower socioeconomic groups thought more about the extrinsic (financial) rewards of medicine.	Focus group study, Qualitative
13	Gussman, D. (1982) Nurses in medical school, Journal of Medical Education, vol. 57, pp. 180-183.	USA, 33 medical students with nursing background	To find out why medical students, who have completed nursing education, choose to enter medical study.	Motivations for entering medical study were increased patient care responsibility, medical knowledge, personal challenge and status.	Questionnaire-baased, Quantitative
14	Harth, S.C., Biggs, J.S. & Thong, Y.H. (1990) Mature-age entrants to medical school: a controlled study of sociodemographic characteristics, career choice and job satisfaction, Medical Education, vol. 24, no. 6, pp. 488-498.	Australia, 121 mature-age and 270 normal-age medical entrants	To compare motivation to study medicine between mature-age and normal-age medical entrants.	Most mature age-entrants cited intellectual satisfaction as their main reason followed by working with people and desire to help others. Most normal-age entrants cited desire to help others followed by enjoyment through working with	Questionnaire-based, Quantitative

				people and intellectual satisfaction.	
15	Hoschl, C. & Kozeny, J. (1997) Predicting academic performance of medical students: the first three years, American Journal of Psychiatry, vol. 154, pp. 87-92.	Czech Republic, 92 medical students	To identify variables like premedical education grades, admission procedure, and personality structure domains with predictive validity for academic success over three years of study.	Motivation to study medicine is predictive of GPA in the third year, but not the first two years of medical study, though the explained variance in GPA was small, i.e. 6%	Partly questionnaire-based and admission interview committee reports, Quantitative
16	Hulsman, R.L., van der Ende, J.S.J., Oort, F.J., Michels, R.P.J., Casteelen, G. & Griffioen, F.M.M. (2007) Effectiveness of selection in medical school admissions: evaluation of the outcomes among freshmen, Medical Education, vol. 41, pp. 369-377.	The Netherlands, 418 first and second year medical students	To establish how Selection Procedure students compared with Random Selection and Direct Access students on motivation, academic achievement, study behaviour and extracurricular activities	Selection procedure students were significantly more highly motivated but this was not reflected in academic achievement, though motivation did affect study behaviour and health care-related extra-curricular activities. No significant correlation was found between motivation and academic success in a Netherlands based study.	Quantitative

17	Kaplan, S.R. (1981) Motivations of women over 30 for going to medical school, Journal of Medical Education, vol. 56, pp. 856-858.	USA, 37 medical students, who were women over 30 years	To study motivations of medical students, who were women over 30, decide to study medicine.	Motivations for studying medicine were intellectual stimulation, developing competence and to feel achievement	Questionnaire-based, Quanitative
18	Karalliedde, L.D. & Premadasa, I.G. (1988) Socioeconomic status and aspirations of third world medical entrants: A Sri Lankan study, Medical Teacher, vol. 10, no. 1, pp. 101-104.	Sri Lanka, 154 medical students	To obtain information on the socioeconomic background and aspirations of medical graduates on entry to the medical schools in Sri Lanka.	Attraction of medicine as a science and caring for the sick were the prime factors for choosing a career in medicine.	Questionnaire - based, Quantitative
19	Kassler, W.J., Steven, M.P.H., Wartman, A. & Silliman, R.A. (1991) Why medical students choose primary care careers? Academic Medicine, vol. 66, pp. 41-43.	USA, 293 fourth year medical students	To determine what factors distinguish medical students who choose primary care careers.	Primary care specialty was chosen for direct and continuity of patient care and psychosocial aspects. High technology specialties were chosen for higher income, prestige, research opportunities and better quality of life.	Questionnaire-based, Quantitative

20	Khater-Menassa, B. & Major, S. (2005) Factors influencing the choice of specialty among medical students in Lebanon, Lebanese Medical Journal, vol. 53, no. 1, pp. 16-20.	Lebanon, 127 graduating medical students	To highlight factors considered by medical students while making a career choice and to compare these between primary care and non-primary care candidates.	Intellectual content and helping people appeared to be among the top motivations for medicine and diversity in diagnosis and therapy v/s working with new technology were the reasons for choosing primary v/s non-primary care specialties.	Questionnaire-based, Quantitative
21	Kronqvist, P., Mäkinen, J., Ranne, S., Kääpä, P. & Vainio, O. (2007) Study orientations of graduate entry medical students, Medical Teacher, vol. 29, pp. 836-838.	Finland, 25 graduate entry and 120 non-graduate entry medical students	To look at the study performance of students with different educational backgrounds with special emphasis on graduate entry students.	Non-graduate entry students had higher achievement motivation as compared to graduate entry students. This finding cannot be generalized as the sample size of graduate entry students (N=25) was very small.	Questionnaire-based, Quantitative
22	Kutner, N.G. & Brogan, D.R. (1980) The decision to enter medicine: Motivations, social support and discouragements for women, Psychology of Women Quarterly, vol. 5, no.	USA, 338 medical students	To explore the relevance of certain factors to the decision to enter medicine for women medical students.	Similar motives were found between males and females for entering medicine, viz. interest in people, help others and independence in work.	Mixed methods research

	2, pp. 341-357.				
23	Lorber, J. & Ecker, M. (1983) Career development of male and female physicians, Journal of Medical Education, vol. 58, pp. 447-456.	USA, 400 physicians with data from medical school	To analyze effects of achievement motivation, performance in medical school, peer evaluation, prestige of internship and family responsibilities on professional attainment.	Achievement motivation was a better predictor of professional attainment in men than in women.	Questionnaire-based, Quantitative
24	Loucks, S., Kobos, J.C., Stanton, B., Burstein, A.G. & Lawlis, G.F. (1979) Sex-related psychological characteristics of medical students, The Journal of Psychology, vol. 102, pp. 119-123.	USA, 246 medical students	To explore whether there are differences between personality traits of female and male medical students.	Female medical students were significantly more achievement oriented as compared to male medical students.	Questionnaire-based, Quantitative
25	Lovecchio, K. & Dundes, L. (2002) Premed survival: Understanding the culling process in premedical graduate education, Academic Medicine, vol. 77, pp. 719-724.	USA, 97 pre-medical students	To study why students either persevere in their premedical studies or seek alternative careers.	Premed students were attracted to medicine by scientific interest, intellectual challenge and the power to help others.	Questionnaire-based, Quantitative

26	Mattick, K. & Knight,L. (2009) The importance of vocational and social aspects of approaches to learning for medical students. Advances in Health Sciences Education, 14, 629-644.	UK, 15 second and 13 third year medical students (Follow-up study)	To capture the full range of intentions and motivations for learning that exist within populations of medical students.	Motivation to be a good doctor and avoid harm to patients stimulates a vocational approach to study in medical students. Different intrinsic motivations, viz. interest in medicine and learning, achievement and workplace utility, and extrinsic motivations, viz. social competition or pressure and assessment, stimulate learning in medical students.	Qualitative study
27	McHarg, J., Mattick, K.M. & Knight, L.V. (2007) Why people apply to medical school: implications for widening participation activities, Medical Education, vol. 41, pp. 815-821.	UK, 15 second year medical students	To identify the influences contributing to students' decisions to study medicine.	Parent support and encouragement had a positive effect and lack of teacher support had a negative effect on students' motivation to apply to medical school. The results of this study cannot be generalized owing the fact that the sample size is low (N=15) and it is a highly selected sample.	Interview-based, Qualitative

28	McManus, I.C., Livingston, G. & Katona, C. (2006) The attractions of medicine: the generic motivations of medical school applicants in relation to demography, personality and achievement, BMC Medical Education, vol. 6, pp. 11.	UK, 2867 prospective medical students	To explore the nature of the generic motivations for studying medicine in those considering medical careers, and to examine how those motivations differed between different types of individual in terms of demography and personality.	Four major underlying dimensions for choice of medicine as a career appear: helping people, being respected, being indispensable and becoming a scientist. Differences were found according to gender and ethnic origin. Males report interest in science and being indispensable as the most important reasons motivating them for medicine Non-white students score significantly higher on "Science" and significantly lower on "Helping people" as compared to white students.	Questionnaire based, Quantitative, Sizes of correlations between gender and motivations for joining medicine are small (r<0.2, though statistically significant).
29	Millan, L.R., Azevedo, R.S., Rossi, E., de Marco, O.N.L., Millan, M.P.B. & de Arruda, P.C.V. (2005) What is behind a student's choice for becoming a doctor? Clinics, vol. 60, no. 2, pp. 143-150.	Brazil, 60 first year medical students	To determine the reasons for choosing the medical profession and investigate their socio-economic and psychological profiles and gender differences.	Most students had chosen medicine out of altruistic or person-oriented motives followed by intellectual curiosity.	Interview-based, Qualitative data assessed quantitatively

30	Moulaert, V., Verwijnen, M.G.M., Rikers, R. & Scherpbier, A.J.J.A. (2004) The effects of deliberate practice in undergraduate medical education, Medical Education, vol. 38, pp. 1044-1052.	The Netherlands, 777 year 1-6 medical students	To investigate the relationship between several aspects of deliberate practice like planning, study style, motivation and self-reflection and study achievements among undergraduate students.	Motivation significantly correlated (r=0.3) with academic performance.	Questionnaire-based, Quantitative
31	O'Neill, P., Baxter, C.M. & Morris, J. (1999) Does awarding a medical degree with honours act as a motivator or demotivator to student learning?, Medical Education, vol. 33, pp. 566-571.	UK, 1290 medical students	To look at students' perceptions and effects of awarding degree with honours.	More students from the earlier years agreed that a degree with honours was a motivator for learning and the number decreased as they approached final year. An honours system does not necessarily motivate students and may demotivate a significant number of them over time-course of the study.	Mixed-methods study
32	Pelaccia, T., Delplancq, H., Triby, E., Bartier, J-C., Leman, C. & Dupeyron, J-P. (2009) Impact of training periods in the emergency department on the	France, 302 medical and nursing students with a ratio of 1:2	To assess the impact of training periods in the emergency department on the motivation of health care students to learn in the field of	Experiential learning without negative outcome events increases intrinsic motivation for a course. Intrinsic motivation is positively correlated with	Questionnaire-based, Quantitative

	motivation of health care students to learn. Medical Education, 43, 462-469.		emergency medicine.	high perceived task value (r=0.546), self-efficacy (r=0.419) and autonomy in learning (r=0.354).	
33	Popovic, C. (2010) Myth busting: an examination of teachers beliefs about first year medical students. How well do teachers know their students? Innovations in Education and Teaching International, 47 (2), 141-154.	UK, 436 first year medical students	To identify any connection between students' ethnicity, affluence and academic performance.	Neither intrinsic nor extrinsic motivation was significantly correlated with academic performance.	Questionnaire-based, Quantitative
34	Powell, A., Boakes, J. & Slater, P. (1987) What motivates medical students: how they see themselves and their profession, Medical Education, vol. 21, pp. 176-182.	UK, 30 first, third and final year medical students	To study medical students' perceptions of medicine and its specialties.	First year students are more oriented towards prestige, money and success, but final year students are more oriented towards relief of suffering and importance for mankind. Though this study was of good quality, the findings have limited generalizability as the sample size was very small (N=30).	Questionnaire-based, Quantitative

35	Price, J., Williams, G. & Wiltshire, E.B. (1994) Influence of motivational and demographic factors on performance in the medical course: a prospective study, Medical Education, vol. 28, pp. 107-115.	Australia, 399 first year medical students	To correlate motivational and demographic factors with performance in medical study and its completion.	Altruistic reasons were the most important for most males and females, though more females were oriented towards them than men and more men than females were oriented towards financial security. Students entering medicine with intellectual challenge as the most important motive were found to have higher GPAs, though the variance in GPA explained was low i.e. around 5% (regression coefficient=0.05).	Questionnaire-based, Quantitative
36	Ratanawongsa, N., Wright, S.M. & Carrese, J.A. (2008) Well-being in residency: Effects on relationships with patients, interactions with colleagues, performance, and motivation, Patient Education and Counseling, vol. 72, pp. 194-200.	USA, 26 residents	To explore residents' concept of well-being and how it affects their work.	Well-being affects motivation in daily work and overall career; lower motivation leading to feelings of ambiguity in career choice and higher well-being leading to greater zeal towards purpose In medicine and intrinsic passion for work.	Qualitative

37	Robbins, L., Robbins, E.S., Katz, S.E., Geliebter, B. & Stern, M. (1983) Achievement motivation in medical students, Journal of Medical Education, vol. 58, pp. 850-858.	USA, 144 third year and 74 fourth year medical students	To assess similarities and differences between male and female medical students with respect to fear of success, interests and attitudes towards medical school.	Males found interest in science, helping people and having a career, most important motivations to join medicine; whereas women ranked helping people first.	Questionnaire-based, Quantitative data assessed quantitatively
38	Rogers, L.Q., Fincher, R.E. & Lewis, L.A. (1990) Factors influencing medical students to choose primary care or non-primary care specialties. Academic Medicine, vol. 65, no. 9, pp. S47-S48.	USA, 266 medical students	To seek factors that influence medical students to choose primary care or non-primary care specialties.	Motives for choosing primary care specialties were longitudinal patient care opportunities, whereas motives for choosing non-primary care specialties were better lifestyle, monetary rewards and prestige.	Questionnaire-based, Quantitative
39	Rolfe, I.E., Ringland, C. & Pearson, S. (2004) Graduate entry to medical school? Testing some assumptions, Medical Education, vol. 38, pp. 778-786.	Australia, 608 medical students and graduates	To compare the medical school experiences, research and academic achievements and practice outcomes of graduates who entered medical study with high school background v/s tertiary background.	Working with people, intellectual satisfaction and helping others and were the most important motives for joining medicine for both high school and tertiary entrants. Significantly more tertiary entrants entered for professional independence than high school entrants and more	Questionnaire-based, Quantitative

				high school than tertiary entered because of parental pressure. Also significantly more high school entrants had doubts about wanting to be a doctor as compared to tertiary entrants.	
40	Sobral, D.T. (2008) Student –selected courses in medical school: scope and relationships, Medical Teacher, vol. 30, no. 2, pp. 199-205.	Brazil, 247 first year medical students	To study the scope of student-selected components in a medical programme and analyze their relationships with achievement and motivation.	Higher intrinsic motivation was related to more optional course credits and peer-tutoring activities.	Quantitative study
41	Sobral, D.T. (2004) What kind of motivation drives medical students learning quests? Medical Education, vol. 38, pp. 950-957.	Brazil, 297 first year medical students	To describe the patterns of medical students' motivation early in the undergraduate programme and to examine their relationships with learning features and motivational outcomes.	Medical students portray distinct patterns of autonomous and controlled motivation that seem to relate to the learners' frame of mind towards learning as well as the educational environment. (GPA in pre-clinical years and motivation correlation $r=0.14$).	Quantitative

42	Tan, C.M. & Thanaraj, K. (1993) Influence of context and preferred learning environments: approaches to studying physiology, Medical Education, vol. 27, pp. 143-159.	Malaysia, 128 second year medical students	To explore interactions between study orientations and preferences for different kinds of learning environments.	Intrinsic motivation was significantly negatively correlated with academic grades, but it was measured with only one item in the questionnaire.	Quantitative
43	Tanaka, M., Mizuno, K., Fukuda, S., Tajima, S. & Watanabe, Y. Personality traits associated with intrinsic academic motivation in medical students. (2009) Medical Education, 43, 384-387.	Japan, 112 second year medical students	To examine the relationships between personality traits and intrinsic academic motivation.	The temperament dimension of persistence (r=0.237) and the character dimensions of self-directedness (r=0.369) and self-transcendence (r=0.223), which are expected to enhance the learning process, are associated with intrinsic academic motivation in medical students.	Questionnaire-based, Quantitative
44	Todisco, J., Hayes, S. & Farnill, D. (1995) Career motivations of male and female medical students, Psychological Reports, vol. 77, no. 3 pt 2, pp. 1199-1202.	Australia, 645 first year medical students	To investigate gender differences in motivations of students at entry into medical school.	Both male and female medical students ranked desire to help others as the most important motivation, followed by scientific nature and intellectual challenge of the profession.	Ranking-based, Quantitative

45	Vaglum, P., Wiers-Jenssen, J. & Elkeberg, O. (1999) Motivation for medical school: the relationship to gender and specialty preferences in a nationwide sample, Medical Education, vol. 33, pp. 236-242.	Norway, 379 first year medical students	To study motivation of students for going to medical school	Most important motives influencing the decision to study medicine are helping people, desire for challenge and interest in human biology. Female medical students scored higher on the person-oriented motive, lower on natural science motive and equal to male medical students on status-oriented motive. Differences were also found in motives for choosing specialties.	Questionnaire-based, Quantitative
46	Von Below, B., Hellquist, G., Rodger, S., Gunnasson, R., Bjorkelund, C. & Wahlqvist, M. (2008) Medical students' and facilitators' experiences of an early professional contact course: Active and motivated students, strained facilitators, BMC Medical Education, vol. 8, pp. 56.	The Netherlands, 60 students, 15 facilitators	To assess and analyse students' and clinical facilitators' experiences of the Early Professional Contact course	"Early Professional Course" increased student motivation for biomedical and further study. Students were inspired for their future work as doctors.	Questionnaire-based, Quantitative

47	Wagoner, N.E. & Bridwell, S.D. (1989) High school students' motivations for career as a physician, Academic Medicine, vol. 64, pp. 325-327.	USA, 180 high school students	To assess general motivational factors for choosing a career and to explore if there are ethnic differences	Differences were found between white and black medical students motivations to choose a medical career. Black students gave significantly higher ratings to earning potential, job security and status of a physician than white students.	Questionnaire-based, Quantitative
48	Webb, C.T., Sedlacek, W., Cohen, D., Shields, P., Gracely, E., Hawkins, M. & Nieman, L. (1997) The impact of non-academic variables on performance at two medical schools, Journal of The National Medical Association, vol. 89, pp. 173-180.	USA, 206 first year medical students	To examine relationship between medical school performance and non-academic variables like leadership, expected difficulty in medical school and motivation.	Non-academic variables like leadership, motivation and expected difficulty level predicted about 11% variance in academic performance in only one school and the size of correlation of motivation and performance was small ($r=0.22$) and not significant.	Questionnaire-based, Quantitative

49	White, C.B. (2007) Smoothing out transitions: How pedagogy influences medical students' achievement of self-regulated learning goals? Advances in Health Sciences Education, vol. 12, pp. 279-297.	USA, 36 medical students	To explore links between medical students' use of self-regulated learning as it relates to motivation, autonomy and control by comparing PBL and traditional curricula.	PBL curriculum motivated students to learn for learning's sake i.e. intrinsic motivation. This could be because of the autonomy they find in their learning. These students were able to channelize their motivation for effective transition from the classroom to the clerkship. Traditional curriculum motivated students towards obtaining high grades i.e. extrinsic motivation. This could be because of a controlling environment by the faculty. The transition from classroom to clerkship for these students was more difficult.	Interview-based, Qualitative

50	Wierenga, A.R., Branday, J.M., Simeon, D.T., Pottinger, A. & Brathwaite, B. (2003) Motivation for and concerns about entering a medical programme, West Indian Medical Journal, vol. 52, no. 4, pp. 304-310.	West Indies, 193 medical students	To study motivation for and concerns about studying medicine and future career plans of students.	Main motivations were joining medicine were people oriented, interest in human biology and defined profession. Males had significantly higher orientation than females towards prestige/status, whereas women had higher orientation towards working with people.	Questionnaire-based, Quantitative
51	Wilkinson, T.J., Wells, J.E. & Bushnell, J.A. (2007a) Medical student characteristics associated with time in study: Is spending more time always a good thing?, Medical Teacher, vol. 29, pp. 106-110.	New Zealand, 173 fourth and fifth year medical students	To determine how time in study relates to motivation and study approaches.	Higher achievement motivation, certainty of career choice and lack of confidence are associated with greater time investment in study.	Quantitative
52	Wilkinson, T.J., Wells, J.E. & Bushnell, J.A. (2007b) What is the educational impact of standards-based assessment in a medical degree? Medical Education, vol. 41, pp. 565-572.	New Zealand, 1258 medical students	To evaluate the impact of standards-based assessments on medical student learning.	Standards-based assessment system was found to be associated with beneficial effects on deep motive, deep strategy and professional identity.	Questionnaire-based, Quantitative

53	Williams, G.C., Saizow, R., Ross, L. & Deci, E.L. (1997) Motivation underlying career choice for internal medicine and surgery, Social Science Medicine, vol. 45, no. 11, pp. 1705-1713.	USA, 207 year 4 medical students	To determine whether autonomy support by instructors during Internal medicine and surgery clerkships could predict that those students would choose that particular specialty.	Choice of internal medicine (r=0.29) and surgery (r=0.34) clerkships were significantly correlated with the students' perceptions of autonomy support on their corresponding clerkships. The correlations, though significant, were small in size. Autonomy support enhances students' motivation to select a residency in that particular field of medicine.	Questionnaire-based, Quantitative
54	Williams, G.C. & Deci, E.L. (1996) Internalization of biopsychosocial values by medical students: A test of self-determination theory Journal of Personality and Social Psychology, vol. 70, no. 4, pp. 767-779.	USA, 56 second year medical students with follow-up data after two years	To test whether instructors who are perceived as more autonomy supportive will facilitate students becoming more autonomous in their learning.	Autonomy support by teachers was a significant predictor for both, students' autonomous motivation and competence for a study course.	Quantitative

55	Willis, S.C., Jones, A. , Bundy, C., Burdett, K., Whitehouse, C.R.& O'Neill,P.A. (2002) Small-group work and assessment in a PBL curriculum: a qualitative and quantitative evaluation of student perceptions of a process of working in small groups and its assessment. Medical Teacher, 24 (5), 495-501.	UK, 16 year 2 and 3 medical students	To focus on producing a qualitative description of the cognitive and motivational influences on group processes and how they contribute to a successful PBL group.	Students in PBL groups felt motivated for group working as they perceived that it was responsible for delivering their learning.	Qualitative study
56	Woltering, V., Herrier, A. & Spitzer, K. (2009) Blended learning positively affects students' satisfaction and the role of the tutor in the problem-based learning process: results of a mixed-method evaluation. Advances in Health Sciences Education, 14, 725-738.	Germany, 97 and 88 third year medical students in blended PBL and traditional PBL respectively	To determine whether blended PBL increases students' motivation and supports their learning process.	Students' motivation is higher in blended PBL as compared to traditional PBL, both through quantitative and qualitative data.	Mixed-methods study

Chapter 4

Validity evidence for the measurement of the Strength of Motivation for Medical School

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Abstract

Background

The Strength of Motivation for Medical School (SMMS) questionnaire is designed to determine the strength of motivation of students particularly for medical study.

Objective

This research was performed to establish the validity evidence for measuring strength of motivation for medical school. Internal structure and relations to other variables were used as the sources of validity evidence.

Methods

The SMMS questionnaire was filled out by 1494 medical students in different years of medical curriculum. The validity evidence for the internal structure was analyzed by principal components analysis with promax rotation. Validity evidence for relations to other variables was tested by comparing the SMMS scores with scores on the Academic Motivation Scale (AMS) and the exhaustion scale of Maslach Burnout Inventory-Student Survey (MBI-SS) for measuring study stress. Evidence for internal consistency was determined through the Cronbach's alpha for reliability.

Results

The analysis showed that the SMMS had a 3-factor structure. The validity in relations to other variables was established as both, the subscales and full scale scores significantly correlated positively with the intrinsic motivation scores and with the more autonomous forms of extrinsic motivation, the correlation decreasing and finally becoming negative from the intrinsic to the extrinsic motivation end of the spectrum. They also had significant negative correlations with amotivation scale of the AMS and exhaustion scale of MBI-SS. The Cronbach's alpha for reliability of the three subscales and full SMMS scores was 0.70, 0.67, 0.55 and 0.79.

Conclusion

The strength of motivation for medical school has a three factor structure and acceptable validity evidence was found in our study.

Validity evidence for the measurement of the Strength of Motivation for Medical School

Introduction

Motivation drives behaviour and effort towards success.[1, 2] Not much is known about motivation of medical students. There exists literature on the motivations or motives of students in entering medical study[3-6], but once the students start their medical study, very little is known about what happens to their motivation.[7] We performed a review on research done on motivation in medical education[8] and found that motivation can be both, a dependent and an independent variable in medical education. As a dependent variable, motivation could be enhanced or manipulated by changes in the curriculum and learning environment[9-14] and as an independent variable it does stimulate learning[7, 15-17] and academic success.[7, 18-20] The number of studies investigating motivation as a dependent variable was few. Also, although motivation for medical study has been found to correlate significantly with better performance in the study, more research is required to establish the causal relationship between the two variables
Knowledge of factors influencing motivation could provide medical educators with concrete means to enhance motivation of their students.

To carry out studies for exploring such relationships, we needed an instrument which would result in a valid measurement of the strength of motivation for medical school. Such an instrument was developed in our institute.[21] The initial analysis suggested that the strength of motivation for medical school might have a uni-dimensional structure and the evidence for this was reported locally by our institute.[22] The analyses were limited and involved only first year medical students. Therefore we decided to delve deeper and look more rigorously into the evidence for the internal structure of the strength of motivation for medical school and also its relations to other variables.

Keeping in mind that, "validity refers to the degree to which evidence and theory support the interpretations of test scores entailed by proposed uses of tests" and not "to the test itself"[23-25], we would first like to clarify the proposed uses of the SMMS questionnaire. The SMMS questionnaire is a useful tool to carry out studies to uncover relationships between motivation, teaching-learning processes, academic successes, but is not intended or recommended to be used for high stakes examinations, for e.g. for selection of students for medical study, because of the possibility of socially desirable answers in high stakes situations.[21] We carried out the present study to evaluate the evidence for validity of measurement of strength of motivation for medical school using the SMMS questionnaire for these proposed uses.

Methods

Design

SMMS, AMS and MBI-SS (exhaustion scale) questionnaires were sent out electronically to 4162 medical students from two universities, UMC Utrecht and VUmc Amsterdam, in The Netherlands. This was done using an internet based data collection programme called Survey Monkey (www.surveymonkey.com).

Ethical considerations

According to Dutch regulation, ethical permission is not mandatory for educational research. The work was carried out according to the Declaration of Helsinki i.e. the participation was voluntary, written informed consent was obtained from all the participants, confidentiality was guaranteed and the data was kept anonymous. The participants were assured that non-participation would not cause them any harm or disadvantage and that they could withdraw from the study any time without giving any reason for doing so.

Instruments

The Strength of Motivation for Medical School (SMMS) questionnaire[21] contains sixteen items that are scored on a Likert point scale of 5, ranging from "Strongly Disagree" to "Strongly Agree". The higher the score, the greater is the strength of motivation. The measurement with this questionnaire has been previously reported to have favourable psychometric properties and good content validity.[21]

Academic motivation scale (AMS) by Vallerand et al.[26-28] measures the quality or type of motivation. It is based on the Self-determination theory (SDT) of motivation by Deci and Ryan.[29, 30] SDT basically distinguishes two types of motivation: intrinsic and extrinsic, and a state called "amotivation", signifying a lack of motivation. Having intrinsic motivation for a study is to pursue the study solely out of genuine liking or interest. Having extrinsic motivation for a study is to pursue it for an external gain or benefit. Extrinsic motivation is further decomposed into several stages on a continuum from 'very extrinsic' to 'approaching intrinsic motivation' (Figure 1). The motivation in these stages is regulated by four different mechanisms: external regulation, introjected regulation, identified regulation and integrated regulation. External regulation means, when we use education as our example, studying without any interest or perceived relevance, only because of pressure or expectation of others, e.g. parents. In this case, the locus of causation for studying is fully external. "Introjected regulation" means that a student realizes the importance of the study but the locus of causation is still external. "Identified regulation" means that a student has come to value the importance of his study, has identified with it and accepted the regulatory process. “Integrated regulation” means that the importance of the study has been fully integrated into the individual’s coherent sense of self; now the locus of causation is internal. Self-determination, the regulation type that fits with intrinsic motivation, means that one determines one’s own motivation; the motivation is self-generated and autonomous. External regulation is the least and integrated regulation is the most autonomous regulation of extrinsic motivation. Thus motivation has a spectrum which is most autonomous at one end and least autonomous at the other, the far end being amotivation (Figure 1).[29] Amotivation is the absence or lack of motivation.

Figure 1 The Self-determination continuum

Amotivation	**Extrinsic motivation**				**Intrinsic motivation**
	External Regulation	Introjected Regulation	Identified Regulation	Integrated Regulation	
	Least autonomous	→	→	→	Most autonomous

AMS (Figure 2) has 28 items grouped into 7 subscales, i.e. 4 items each, scored on a Likert scale of 1 to 7. An average of the total scores on each subscale is taken as the score. The subscales are “Intrinsic Motivation to know”, “Intrinsic Motivation towards accomplishment” and “Intrinsic Motivation to experience stimulation”, “Extrinsic Motivation- Identified Regulation”, “Extrinsic Motivation-Introjected Regulation”, “Extrinsic Motivation-External Regulation” and “Amotivation”.[27] Intrinsic motivation (IM)-to-know is to study for the pleasure and satisfaction experienced while learning. IM-towards-accomplishment is to study for the pleasure and satisfaction experienced while accomplishing things.[27] IM-to-experience stimulation is to study in order to experience stimulating sensations.[27] There is no subscale available to measure EM-integrated regulation. There exists good evidence for the validity and reliability of the abovementioned construct of motivation as measured by the AMS.[26]

The AMS-C 28 (i.e. college version) was used as it was most appropriate for the sample, but the words "college" were replaced by "school (medical)" as this is the term commonly used for medical study.

AMS available online from:
http://www.er.uqam.ca/nobel/r26710/LRCS/echelles_en.htm

Figure 2 AMS and subscales (Vallerand et al., 1989)

Academic Motivation Scale (AMS)

Using the scale below, please indicate to what extent each of the following items presently corresponds to one of the reasons why you go to school (medical).

Intrinsic motivation - to know

2. Because I experience pleasure and satisfaction while learning new things.
9. For the pleasure I experience when I discover new things never seen before.
16. For the pleasure that I experience in broadening my knowledge about subjects (medical) which appeal to me.
23. Because my studies (medical) allow me to continue to learn about many things that interest me.

Intrinsic motivation - towards accomplishment

6. For the pleasure I experience while surpassing myself in my studies (medical).
13. For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments.
20. For the satisfaction I feel when I am in the process of accomplishing difficult academic activities.
27. Because school (medical) allows me to experience a personal satisfaction in my quest for excellence in my studies (medical).

Intrinsic motivation - to experience stimulation

4. For the intense feelings I experience when I am communicating my own ideas to others.
11. For the pleasure that I experience when I read interesting authors (medical).
18. For the pleasure that I experience when I feel completely absorbed by what certain authors have written.
25. For the "high" feeling that I experience while reading about various interesting subjects (medical).

Extrinsic motivation – identified regulation

3. Because I think that a school (medical) education will help me better prepare for the career I have chosen.
10. Because eventually it will enable me to enter the job market in a field (medical) that I like.
17. Because this will help me make a better choice regarding my career (medical) orientation.
24. Because I believe that a few additional years of Education (medical) will improve my competence as a worker.

Extrinsic motivation – introjected regulation

7. To prove to myself that I am capable of completing my school (medical) degree.
14. Because of the fact that when I succeed in school (medical) I feel important.
21. To show myself that I am an intelligent person.
28. Because I want to show myself that I can succeed in my studies (medical).

Extrinsic motivation - external regulation

1. Because with only a high-school degree I would not find a high-paying job later on.
8. In order to obtain a more prestigious job later on.
15. Because I want to have "the good life" later on.
22. In order to have a better salary later on.

Amotivation

5. Honestly, I don't know; I really feel that I am wasting my time in school (medical).
12. I once had good reasons for going to college (medical); however, now I wonder whether I should continue.
19. I can't see why I go to school (medical) and frankly, I couldn't care less.
26. I don't know; I can't understand what I am doing in school (medical).

We were looking for a measure of actual sacrifice for medical study and found the Maslach Burnout Inventory-Student Survey (MBI-SS), which contained an Exhaustion scale.[31] Burnout among students has been defined as feeling exhausted because of study demands, having a cynical and detached attitude toward one's study, and feeling incompetent as a student. Only the exhaustion scale was used in our study expecting that if a student had a higher score on exhaustion from study his strength of motivation for medical school would be lowered. This scale had 5 items scored on a Likert scale of 0 to 6. Construct and concurrent validity evidence for this is good.[31]

Statistical analyses

The statistical analyses were carried out using the software programme SPSS version 15.0. An exploratory factor analysis for SMMS item scores was carried out. These items were analysed for grouping into subscales by using principal components analysis using promax rotation with Kaiser normalization, as the factors were not expected to be completely independent of each other.[32, 33] The 'Relations to other variables' were tested by Pearson's correlation analysis of the SMMS subscales with the scores on the different scales of the AMS and exhaustion scale of the MBI-SS. Cronbach's alpha for internal consistency was determined for establishing the reliability of the subscales.

Results

Out of the 4162 students approached through their university e-mail accounts, there were 28 failed addresses, 2 students were out of the country, 1 had left to join another course and 9 explicitly refused to participate. Only 2366 students viewed the questionnaire and only 1494 completed it. Thus the sample size amounted to 1494 (N) and the response rate to 36.2%.

The gender distribution among the responders was 71.9% females (1075/1494) and 28.1% males (419/1494). This distribution was slightly, but significantly different from the actual population in both the schools. In percentage terms the difference was less than 5%, so we find it acceptable and representative. This difference was found to be approximately similar in both medical school populations. We also performed t-tests for independent groups on the SMMS total and subscale scores of males and females and did not find significant differences.

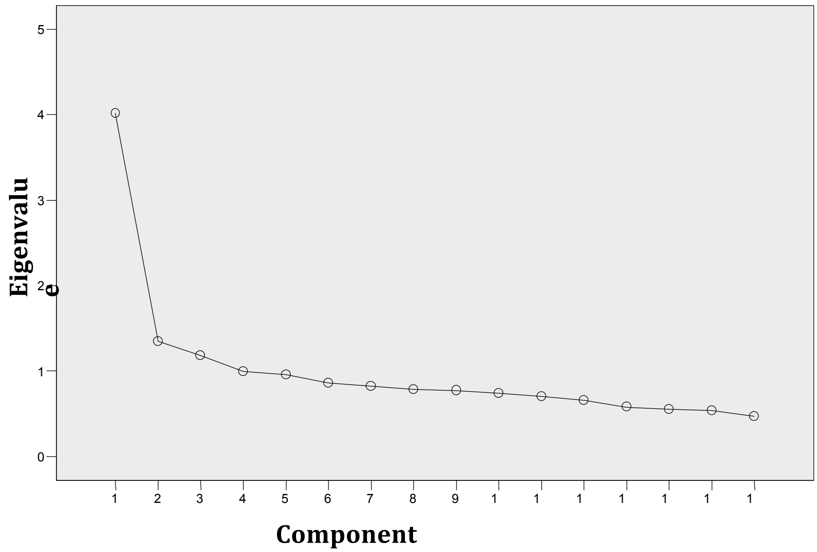
The factor analysis with promax rotation yielded three separate factors or subscales explaining 40.8% of the variance in the SMMS scores. The criteria for accepting the 3-factor structure were: eigenvalues above 1[33], the scree plot (Figure 3) and the amount of variance explained by the factors. This was also supported by theoretical explanation of three separate subscales as covered in the definition of strength of motivation for medical school. The three subscales for strength of motivation for medical study could be labelled as:

1. Willingness to sacrifice (Subscale 1)
2. Readiness to start (Subscale 2)
3. Persistence (Subscale 3)

Subscale 1- Willingness to sacrifice

This subscale measures the willingness of a student to sacrifice for his/her medical study. It explained 26% of the variance in the SMMS scores. Five items i.e. 5, 7, 9, 10 and 12, based on their factor loadings (>0.40), fitted into this subscale (Table 1). Item 15 had low factor loadings i.e. 0.27, 0.21 and 0.06 on the subscales. We decided to check whether there is increase in internal consistency of subscale 1 if this item is deleted and then make a decision on whether to retain this item in the subscale or not. The Cronbach's alpha of this subscale was 0.69 and increased to 0.70 when item 15 was deleted, so we decided to drop this item from the subscale. All further analyses have been carried out after omitting item 15. Item total correlations of all items were >0.3, which is the recommended value.[33]

Figure 3 Scree plot of SMMS questionnaire factor analysis



Subscale 2 - Readiness to start

This subscale measures the readiness and will to enter medical study. It explained 9% of the variance in the SMMS scores. Five items i.e. 1, 3, 6, 11 and 16, with factor loadings >0.40, fitted into this subscale (Table 1).

Internal consistency of this subscale was 0.67. Item total correlations of all items were >0.3.

Subscale 3 – Persistence

This subscale measures the persistence in medical study in spite of unfriendly circumstances during or after the study. This factor explained 8% of the variance in the SMMS scores. Five items i.e. 2, 4, 8, 13 and 14, with factor loadings >0.40, fitted into this scale (Table 1). Internal consistency of this subscale was 0.55, which is lower than recommended. Corrected item total correlation was 0.220, which is also lower than the recommended 0.3 (Field 2005).

Table 1 Factor loadings of the SMMS questionnaire items

Sr. No.	*SMMS Item*	*Factor 1*	*Factor 2*	Factor 3
5.	Even if I could hardly maintain my social life, I would still continue medical training.	**0.75**	0.02	-0.08
7.	I would still choose medicine even if that meant I would never be able to go on holidays with my friends anymore.	**0.70**	0.05	-0.02
9.	If studying took me more than an average of 60 hours a week, I would seriously consider quitting.	**0.45**	-0.01	0.22
10.	I intend to become a doctor even though that would mean taking CME courses two evenings a week throughout my professional career.	**0.57**	0.11	0.08
12.	I would like to become a doctor, even if that would mean giving precedence to my work over my family.	**0.76**	-0.12	-0.04
15.	I would like to study medicine, even if I have to spend a lot of time on topics that later	0.27	0.21	0.06

	turn out to be a waste of time.			
1.	I would always regret my decision if I hadn't availed myself of the opportunity to study medicine.	-0.08	**0.76**	-0.04
3.	I would still choose medicine even if that would mean studying in a foreign country in a language that I have not yet mastered.	-0.10	**0.51**	0.16
6.	I wouldn't consider any other profession than becoming a doctor.	0.11	**0.66**	-0.04
11.	It wouldn't really bother me too much if I could no longer study medicine.	0.04	**0.66**	0.09
16.	I would be prepared to retake my final high school exams to get higher marks if this would be necessary to study medicine.	0.10	**0.57**	-0.16
2.	I would quit studying medicine if I were 95% certain that I could never become the specialist of my choice.	0.06	-0.33	**0.65**
4.	As soon as I would discover that it would take me ten years to qualify as a doctor, I would stop studying.	0.02	0.17	**0.57**
8.	I would stop studying medicine if I started scoring low marks and failing tests often.	-0.02	0.17	**0.47**
13.	I would quit studying as soon as it became apparent that there were no jobs or resident positions after graduation.	0.01	-0.07	**0.69**
14.	I would not have chosen medicine if it would have caused me to accumulate substantial financial debts.	-0.07	0.21	**0.50**

Factor/Subscale 1 - Willingness to sacrifice, Factor/Subscale 2 - Readiness to start, Factor/Subscale 3 - Persistence

There were no cross loadings of items in one subscale onto another subscale which were greater than 0.40 (Table 1). The three subscales were significantly correlated with each other with correlations of 0.485 (subscales 1 & 2), 0.369 (subscales 2 & 3) and 0.360 (subscales 1 & 3). This was expected, as they are not completely independent, which was also the reason why a promax rotation was used in the factor analysis.

The SMMS scores for subscale 1, 2 and 3 and full SMMS (without item 15) correlated significantly positively with intrinsic motivation (0.248, 0.276, 0.175 and 0.308) and the correlation decreased and became negative as one moved from the intrinsic to the extrinsic motivation spectrum (Table 2, Figure 4). The correlations of subscale 1 and 2 and full SMMS with the Extrinsic Motivation-External Regulation score (0.018, 0.037 and -0.023 respectively) and SMMS subscale 3 with Extrinsic Motivation-Introjected Regulation (-0.036) were not significant. The correlations with amotivation (-0.367, -0.450, -0.293 and -0.472 respectively) and exhaustion from study (-0.184, -0.151, -0.175 and -0.206 respectively) scores were negative and significant.

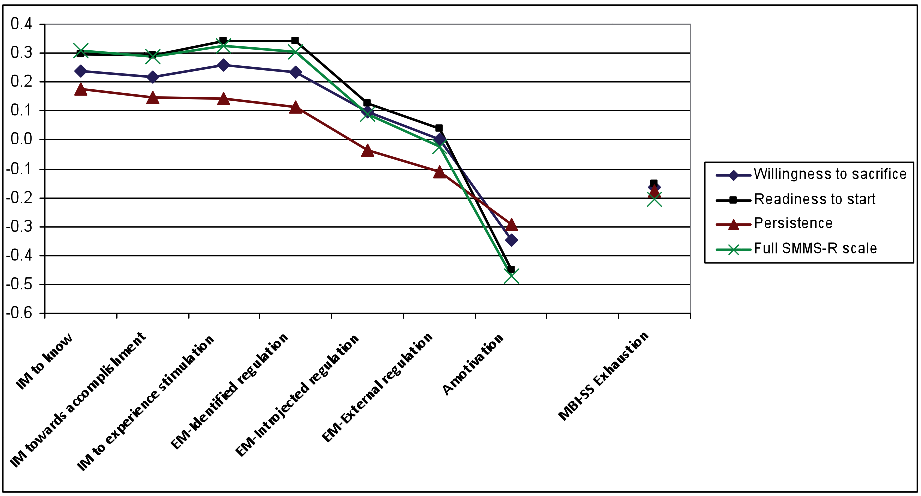
Table 2 Pearson correlations between SMMS subscales and AMS and MBI-SS

Subscales of AMS and MBI-SS	***Willingness to sacrifice***	***Readiness to start***	***Persistence***	***Full SMMS without item 15***
Intrinsic Motivation to Know (AMS)	0.248*	0.296*	0.175*	0.308*
Intrinsic Motivation towards Accomplishment (AMS)	0.225*	0.294*	0.145*	0.286*
Intrinsic Motivation to experience	0.258*	0.341*	0.144*	0.327*

stimulation (AMS)				
Extrinsic Motivation - Identified Regulation (AMS)	0.257*	0.340*	0.114*	0.305*
Extrinsic Motivation - Introjected Regulation (AMS)	0.104*	0.126*	-0.036 (p=0.169)	0.087*
Extrinsic Motivation - External Regulation (AMS)	0.018 (p=0.494)	0.037 (p=0.148)	-0.112*	-0.023 (p=0.375)
Amotivation (AMS)	-0.367*	-0.450*	-0.293*	-0.472*
Exhaustion from study (MBI-SS)	-0.184*	-0.151*	-0.175*	-0.206*

All positive and negative correlations > 0.037 and < 0.450 are significant at P< 0.001

Figure 4 Graphical representation of correlations between SMMS and AMS and MBI-SS exhaustion subscales



All positive and negative correlations > 0.037 and < 0.450 are significant at P< 0.001

Discussion

The SMMS questionnaire is the only existing questionnaire, to the best of our knowledge, for measuring the strength of motivation of students particularly for medical school. Validation of the measurement by this instrument is therefore important. If this measurement has good psychometric properties, the SMMS questionnaire could be used on a post-hoc basis for measuring strength of motivation of students admitted to medical study or for studying motivation of students through the duration of their medical study and how it can be manipulated, finding a link between motivation and academic success and so on.

The SMMS questionnaire has previously been proposed to have a uni-dimensional factor structure.[21] Though in our analyses the first factor alone could explain 26% of the variance in the SMMS scores, we accepted a 3-factor structure for the questionnaire because the factor loadings of 11 items in the questionnaire onto the first factor were less than 0.40. The 3-factor structure was also theoretically sound.

The findings for reliability of the Willingness to sacrifice and Readiness to start are acceptable since they are 0.70 and 0.67 respectively. The reliability for Persistence subscale (0.55) was lower than expected, but we think that it is acceptable for comparing groups of students. These reliabilities are good enough for use of this questionnaire to assess and understand relationships between motivation and teaching-learning processes or academic successes. We would not advocate the use of this instrument for selecting medical students in which case it would qualify as a high-stakes examination and would need higher reliability values. We would recommend the use of the Persistence subscale with caution and encourage further studies for establishing further validity evidence. The use of the full scale (SMMS-R, Figure 5) would also be acceptable. The reliability of the full scale is higher than that of the subscales (Cronbach's alpha=0.79). Similar reliabilities have been found in other studies.[34]

Figure 5 SMMS-R Questionnaire‡

(People have diverse reasons to study medicine. Please indicate how much the following statements reflect your personal situation by marking 1 to 5 (Strongly disagree to Strongly agree) with each statement below.)

Sr. No.	*SMMS-R Item*	*Subscale*	*To be reverse scored*
1.	I would always regret my decision if I hadn't availed myself of the opportunity to study medicine.	**2**	
2.	I would quit studying medicine if I were 95% certain that I could never become the specialist of my choice.	**3**	√
3.	I would still choose medicine even if that would mean studying in a foreign country in a language that I have not yet mastered.	**2**	
4.	As soon as I would discover that it would take me ten years to qualify as a doctor, I would stop studying.	**3**	√
5.	Even if I could hardly maintain my social life, I would still continue medical training.	**1**	
6.	I wouldn't consider any other profession than becoming a doctor.	**2**	
7.	I would still choose medicine even if that meant I would never be able to go on holidays with my friends anymore.	**1**	
8.	I would stop studying medicine if I started scoring low marks and failing tests often.	**3**	√
9.	If studying took me more than an average of 60 hours a week, I would seriously consider quitting.	**1**	√
10.	I intend to become a doctor even though that would mean taking CME courses two evenings a week throughout my professional career.	**1**	
11.	It wouldn't really bother me too much if I could no longer study medicine.	**2**	√
12.	I would like to become a doctor, even if that would mean giving precedence to my work over my family.	**1**	
13.	I would quit studying as soon as it became apparent that there were no jobs or resident positions after graduation.	**3**	√
14.	I would not have chosen medicine if it would have caused me to accumulate substantial financial debts.	**3**	√

†15.	I would be prepared to retake my final high school exams to get higher marks if this would be necessary to study medicine.	**2**

†*Old Item 15 deleted and old item 16 renumbered as item 15*
‡ *The SMMS-R has been translated from Dutch to English for publication purposes.*

We found significant correlations with a more established motivation scale i.e. the AMS, and a pattern of decreasing correlations from the intrinsic to the extrinsic motivation could be clearly observed. This supports the construct validity of the SMMS scale. We expected all AMS subscales for intrinsic motivation and the extrinsic subscale for “identified regulation” to correlate highest with the SMMS scores and its subscales. This was supported by the results. The size of correlations was not very big. This may be explained by the fact that the SMMS measures strength of motivation and the AMS measures type of motivation. We also expected all three SMMS subscales to have a strong negative correlation with amotivation, which was also supported by the results. These findings are in concurrence with the earlier study, which had found that SMMS scores correlated significantly negatively with ambivalence towards studying. [21] We also expected no significant correlation between the SMMS subscales and external regulation subscale of the AMS. This was because earlier studies indicate that a higher number of students have altruistic motives for entering medical study than monetary or status motives and the external regulation subscale measures the latter rather than the former.[3-6] We expected the identified regulation subscale of AMS to be positively correlated with the SMMS subscales because the unique nature of medical education would make most students answer the items positively, as all the statements seem to be true in the absolute sense of the profession. Considering this as a limitation of these items, we would not recommend deep interpretation of this particular finding. The significant negative correlation with exhaustion from studies was expected as exhaustion or stress of study would tend to lower the motivation in the students. Low motivation has previously been proposed as both a cause and consequence of student distress.[35, 36] It would perhaps have been better to use the entire MBI-SS rather than using the exhaustion scale in isolation, since the other scales measuring cynical and detached attitude towards study and feelings of incompetence would have added on to the findings and perhaps even increased the size of correlation. The reason not to do so in the current study was the anticipated length of all questions combined and its adverse effect on response. The use of the entire MBI-SS is however recommended in any further studies.

This study has a number of limitations. The biggest limitation is the response rate, which was quite low, therefore we cannot rule out a response bias. One of the reasons for this response rate could be that the students found the survey too long. The other reason for a response bias could be that the more motivated students in the sample were also the ones taking part in the study. The construct validity of this questionnaire needs to be evaluated and established in a wider variety of samples as all the studies which have used SMMS questionnaire as the instrument have been carried out in the Netherlands on Dutch students; even if they have been done in different institutes in the country. We recommend this because most of the students in The Netherlands enter medical study through a weighted lottery system and there have been studies which show that students entering by selection have higher motivation than those entering through lottery as measured with the SMMS.[37] Therefore, additional validation needs to be carried out in other countries where selection is the method for entry into medical school. Further studies are also proposed to confirm the 3-factor structure through a confirmatory factor analysis.

Conclusion

We established support for the validity of measurement of the strength of motivation for medical school using the SMMS questionnaire, both for its entirety and for its subscales. The SMMS questionnaire has a three factor structure, signifying Willingness to sacrifice, Readiness to start and Persistence.

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Chapter 5

Motivational profiles of medical students: Association with study effort, academic performance and exhaustion

Submitted for review and publication

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Abstract

Background

Students enter medical study with internally generated motives like genuine interest (intrinsic motivation) or externally generated motives like parental pressure or desire for prestige (controlled motivation). Depending on the endorsement of intrinsic motivation versus controlled motivation, students could differ in their study effort, academic performance and adjustment to the study.

Aim

The objectives of this study were to generate motivational profiles using combinations of high or low intrinsic and controlled motivation and test their value in better predicting study outcomes in medical students.

Methods

Participating students (N=844) from University Medical Center Utrecht, The Netherlands, were assigned to different clusters through K-cluster analysis using intrinsic and controlled motivation scores. Cluster membership was used as an independent variable to assess dependent variables like study strategies, self-study hours, academic performance and exhaustion from study.

Results

Four clusters; High Intrinsic High Controlled-HIHC (N=213, 25.2%), Low Intrinsic Low Controlled-LILC (N=143, 16.9%), Low Intrinsic High Controlled-LIHC (N=268, 31.8%) and High Intrinsic Low Controlled-HILC (N=220, 26.1%) were obtained. HILC students were significantly better at deep study strategy ($p<0.001$), self-study hours ($p<0.05$), GPAs ($p<0.001$) and had lower exhaustion ($p<0.001$) than LIHC and LILC students. HILC profile is associated with good study effort, strategy, academic performance and less exhaustion from study, so is HIHC profile, except for high surface strategy. LILC and LIHC profiles were associated with the least desirable study outcomes.

Conclusion

Motivational profiling is a useful tool to understand learning and performance processes within individual students and can be a complementary approach to studying motivation and academic performance as group variables.

Motivational profiles of medical students: Association with study effort, academic performance and exhaustion

Introduction

Students enter medical study with a variety of motives.[1] These could be[2-9] generated internally like interest in helping people, interest in science or biology, desire for intellectual challenge which would classify as "intrinsic motivation"[10, 11] or generated from external factors like desire for monetary rewards or prestige or pressure from parents which would classify as "controlled motivation"[10, 11]. Individual students may combine intrinsic and controlled motivations in a unique way. These motivations endorsed by the students are considered important in predicting how students adjust to their study, how much effort they are willing to invest in their study, performance in medical school and preference of specialty.[3, 5] Combination of intrinsic and controlled motivations endorsed by the students may give rise to different motivational profiles which could affect their study outcomes. For example, students studying because of genuine interest in the study (intrinsic motivation) would exhibit different type of study behaviour as compared to students who are studying because of parental pressure or prestige (controlled motivation).[10, 12, 13] The combination of these motivations may give rise to unique profiles among students, which would be lost if motivation is studied as a group variable.[14] Studying motivation and study outcomes as group variables would give us important information about how they affect each other. Studying unique combinations of motivations in each individual student, which is called a person-oriented approach, would be a complementary approach which could yield more insights into what happens in every individual student.

The present study was carried out with the intention of combining high or low quantities of intrinsic and controlled motivations, generating motivational profiles using these two dimensions and testing the value of using these motivational profiles for better predicting learning outcomes in medical students. We planned this because we have the view that a student's motivational profile is likely to impact on his or her academic performance.[14, 15] We aimed to answer the following questions through this study:

- What types of motivational profiles, combining high or low intrinsic and controlled motivations, exist among medical students?

- Do different motivational profiles, based on the above combinations, predict differences in study effort, strategies, academic performance and exhaustion from study?

To clarify the concept of motivational profiles, we would like to explain some concepts elaborated in Self-determination Theory (SDT). Deci and Ryan elaborated two types of motivation; intrinsic and extrinsic.[10, 13, 16] A person is said to be intrinsically motivated for something when it is done out of genuine liking and extrinsically motivated when it is done for a particular gain. In the recent years, SDT introduced the dichotomy of "autonomous" versus "controlled" motivation.[17, 18] This taxonomy is based on the origin of the motivation and differs whether it originates from within an individual (autonomous/self-determined) versus from forces outside an individual (controlled). Intrinsic motivation is considered the prototype of autonomous or self-determined motivation. It has been found that autonomous motivation, as compared to controlled motivation, leads to greater creativity [19], less superficial information processing[17], more deep learning[18, 20], higher achievement[21, 22], enhanced well-being or adjustment[23, 24], decreased drop-out intention and behaviour[25, 26]. SDT posits that quality of motivation i.e. intrinsic or autonomous and extrinsic or controlled, is more important than quantity of motivation i.e. high or low in determining study outcomes of students. Other theories of motivation like Need to Achieve theory, Expectancy-value theory etc., subscribe to the view that the higher the quantity of motivation, the better are the study outcomes.[27, 28] We wanted to test how different combinations of high or low intrinsic and controlled motivations would affect study outcomes of students.

For generating different motivational profiles, we planned to do cluster analyses using the intrinsic and controlled motivation scores of the students. We expected to find four motivational profiles namely High Intrinsic High Controlled (HIHC), Low Intrinsic Low Controlled (LILC), Low Intrinsic High Controlled (LIHC) and High Intrinsic Low Controlled (HILC) (See Table 1) based on the different combinations of quality and quantity of motivation. HIHC profile would be seen in a student who endorsed both intrinsic and controlled motivations in high quantity, e.g. a student who was interested in medicine, but also driven by prestige of the profession. HILC profile would be seen in a student who endorsed intrinsic motivation in high quantity and controlled motivation in low quantity, e.g. a student studying medicine only because of interest in patients or biology. LIHC profile would be seen in a student who was in the study only for monetary rewards or parental pressure. LILC profile would be seen in a student who was indifferent to the choice of medicine, performed well in the qualifying exam, had the chance to enter medicine and decided to try it. The examples of motivations of students given above have been actually found in studies in medical education.[2-9]

Ratelle et al.[15] and Vansteenkiste et al.[14], designed research to disentangle the quantity versus quality of motivation issue and to find more evidence for SDT, i.e. the quality of motivation. Vansteenkiste et al.[14] proposed that similar quantities of motivation with different qualities would produce different outcomes and that quality of motivation is in fact rather the differentiator for learning outcomes, not quantity. In their study, quantity could be 'high' or 'low' and quality could be 'autonomous' or 'controlled'.[14] Thus the different combinations of quantity and quality of motivation could be High Autonomous High Controlled (HAHC) motivation, Low Autonomous Low Controlled (LALC) motivation, Low Autonomous High Controlled (LAHC) motivation and High Autonomous Low Controlled (HALC) motivation (see Table 1). They used cluster analyses on their data (from secondary and high school students and college students) that created motivational profiles which were shown in Table 1.

Table 1 Motivational profiles based on SDT

Autonomous motivation	**Controlled motivation**	**Motivational profile based on SDT** Vansteenkiste et al.[14] *study*	**Motivational profile (I–Intrinsic motivation)** *Current study*
High	High	**HAHC**	**HIHC**
High	Low	**HALC**	**HILC**
Low	High	**LAHC**	**LAHC**
Low	Low	**LALC**	**LALC**

Though Vansteenkiste et al. hypothesized that HALC motivation students would perform better than HAHC motivation students, engage in more meaningful study and have better well-being than HAHC motivation, they actually found that these students were indeed significantly better on performance and test anxiety, but not on the other learning parameters.[14] Ratelle et al. used quality, i.e. autonomous and controlled motivation and amotivation scores, and quantity, i.e. high, moderate and low motivation to create different profiles.[15] They could not find evidence for all the profiles which they had hypothesized about. They found that HAHC students performed as well as HALC students, but HALC students were more persistent in their study.[15]

We used intrinsic motivation scores instead of autonomous motivation scores and controlled motivation scores to cluster our subjects as intrinsic motivation is considered as the prototype of autonomous motivation and we had earlier found that one of the subscales for autonomous motivation does not work well in students of health professions education.[29]

Based on SDT[10, 13] and the research done in general education on motivational profiles based on SDT[14, 15], we hypothesized that:

- HILC motivational profile would be associated with a deep study strategy and more hours of studying, better academic performance and low exhaustion.
- HIHC motivational profile would be associated with more surface learning strategy, good academic performance and higher exhaustion.
- LILC and LIHC motivational profiles would be associated with surface learning strategy, less hours of study, lower academic performance and high exhaustion.

Methods

Sample

Students from all six years of the medical course at University Medical Center Utrecht, The Netherlands, were included in this study. The first part of the study was carried out over a period of three months towards the end of 2009. The internet based data collection programme "Survey Monkey – www.surveymonkey.com " was used to send out electronic questionnaires to these students. Two thousand and twenty students were sent an invitation to participate in the study with a link to the questionnaire. A book voucher worth 50 € was offered to 5 students to be picked out by lottery. A time period of four weeks was given to fill up the questionnaire. Three reminders were sent to students who did not respond. The second part of the study was carried out in October 2010 which included collecting academic performance data from one term, i.e six months of the academic year 2009-2010. The data was available only to RAK and she anonymized it before carrying out any analyses.

Ethical approval

The NVMO-ERB (Netherlands Association for Medical Education Ethical Review Board) was established much after our study began. Before this board came into existence, medical education research in The Netherlands was exempt from ethical approval requirement. To make sure that we complied with the rules laid down by the Declaration of Helsinki the students were explained that the participation in the study was voluntary, there was guarantee of confidentiality and anonymity and that non-participation would not cause them any harm. They could also choose to withdraw from the study at any time without giving any reason. Written informed consent was obtained from all the participants.

Instruments used

An internet-based electronic survey was designed which contained some personal proforma questions, the Academic Motivation Scale (AMS)[30] to measure intrinsic and controlled motivation, self-study hours/week, Study Process Questionnaire (SPQ)[31] to assess the study strategies (deep and surface) of the students and “exhaustion from study” scale from Maslach Burnout Inventory-Student Survey (MBI-SS)[32]. We used Intrinsic motivation scores instead of Autonomous motivation scores (average of intrinsic and identified regulation scores) as we had earlier found the latter subscale did not work well in students of health professions education.[29] Controlled motivation scores were calculated by taking an average of introjected regulation and external regulation extrinsic motivation scores as described in SDT literature. (Please refer to[17, 18] for further details on calculation of autonomous and controlled motivation scores). According to SPQ, deep study strategy scores reflected use of study strategy by students to create an in-depth understanding of the study material, whereas surface study strategy scores reflected the use of study strategy to memorize facts from the study material without deep understanding.[31] We collected the academic performance results in terms of ECTS (European Credit Transfer System) credits and GPA (Grade Point Average) attained by the students from September 2009 up to February 2010 (six months/one term). ECTS credits are awarded after completing a course and passing the exam on that course and GPA is the weighted average of grades (weighted according to the ECTS that can be obtained) attained by the students. All questionnaires used had proven validity and reliability.[30-32]

Statistical Analyses

The data were analysed using SPSS version 15.0. Students were clustered into different motivational profiles using K-means clustering (using squared Euclidean distances and iterative method) on the Z-scores of their autonomous and controlled motivations. The variances in autonomous and controlled motivation scores explained by the cluster solution were calculated using analysis of variance ANOVA. For the cluster solution to be acceptable, it needs to explain a minimum of 50% variance in the autonomous and controlled motivation scores.[14] We carried out validation procedure for the cluster solution by creating sub-samples and comparing their respective cluster solutions. Using cluster membership as an independent variable, we compared study strategies, self-study hours, exhaustion from study, ECTS and GPAs using multivariate analysis of covariance MANCOVA method.

Results

There was a response rate of 42% since 849 students out of 2020 filled out the survey. Out of these 73.2% were females and 26.8% were males, close to the actual gender distribution among the whole student population (69.6% and 30.4%). Since the differences between the actual percentages and responders percentages were less than 5%, we consider the responders representative of the gender distribution. Not all the scales were filled out by all students. We carried out the analyses of the learning variables and outcomes with the respective completed responses (See Table 4). The internal consistencies of the different scales used in the survey were acceptable, Cronbach's alpha values of all being above 0.70. First we computed the correlations between all independent and dependent variables which are given in Table 2. We found that intrinsic motivation was significantly positively correlated with deep strategy towards study (r=0.46), self-study hours (r=0.09) and GPA (r=0.108) and significantly negatively correlated with surface strategy towards study (r=-0.152) and exhaustion from study (r=-0.179). In contrast, controlled motivation was significantly negatively correlated with self-study hours (r=-0.115) and GPA (r=-0.117) and significantly positively correlated with surface strategy (r=0.26) and exhaustion from study (r=0.088).

Table 2 Correlations between all variables measured and differences between males and females

Variable	Males Mean (SD)	Females Mean (SD)	T test (p value)	1	2	3	4	5	6	7
1 Intrinsic motivation	4.82 (0.72)	4.91 (0.73)	-1.47 (0.14)	-						
2 Controlled motivation	4.23 (1.14)	3.86 (1.18)	4.09 (0.00***)	0.332**	-					
3 Deep strategy	2.83 (0.61)	2.79 (0.64)	0.84 (0.397)	0.460**	0.050	-				
4 Surface strategy	2.39 (0.59)	2.34 (0.58)	0.991 (0.322)	-0.152**	0.260**	-0.239**	-			
5 Self-study hours	12.92 (7.12)	13.97 (7.10)	-1.84 (0.065)	0.095**	-0.115**	0.332**	-0.153**	-		
6 ECTS	19.95 (7.86)	20.92 (8.40)	-1.446 (0.149)	0.008	0.066	-0.017	0.017	-0.068	-	
7 GPA	7.22 (0.98)	7.45 (0.84)	-3.00 (0.003**)	0.108**	-0.117**	0.195**	-0.250**	-0.032	-0.032	-
8 Exhaustion from study	1.88 (1.07)	2.07 (1.02)	-2.38 (0.017*)	-0.179**	0.088*	-0.123**	-0.290**	0.085*	-0.052	-0.151**

*p<0.05, ** p<0.01, ***p<0.001

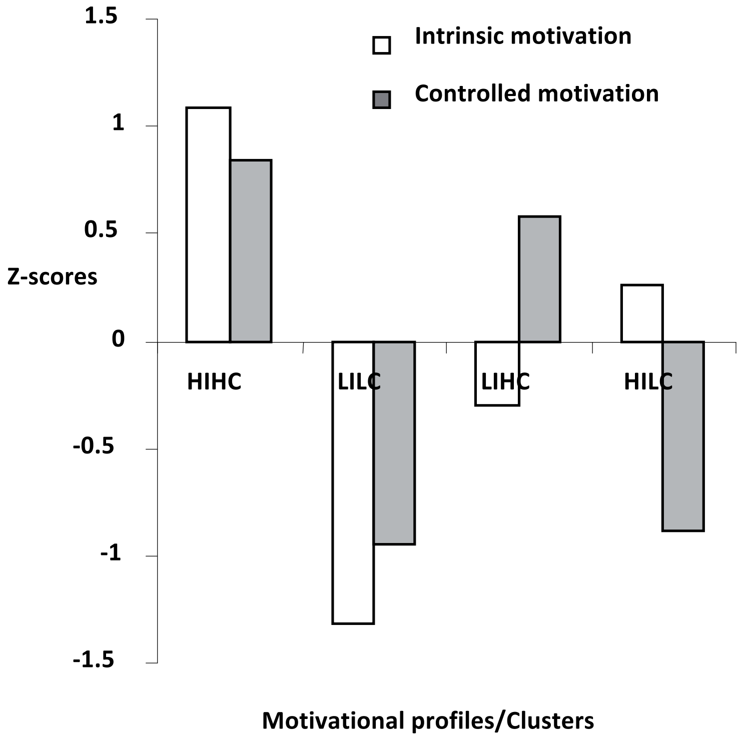
All scores obtained from the students were converted into Z-scores in order to make them comparable. The Z-scores on intrinsic motivation and controlled motivation were used to cluster the students into different motivational profiles.

Five outliers were removed from the data as cluster analyses are highly sensitive to outliers. For the 844 students included in the analyses we tried fitting 3-cluster, 4-cluster and 5-cluster solutions according to the methods described for cluster analyses. A 4-cluster solution, as we had anticipated finding, indeed fitted the data best. It explained 69.7% variance in the intrinsic motivation scores and 64.4% variance in the controlled motivation scores. The 4 clusters obtained are shown in Table 3 & Figure 1.

Table 3 Distribution of students among 4 clusters along with gender

Cluster membership	Intrinsic motivation Z-score Mean (SD)	Controlled motivation Z- score Mean (SD)	No. of students in cluster (%)	Males	Females
HIHC	1.087 (0.546)	0.843 (0.622)	213 (25.2%)	61 (27%)	152 (24.6%)
LILC	-1.322 (0.589)	-0.948 (0.738)	143 (16.9%)	38 (16.8%)	105 (17%)
LIHC	-0.301 (0.511)	0.575 (0.481)	268 (31.8%)	92 (40.7%)	176 (28.4%)
HILC	0.261 (0.482)	-0.881 (0.586)	220 (26.1%)	35 (15.5%)	185 (30%)
Total			844 (100%)	226 (100%)	618 (100%)
Chi-square statistic for gender	21.42				
Significance	P=0.00				

Figure 1 Motivational profiles through cluster analysis



Apart from having a theoretical explanation and validation for the 4-cluster solution, we tried to establish validation by randomly splitting the sample into two and running the cluster analyses separately on these two samples. We found that both samples yielded similar cluster solutions. Finding differences in study behavior and performance results (explained subsequently) also yields additional validation for the 4-cluster solution.

The distribution of males and females in the different clusters was significantly different with a Chi square statistic of 21.42 and $p<0.001$ (see Table 3). LIHC cluster has highest percentage of male students (40.7%)

and the HILC cluster has the highest percentage of female students (30%) and lowest percentage of male students (15.5%). The students from different years of the curriculum (1 to 6) were well-distributed among the different clusters, therefore we did not control for year of curriculum while performing the analyses.

Since we found significantly different distribution of gender between the clusters and significant differences in some learning variables (Table 2), we decided to analyze the differences between learning variables and outcomes between the clusters after correcting for gender differences. After performing the checks required to test the assumptions of MANCOVA, we conducted a MANCOVA using cluster membership as an independent variable, learning variables and outcomes as dependent variables and gender as a covariate.

For the learning variables and outcomes the Wilk's lambda was significant, F=68.674, P<0.001, partial eta squared=0.508 i.e a large effect size[33], meaning that learning variables and outcomes were significantly different for different clusters. Gender showed a multivariate effect F=4.366, P<0.001, partial eta squared=0.062 i.e. a medium effect[33], meaning that there were significant differences because of gender.

Table 4 Differences between learning variables and outcomes among different clusters (MANCOVA)

	HIHC Mean (SD)	LILC Mean (SD)	LIHC Mean (SD)	HILC Mean (SD)	F	Eta squared (% of variance explained)
Intrinsic motivation (n=844)	5.70_{a} (0.41)	3.85_{b} (0.45)	4.63_{c} (0.39)	5.07_{d} (0.36)	452.72***	0.694 (69.4%)
Controlled motivation (n=844)	4.96_{a} (0.74)	2.82_{b} (0.88)	4.64_{c} (0.57)	2.90_{b} (0.69)	352.77***	0.639 (63.9%)
Deep strategy (n=709)	3.10_{a} (0.55)	2.40_{b} (0.65)	2.64_{c} (0.58)	2.93_{d} (0.62)	31.64***	0.137 (13.7%)
Surface strategy (n=709)	2.39_{a} (0.62)	2.37_{a} (0.59)	2.50_{a} (0.57)	2.14_{b} (0.52)	11.48***	0.054 (5.4%)
Self -study hours (n=796)	$14.16_{a,b}$ (7.67)	$13.20_{a,b}$ (6.61)	12.77_{a} (6.31)	14.65_{b} (7.69)	3.05**	0.015 (1.5%)
ECTS (n=780)	21.39_{a} (8.15)	20.23_{a} (7.96)	20.95_{a} (8.07)	19.84_{a} (8.77)	1.126	0.004 (0.4%)
GPA (n=780)	7.41_{a} (0.93)	$7.35_{a,b}$ (0.86)	7.20_{b} (0.93)	$7.62_{a,c}$ (0.76)	5.78***	0.028 (2.8%)
Exhaustion from study (n=844)	1.91_{a} (1.03)	2.29_{b} (1.06)	$2.14_{a,b}$ (1.03)	$1.83_{a,c}$ (0.99)	5.04**	0.025 (2.5%)

***p<0.05, ***p<0.001. The means with different subscripts are significantly different from each other. Effect sizes[33] from Eta squared: Small=0.01-0.06, Medium=0.06-0.138, Large>0.138*

All the clusters were significantly different as regards intrinsic motivation and all but LILC and HILC were significantly different from each other on controlled motivation (see Table 4). HILC motivation students had significantly more deep strategy and significantly less surface strategy towards study as compared to LIHC (p<0.001) and LILC (p<0.001, p<0.01) motivation students. This was as we expected to find. HIHC students had significantly more, both, deep ($p<0.05$) and surface strategies ($p<0.001$) as compared to HILC students. It probably means that HIHC students employ both deep and surface strategies as and when required. HILC motivation students had significantly less exhaustion from study as compared to LILC ($p<0.001$) and LIHC ($p<0.01$) students. HIHC students also had significantly less exhaustion from study as compared to LILC students ($p<0.05$). HILC students showed significantly more self-study hours as compared to LIHC students ($p<0.01$) and also more than HIHC and LILC students, but this difference did not reach statistical significance. There was no difference between the ECTS credits obtained by the different clusters. HILC students had the highest GPAs, which were significantly higher than LILC ($p<0.05$) and LIHC ($p<0.001$) students, but the difference did not reach statistical significance in comparison with HIHC students.

Discussion

Motivational profiling has been described as a person-oriented approach as it focuses on combination of high or low autonomous and controlled motivation in every individual.[14, 15] This helps to carry out more in-depth analyses of motivational forces working in every individual. Studying motivation as a group variable is important to find how motivation affects study behaviour and academic performance and also the direction of the influence. Studying motivation through a person-oriented approach, i.e. motivational profiles, investigates processes working in individual students. Thus, motivational profiles type of analysis yields complementary information to studying autonomous and controlled motivations as group variables.

To our knowledge, this is the first study in medical education which classifies students according to their motivational profiles. Cluster analysis of the motivational variable has been done before in medical education, but the clusters found were based only on quantity of autonomous and controlled motivation, i.e. high, moderate, low and poor (though the clusters were not labelled as such).[34] Sobral did not look at autonomous or controlled motivational profiles and how they affected learning in medicine.[34] Our study also carries the work of Vansteenkiste et al. a step further as it utilizes actual academic performance results rather than self-reported performance results.[14]

Table 5 Learning composite according to motivational profiles

Cluster Profile	HIHC	LILC	LIHC	HILC
Intrinsic motivation	High	Low	Low	High
Controlled motivation	High	Low	High	Low
Deep strategy	High	Low	Low	High
Surface strategy	High	High	High	Low
Self -study hours	Good	Low	Low	High
ECTS	Good	Good	Good	Good
GPA	Good	Low	Low	High
Exhaustion from study	Low	High	High	Low

We found that males had significantly higher controlled motivation as compared to females, which has been found in earlier studies[14, 15, 34], but we found no difference in intrinsic motivation. When we looked into the distribution of genders within the clusters, we found that males were represented more in the LIHC motivation profile and females were represented more in the HILC motivation profile. Vansteenkiste et al. found similar distribution among the clusters found in their study.[14]

We found that HILC motivation students had the optimal learning profile with high deep strategy, low surface strategy, more time spent in self-study, good ECTS, high GPA and low exhaustion from study (see Table 5). Both LILC and LIHC motivation clusters had the least desirable learning profiles with satisfactory ECTS credits, but low deep strategy, high surface strategy, less time in self–study, low GPA and high exhaustion from study. These findings are in line with the Vansteenkiste et al. study.[14] HIHC students surprisingly scored high on depth of study strategy (even higher the HILC cluster) and low on exhaustion from study.[14] On all parameters they did as well as the HILC profile, except the GPA where the difference was not statistically significant. This was the difference we found from Vansteenkiste et al. study in which GPA (self-reported grades) of HALC students was significantly higher.[14] Also they found that HAHC students had higher test anxiety, but we found this profile similar to HALC on exhaustion from study.[14] HIHC motivation students in our study showed high deep strategy and good GPA probably because their intrinsic motivation scores were higher than their controlled motivation scores, even though the controlled motivation scores, themselves were quite high. We probably did not find differences in ECTS credits because these credits are awarded on completion of a course and passing the exam on that course, independent of how high a student may score in the exam. Thus ECTS credits may not be discriminative enough among different students. Since Ratelle et al. found HAHC profile to have higher dropout behaviour as compared to LAHC profile[15], dropout behaviour, which we did not include in our study, could be added in any further studies.[15]

It would be worth investigating if different motivational profiles need different ways of monitoring and mentoring during their medical study. It would also be of interest to find out whether these motivational profiles remain stable during medical study or change according to the learning environment and experience. We would recommend a longitudinal study design to study this aspect of profiling. Another area of interest for further research would be to investigate whether different motivational profiles show differences in effectiveness and attitudes towards the practice of medicine in their professional life.

Limitations

Autonomous motivation is calculated as an average of intrinsic motivation and another (identified regulation) subscale of AMS.[10, 16] Non-usefulness of the latter in students of health professions education led to carrying out all further analyses with intrinsic motivation as the clustering variable. This might have reduced the sensitivity of the variable to pick out differences between the groups. To be able to overcome this difficulty in further studies we would recommend development of an identified regulation scale specifically for students of health professions. Though the sample size for all variables was enough to find differences, the fact that all students did not fill out all questionnaires is a limitation of this study. This study has been carried out in only one university hence the findings have limited generalizability. This line of research needs further development in other universities, national and international. Further differences could be studied between different populations, universities and genders.

Conclusion

HILC motivation is associated with good study hours, deep study strategy, good academic performance and less exhaustion from study. HIHC motivation was also found to be associated with a desirable learning profile, except that students with this profile showed high surface strategy. LILC and LIHC motivation were associated with the least desirable learning behaviours. Motivational profiling is a useful tool to understand learning and performance processes within individual students and can be a complementary approach to studying motivation and academic performance as group variables.

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Chapter 6

Combining quality and quantity approaches in the study of motivation in medical education

Submitted for review and publication

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Abstract

Background

The frequently asked question “How motivated is this student?” can basically be broken down into three questions: Where does this motivation come from? How strong is this motivation? And, What is the target of this motivation? The first two questions are general and refer to qualitative and quantitative aspects of motivation and the last question is situational. Most motivation theories focus on either quality or quantity.

Aim

This paper explores combining both quality and quantity of motivation into one approach and discusses whether this combined approach offers advantages over separate approaches.

Method

We used some of the findings of an earlier literature review, pertaining to how medical education researchers have studied motivation in relation to learning and academic performance, and the findings of an earlier research study, based on a combined approach, that we conducted in medical education. We also deliberately selected from existing theories of motivation, depending on their relevance to building an argument for using a combination of quality and quantity, rather than only quality or quantity.

Results and Conclusion

Based on approaches described by Vallerand et al. (2002), Atkinson (1966), Deci & Ryan (2000), Vansteenkiste et al. (2005) and Kusurkar et al. (submitted), we conclude that an approach to motivation combining the two dimensions of quality and quantity is useful in creating and enhancing understanding of motivational processes influencing learning and academic performance in medical education within individual students. Such an approach can help educators in differential mentoring and monitoring of medical students according to their specific needs.

Combining quality and quantity approaches in the study of motivation in medical education

Introduction

A ubiquitous question in education in general and also in medical education, is *How motivated is this student*? Teachers rate 'high motivation' as one of the most important and desirable characteristics of medical students.[1] If teachers complain about students, it is not uncommon that the concern is about low, disappointing student motivation. There is some evidence that low motivation does have negative effects on the educational processes. Low motivation in members of a problem based learning (PBL) group appears to inhibit the learning process of other students in the group.[2] Efforts have been made to capture this construct in interviews used in medical selection procedures, but with little success.[3, 4] The definition of motivation is multifaceted and for practical purposes it would be very helpful if educators could specify and translate 'how motivated is this student' into a question that better serves the selection, monitoring and mentoring of students.

Analysis of the motivational concept is thus necessary. *How motivated is this student* can basically be broken down into three questions: What type of motivation drives her, i.e. where does this motivation come from? How strong is this motivation? and, What is the target of this motivation? Translated into technical terminology, we talk about quality, quantity and direction of motivation. Vansteenkiste et al.[5] and Ratelle et al.[6] have used an approach which combines both quality and quantity of motivation in education domains other than medical education and their approach is directed towards proving that quality is more important than quantity. Our approach, which differs somewhat from Vansteenkiste et al. and Ratelle et al., is to argue that importance should be given to both quality and quantity of motivation and that their combination should be considered while exploring effects on learning and performance. This approach has never been reported in medical education.

If the combination of quality and quantity of motivation in each individual student were known, differential arrangements could be made in the mentoring and monitoring of students[7] to suit their specific needs. The objective of this paper is to explore and discuss the value of a combined approach to motivation, giving importance to both quality and quantity of motivation, in the context of medical education, and its implications for research and practice.

Methods

We began by revisiting papers in medical education that we had earlier reviewed[8] as a part of exploring two research questions: "How has the literature studied motivation as an independent and a dependent variable in medical education? And How is motivation useful in predicting and understanding processes and outcomes in medical education?" From those 56 papers, we chose those which particularly studied the effects of motivation on learning and academic performance.[8] Our aim for the current paper was to determine how motivation had been studied in medical education in terms of both quality and quantity. This aspect had not been explored in the published review.[8]

Secondly, we deliberately selected from existing theories of motivation, depending on their relevance to building an argument for using a combination of both quality and quantity of motivation. For quality of motivation we selected Self-Determination Theory (SDT) as it has been found to be relevant and applicable in medical education.[7-11] For quantity of motivation we selected Atkinson's theory (Atkinson 1966) as it is a hallmark theory of the quantitative approach to motivation.

Results

The results will be presented in 4 sections. Section [I] will present our synthesis of how motivation has been studied in medical education. The concepts we found in the literature on motivation theories will be presented in section [II] with three sub-sections: direction [IIa], quality [IIb] and quantity [IIc] of motivation. This will be followed by the rationale for combination of quality and quantity, section [III], and a short summary of the results of the study we performed based on this approach, section [IV].

[I] How have researchers in medical education studied quality and quantity of motivation?

In our earlier literature review[8], of the seven papers studying effect of motivation on learning, four studied quantity of motivation[2, 12-14] and three studied quality of motivation[15-17]. These studies found that higher quantity of motivation was associated with higher time investment in study[12], extra-curricular activities[13] and better group functioning[2, 14]. Intrinsic quality of motivation, in comparison with extrinsic motivation, is associated with deep study strategy and time investment in study-related activities.[16, 17] Of nine papers reporting positive correlation of motivation with performance, six[14, 18-21] had analysed the effect of quantity on motivation with performance and three[17, 22, 23] had analysed the effect of quality of motivation on performance. Of the five papers that did not find significant positive effects, three[13, 24, 25] analysed quantity of motivation and two[26, 27] analysed quality of motivation.

One of the probable reasons why these studies have found contradictory effects on academic performance is that they have considered either the quantity of motivation or the quality in isolation from each other.

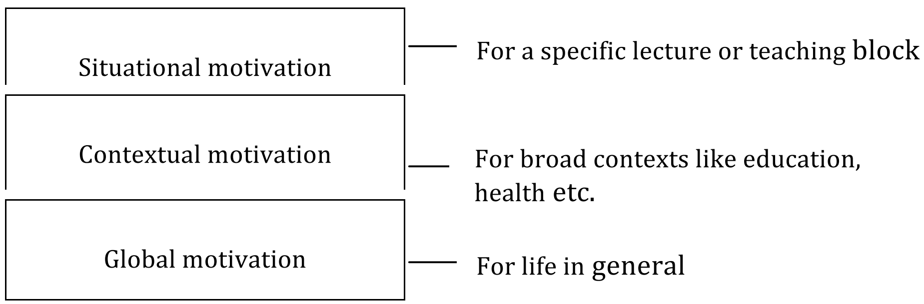
II] Literature on motivation theories

The literature on motivation theories discusses three concepts in motivation:

IIa] Direction of motivation

To create a clear background for discussion of quality and quantity, the direction of motivation will be clarified first.

Figure 1 Vallerand's hierarchical model of motivation

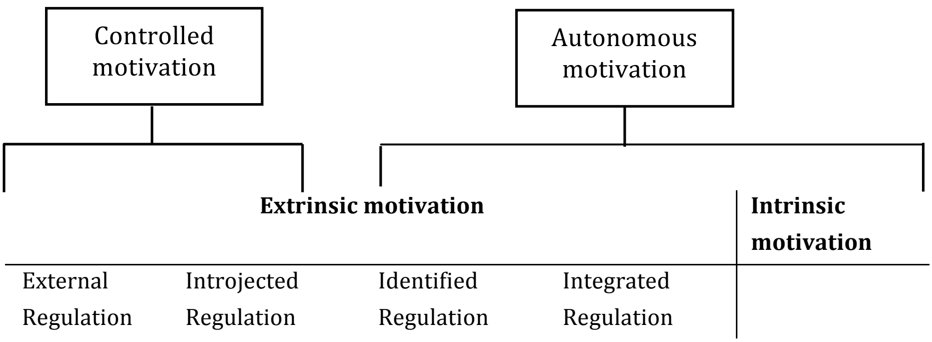


Vallerand and Ratelle (2002) have identified three levels that direct motivation, i.e. a global, a contextual and a situational level, together constituting a hierarchical model (Figure 1). All three pertain to a direction or a target. Global motivation is the general motivation a person feels for all aspects of his life and is also the most stable motivation. A person with high global motivation would be expected to do well in all spheres of his life. E.g., a person with high global motivation may have a natural tendency to put great effort into work (whatever this works turns out to be), home and society in general. There is a general high or low baseline motivation for all the demands of life, but people need to make choices about which demands must be given greater importance. Every individual may not be highly motivated for all categories of activities in their lives. In fact, there might be specific categories for which, for whatever reasons, he or she is not motivated. Vallerand's next level of motivation is contextual motivation, which is the motivation for broad contexts in life like education, leisure, interpersonal relationships etc. It follows that motivation in different contexts can be different; e.g. a student may be motivated to become an academician, but not a musician. Motivation for medical education would fall into the category of contextual motivation. Contextual motivation of students is relevant during selection for medical study, where the goal is to assess how or why a student is motivated for medical study and the medical profession. Contextual motivation is known to be moderately stable over time[28], i.e. it may change, but not very often and not very quickly. This justifies trying to select students based on their contextual motivation. Contextual motivation can be influenced by social factors specific to that particular context. Thus contextual motivation could be strengthened if students have positive experiences in their study or they identify positive role models; or, it may be diminished if they have negative experiences. Teachers have not only power to enhance student motivation, but also a great responsibility to nurture the right kind of motivation in students. We sometimes see that students are highly motivated for medical education in general, but not in specific situations. This exemplifies the concept of Vallerand's Situational motivation level.[28] Situational motivation is the motivation for a particular situation like a lecture or a small group session or a particular teaching block. Situational motivation is highly variable, as a student may not be motivated for a particular topic, a specific lecture or a particular day of education. Teachers often need to deal with this situational motivation of students, to

be effective in their teaching. Most of the best practices in teaching-learning events are geared towards stimulating situational motivation of students in order to bring about the best learning results.
In this article we will be dealing with one context, i.e. medical education; we will not address differences in the target or direction but assume a similar contextual motivation and focus on the qualitative and quantitative aspects of motivation.

IIb] Quality of motivation

Figure 2 The Self-determination continuum (adapted from[29])



One of the theories of motivation that expands on quality of motivation is Self-determination theory (SDT) by Deci and Ryan[30], which is applicable in the medical education context.[7-11] Quality of motivation differentiates motivation according to the reason behind the pursuit of an activity. If an activity is done out of personal interest or enjoyment, the quality of motivation is called intrinsic. If it is done due to external or internal pressures, the quality of motivation is called extrinsic. Intrinsic and extrinsic motivations are two poles of a continuum which are connected by other states in between, differing in the extent of their extrinsic nature

(Figure 2).[29] Some forms of motivation, intrinsic motivation (activity done because of genuine interest) and identified regulation (activity done because the individual values it, even if he doesn't really enjoy it), which are towards the intrinsic end of the continuum of SDT, have been grouped together for research purposes, based on whether a person perceives the cause of this motivation to be internal to himself. This motivation group is called "autonomous motivation" (see Figure 2).[31] Some forms of motivation, i.e. introjected regulation (activity done out of guilt or shame) and extrinsic regulation (activity done for e.g., high grades or fame or money), which are towards the extrinsic end of the continuum of SDT, have been grouped together based on whether a person perceives the cause of this motivation to be external. This motivation group is called "controlled motivation" (see Figure 2).[31] Autonomous motivation has been proposed and found to lead to better learning outcomes than controlled motivation[31].According to SDT, these different states of motivation are present in any individual for any activity, but the dominant motivation can be signified as either autonomous or controlled or both.

IIc] Quantity of motivation

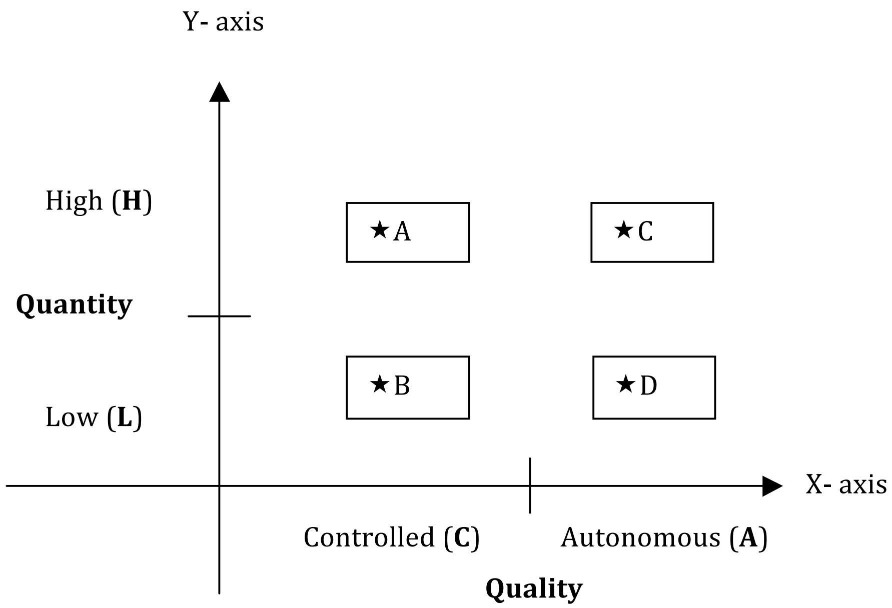
The quantity of motivation can also be called amount, level or strength of motivation. Motivation, in this approach, is a unitary concept which is often visualized in terms of high, moderate and low motivation. Motivation quantity is accurately measurable by summing or multiplying the underlying factors. In 1953, McClelland and his colleagues (Atkinson, Clark and Roby) adapted the Thematic Aperception Test (TAT, developed by Murray in 1938[32]) and developed a method for scoring the achievement motive.[33] Atkinson extended McLelland's work and proposed that the overall motivation of an individual was a sum of "Motivation to succeed" and "Motivation to avoid failure".[34] He derived a formula for the accurate estimation of the quantity of motivation in an individual.[34] Quantity means "how much" motivation. According to the quantitative approach to motivation, the higher the quantity of motivation for a particular activity, the higher would be the tendency to put effort into that activity.[34]

III] Rationale for combining quality and quantity into one approach towards motivation

An approach to motivation can be based on the combination of quality and quantity. This approach has been used by Ratelle et al.[6] and Vansteenkiste et al.[5] in other domains of education than medical education, but has never been reported in medical education. The focus of both these groups was to demonstrate that quality of motivation is more important than quantity. The findings of the two papers do not concur entirely, which will be explained subsequently. We propose an approach that combines quality and quantity, giving importance to both, and will argue for its conceptual validity using empirical evidence we reported in an earlier paper.[35] Figure 3 depicts this combination. Quality of motivation, pertaining to the continuum of autonomous to controlled motivation, is represented on the X-axis, and quantity, pertaining to the spectrum from low to high motivation, is represented on the Y-axis.

Postulating independence of quality and quantity, a person at any given time, and in any given circumstance, would potentially have any combination of autonomous and controlled quality of motivation in high or low quantities.

Figure 3 Four motivational profiles based on differences in quality and quantity of motivation



Combinations-Motivational profiles: AC – HAHC, AD - LAHC, BC – HALC, BD – LALC

If quality and quantity of motivation are indeed independent we would have the possible combinations as depicted in Figure 3 and Table 1.

Table 1 Four motivational profiles based on differences in quality and quantity of motivation

Quantity of AM	Quantity of CM	Motivational profile	Combinat- -ion from Figure 3	Example
High (HA)	Low (LC)	HALC	BC	A student who entered medicine because of genuine interest in medical study or practice OR A student who entered medicine because a desire to help people
High (HA)	High (HC)	HAHC	AC	A student who had entered medicine because of interest in medical study and practice as well as of expectation of high income or prestige
Low (LA)	High (HC)	LAHC	AD	A student who was highly motivated to put effort into studying medicine because of expectation of high income or prestige OR A student who had entered medicine only because of modest parental pressure
Low (LA)	Low (LC)	LALC	BD	A student who was not particularly interested in medicine, but entered because he secured admission to the course

IV] Short summary of the results of a study performed based on this approach

One approach to explore the conceptual validity of this combined approach is to show actual examples of existence of these profiles among students. In a separate paper, we have been able to establish some validity for this approach.[35] We classified students into four clusters based on their scores on intrinsic (prototype of autonomous motivation) and controlled motivations and found clusters similar to those in Table 1. The different clusters were associated with different study strategies, study effort, academic performance and exhaustion from study. Students with HILC (High Intrinsic Low Controlled) motivational profile were found to have the optimal profile for learning with a high level of deep study strategy, a low level of surface study strategy and a higher study effort in terms of hours of self-study. Students with LIHC (Low Intrinsic High Controlled) and LILC (Low Intrinsic Low Controlled) profiles had the least optimal learning profiles and performances and also high exhaustion from study as compared to the other profiles. In accordance with our hypothesis of quality and quantity both being important, we found that HIHC (High Intrinsic High Controlled) motivational profile performed comparably to HILC profile on use of deep study strategy, good GPA and low exhaustion from study. This finding differed from Vansteenkiste et al. who found that HALC profile performed better than HAHC profile on GPA and had lower test anxiety, thus validating their own hypothesis that quality was more important than quantity of motivation.[5] Additional studies should clarify this difference.

Operationalising the combination of quality and quantity

Quantities of autonomous and controlled motivation can be measured by using the Academic Self-regulation Scale[5, 31] and the Academic Motivation Scale (AMS)[36], among others. Both, Academic Self-regulation Scale and AMS, have subscales which give scores on intrinsic motivation, identified regulation, introjected regulation and external regulation (see Figure 2).[36] To determine the quantity of autonomous motivation in an individual one needs to take an average of the sum of the scores on intrinsic motivation and identified regulation (see Figure 2 and Quality of motivation).[5, 31] To determine the quantity of controlled motivation in an individual, one needs to take an average of the sum of the scores on introjected and external regulation (see Figure 2 and Quality of motivation).[5, 31] Depending on the combination of the scores on autonomous and controlled motivation, each individual can be classified into one of the profiles depicted in Figure 3.

Discussion

To date, motivation has been studied in medical education using either a qualitative approach or a quantitative approach. To our knowledge, a combined approach has been applied for the first time in medical education in a research study conducted by us[35] and we have been able to find evidence to support the validity of this approach. Another way of exploring the validity of a combined approach would be to study the variability of one dimension while the other is kept constant.

If the ratio of autonomous and controlled motivation in an individual is held constant, can the quantity vary? One may visualize these states happening. A student might feel more autonomous than controlled motivation for example, at the beginning of a teaching block period and the quantity may be moderate. Such a person may develop high quantity of both autonomous and controlled motivations at the end of the block because she found it very interesting, the exams were very near and she very much wanted to show the world that she could do well in the exams.

Alternatively, if we keep the sum of quantities of autonomous and controlled motivations constant, can the ratio be varied? This could also be possible. For example, a student has low autonomous and high controlled motivation for example, for paediatrics. He has the desire to specialize in surgery, but is not admitted to residency in surgery, whereas he is being invited to apply for paediatrics. This student could develop high autonomous and low controlled motivation (the total quantity remaining the same) for paediatrics because he had found a positive role model in a paediatric teacher. This teacher could inspire him to study the subject with interest. Thus, quantity remaining constant, quality could vary; equally, quality remaining constant, quantity could vary. Experimental studies could be designed, which could stimulate the quantities of either autonomous or controlled motivation, e.g. by giving students experiences with positive role models and highly competitive assessments respectively, in order to examine this variability aspect.

Other research studies need to be designed to find evidence for a combined approach towards motivation in medical and health professions education. Such studies have been done in education domains other than medical education, but they have hypothesized that quality of motivation is more important than quantity.[5, 6] Though both these studies were designed on similar hypotheses, their findings do not concur entirely. Ratelle et al. found that students endorsing both autonomous and controlled motivations perform equally well as students endorsing autonomous motivation more than controlled motivation.[6] Vansteenkiste et al. concluded that students endorsing autonomous motivation rather than controlled motivation performed better than students endorsing both motivations.[5] These contradictory findings made it important for us to explore the hypothesis that both quality and quantity of motivation are important.

Implications for research

A combined approach helps in understanding the learning processes within each student and his or her academic successes or failures. When we study either autonomous or controlled motivation or both as group variables and look for differences between different groups of students or between genders, what we effectively do is study one of these exclusive of the other. It means that we study autonomous motivation of students without giving consideration to how much controlled motivation they have or vice verse. As a result, in this type of analyses, we do not consider the unique combination of autonomous and controlled motivation within each individual student and their quantities. Classifying students into different motivational profiles helps us to study the combinations of these two qualities of motivation and their quantities within each individual student. Knowing the combination of autonomous and controlled motivation in an individual student can help us to plan and arrange mentoring and monitoring of each student according to his or her specific needs. This combined approach can be complementary to an approach where motivation and academic performance are studied as group variables to find out relationships between these two variables at a group level.

There are examples of research in medical education where either quantity of motivation has been studied as a predictor of academic performance[13] or quality of motivation has been studied as a predictor of academic performance[17]. This could be one of the reasons why the positive relationship between motivation and academic success in medical education has not yet been substantiated strongly.[8] In our study[35], we have been able to find some evidence for the predictive value of combination of autonomous and controlled motivation in academic success. This combined approach could very well be expanded to different universities, cultures and countries and its validity and generalizability be further established.

Implications for practice

Analyzing the motivational profiles of students could be helpful in guiding us in mentoring and monitoring of students. Students belonging to different profiles may have different needs in these areas. Students who have more controlled motivation for medical education in general would need more mentoring support and positive role models in order to inspire them to value the profession[7], and to become more autonomously motivated for medical education and practice. Some students who are more autonomously oriented might need support in planning their study activities so that they don't get too carried away in their interest in a particular topic, thus spending too much time on it and ignoring others. Such students could feel easily frustrated with their study and their autonomous motivation could become controlled because they felt constrained by their study, leading to lower feelings of volition. Mentoring support, especially about time management for different subjects within medicine, could help these students to remain autonomously motivated throughout their medical study.

Selecting medical students on the basis of their motivational profiles is not something we would recommend. This is because in high stakes situations students could well report the most desirable type of motivation.[8, 37-39] Monitoring motivational profiles of students throughout their medical study could help in obtaining valuable insights into the effects of the curriculum and learning environment of an institution. Predominance of controlled motivation might suggest that the institution places high value on grades, which become external factors[29] for driving the motivation of the students. Predominance of autonomous motivation might suggest that the institute supports genuine interest in the field of medicine placing lower value on grades to drive student motivation.

Limitations of a combined approach

This combined approach is useful for understanding the learning processes and outcomes in each individual student. It is not suitable to study relationships between different variables at a group level or study cause and effect mechanisms of variables or determine the directions of their effects. It thus cannot replace the approach of studying autonomous and controlled motivations as group variables, but can provide a useful complementary approach.
This combined approach is also more complex to understand and apply for research purposes and requires good methodological skills to be carried out successfully.

Conclusion

An approach towards motivation combining the two dimensions of quality and quantity is useful in creating better understanding of motivational processes influencing learning and academic performance in medical education within individual students. Such an approach can help us in differential mentoring and monitoring of medical students according to their specific needs.

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Chapter 7

How motivation affects academic performance: A structural equation modelling analysis

Accepted by Advances in Health Sciences Education

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Abstract

Background
Few studies in medical education have studied effect of quality of motivation on performance. Self-Determination Theory based on quality of motivation differentiates between Autonomous Motivation (AM) that originates within an individual and Controlled Motivation (CM) that originates from external sources.

Aim
To determine whether Relative Autonomous Motivation (RAM, a measure of the balance between AM and CM) affects academic performance through good study strategy and higher study effort and compare this model between subgroups: males and females; students selected via two different systems namely qualitative and weighted lottery selection.

Methods
Data on motivation, study strategy and effort was collected from 383 medical students of VU University Medical Center Amsterdam and their academic performance results were obtained from the student administration. Structural Equation Modelling analysis technique was used to test a hypothesized model in which high RAM would positively affect Good Study Strategy (GSS) and study effort, which in turn would positively affect academic performance in the form of Grade Point Averages (GPAs).

Results
A structural equation model where RAM positively affected GSS and study effort, which in turn positively affected academic performance fit well with the data, Chi square=1.095, df=3, p=0.778, RMSEA model fit=0.000. This model also fitted well for all tested subgroups of students. Differences were found in the strength of relationships between the variables for the different subgroups as expected.

Conclusion

RAM positively correlated with academic performance through deep strategy towards study and higher study effort. This model seems valid in medical education in subgroups such as males, females, students selected by qualitative and weighted lottery selection.

How motivation affects academic performance: A structural equation modelling analysis

Introduction

Motivation has been shown to positively influence study strategy, academic performance, adjustment and well-being in students in domains of education other than medical education.[1] Studying motivation particularly in medical students is important because medical education is different from general education in several aspects, some of them being high intensity of study, the requirement to carry out clinical work along with study and the need to follow a highly specifically defined path to be able to qualify to practice as doctors. In a literature review we found that the positive correlation between motivation and performance has not been substantiated strongly in medical education as different studies have contradictory findings.[2] The objective of the present research study was to explore the relationships between motivation, study strategy, study effort and academic performance among medical students.

There are different theories of motivation; some focus on quantity of motivation and others on quality. Quantity of motivation could be high or low. Quality of motivation depends on whether the source of motivation is internal or external. Self-determination Theory (SDT) of motivation considers quality of motivation to be more important than quantity and describes a continuum for quality of motivation.[3, 4] This ranges from intrinsic motivation at one end to amotivation at the other end of the continuum, with four types of extrinsic motivation (integrated regulation, identified regulation, introjected regulation, external regulation) in between. Intrinsic motivation is derived out of genuine interest in an activity. Extrinsic motivation is derived out of an expected gain or a separable outcome. As elaborated by SDT, not all types of extrinsic motivation are undesirable. Extrinsic motivation spans from high self-determination to low self-determination (see Figure 1).[3, 4] Identified Regulation, the highly autonomous type of extrinsic motivation, is close to intrinsic motivation. Identified regulation and intrinsic motivation can be summed up to generate Autonomous Motivation (AM). Thus AM depicts self-determined motivation. Introjected and external regulation, which are low in self-determination, can be summed up together to generate Controlled Motivation (CM). Thus CM depicts motivation which is very low on self-determination.

Figure 1 The Self-determination continuum (adapted from[5])

Amotivation	**Extrinsic motivation**				**Intrinsic motivation**
	External Regulation	Introjected Regulation	Identified Regulation	Integrated Regulation	
	Least autonomous	→	→	→	Most autonomous

SDT advocates that the more self-determined or autonomous the motivation, the better are the observed outcomes[3, 4]: namely deep learning[1, 6] high academic performance[7, 8], better adjustment and positive well-being[9, 10].
In the present study we measured Autonomous Motivation (AM) and Controlled Motivation (CM) as described by SDT.[1, 6]

Motivation has been reported in primary, secondary and college education to influence academic performance through study effort as a mediator.[1] This relationship, to our knowledge, has never been tested in medical education. We searched for articles in medical education employing

Structural Equation Modelling (SEM) as a methodology and found articles studying factors leading to choice of specialty in medicine[11, 12], basic science and clinical knowledge[13], clinical reasoning[14], use of SEM in medical education[15], influence of clerkships on student learning etc. We did not find any articles studying the effect of motivation on learning and academic performance. Our study therefore adds to the literature on this aspect in medical education. We have also compared subgroups such as males with females and students selected through a qualitative selection procedure with weighted lottery selection, which has never been done before.

If there is a priori hypothesis, Structural Equation Modelling (SEM) can employed in research reliably for testing the relationships of different variables with each other, though causality cannot be inferred unless it is an experimental study.[15] The foundation of a good SEM analyses is a well-founded theoretical basis for relationships being tested in the model.[15] We had hypotheses, including the directionality of relationships, well-founded in SDT literature. The variables we used in our SEM analyses were Relative Autonomous Motivation (RAM), Good Study Strategy (GSS), Study effort and Academic Performance (See Figure 2). RAM meant how much of the student's motivation originated from within himself or herself (autonomous) as compared to that originating from external factors (controlled).[1] GSS meant how much the students studied to understand the study material as against memorizing it without understanding.[16] Study effort meant how many hours the student devoted to self-study. Academic Performance meant how the student performed in terms of grades during his medical study.

Our hypotheses were:

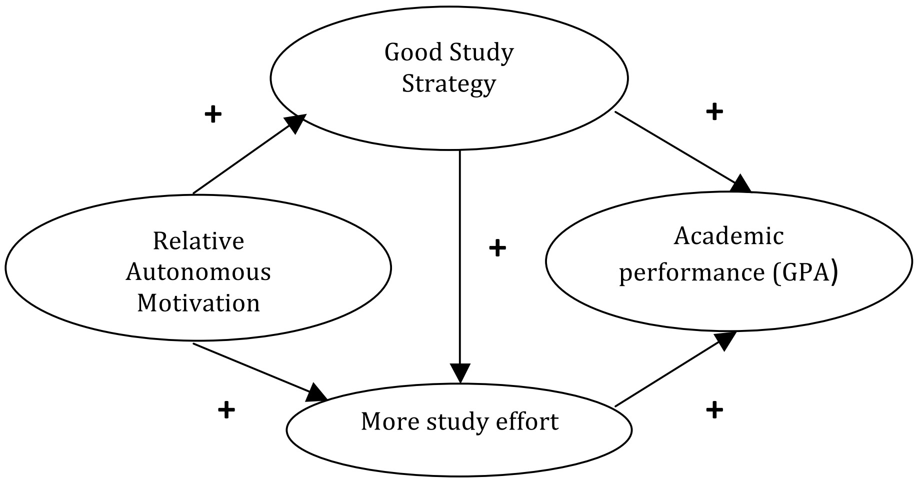
- A relative autonomous or self-determined motivation leads to a good study strategy and high study effort, which leads to better academic performance, i.e. the study strategy mediates the influence of motivation on academic performance.

- The overall process and direction of effects are similar among males, females and students admitted through qualitative selection procedure or weighted lottery selection, the relative influence of different factors being different.

We wanted to study the difference between how the model works in males and females as it has been found before that males have higher CM and lower AM than females.[17, 18, 19, 20] The Netherlands uses a weighted lottery selection system for admitting most students to medical study, and qualitative selection at some schools for a minority of the students. The high school exam Grade Point Average (GPA) of the applicants is weighted according to the score, i.e. the higher the score, the more number of times the student is entered into the lottery, thus giving him or her a higher chance to get selected.[21] We wanted to study the difference between how the model works in students selected through qualitative and weighted lottery, as students selected through qualitative selection have been found to have higher motivation than those selected through weighted lottery.[22] We therefore designed the present study to test the following research questions and model (See Figure 2):

1. Does relative autonomous motivation positively affect good study strategy used by students and the study effort?
2. Do good study strategy and high study effort positively affect academic performance?
3. Does this model (Figure 2) work differently in male and female students? If yes, what are the differences?
4. Does this model work (Figure 2) differently in students selected through qualitative selection and weighted lottery? If yes, what are the differences?

Figure 2 Hypothesized model for motivation influences performance



Methods

Sample

Students from years 2 to 6 of the VU University Medical Center Amsterdam were invited to participate in our research project through an electronic questionnaire in September 2009. The thumb rule for a good sample size for SEM is more than 200, a more accurate estimation being 20 subjects for every variable in the model. Our sample size satisfied both rules.[15]

Instruments used

The electronic survey designed included some personal data questions, the Academic Motivation Scale (AMS – Cronbach's alpha ranging from 0.63 to 0.86 for different subscales)[23, 24] to measure the quality of motivation of the students as described by SDT and the Revised Study Process Questionnaire-2 Factors (R-SPQ-2F – Cronbach's alpha ranging from 0.57 to 0.72)[16] to measure the study strategies used by the students. Academic performance was collected in the form of Grade Point Average (GPA) and European credits (ECs) obtained according to European Credit Transfer System.

Motivational Variables – We used the variables Autonomous Motivation (AM), Controlled Motivation (CM) and Relative Autonomous Motivation (RAM). AM was a measure of the amount of self-determined motivation meaning the motivation which came from within the student. AM was calculated by summing up the average scores on intrinsic motivation and identified regulation subscales of the AMS. CM was a measure of motivation which originated outside of the individual, meaning that it was determined by external factors or reasons. CM was calculated by summing up the average scores on introjected and external regulation subscales of the AMS. Since AM and CM exist simultaneously within an individual, we wanted to create a single score on the relative self-determined motivation, which is put forth as the optimal type of motivation by SDT. RAM was calculated to get a single variable of motivation which incorporated both AM and CM in order to get an idea of the overall self-determined or autonomous motivation. It was calculated by assigning weights to intrinsic motivation (+2), identified regulation (+1), introjected regulation (-1) and external regulation (-2), depending on the placement of this type of motivation in the SDT continuum (see Figure 1) and summing these weighted scores.[1] AM, CM (Cronbach's alpha 0.87 and 0.72 respectively) have been reliably and successfully used in earlier studies.[1]

Study process related variables– R-SPQ-2F was used to obtain the scores on the strategies used by students when they studied, Deep Strategy (DS) and Surface Strategy (SS).[16] Deep Strategy means the strategy used by the student to "maximise meaning" in the material learnt and Surface Strategy means use of rote learning or memorisation of facts. Every student employs both types of strategies from time to time. We wanted to use a score which measured relative use of deep strategy, which is considered the “good” type of strategy to be used by students.[16] We therefore converted these two scores into a single score called Good Study Strategy (GSS) subtracting the mean SS item scores from the mean DS item scores. A similar type of calculation has been used by Vansteenkiste et al. to create an optimal learning composite from the scores on the LASSI (Learning And Study Strategies Inventory).[1] We also collected self-reported data on study effort among the students.

Academic performance variables – All course results obtained by the participating students during one semester (September 2009-January 2010) were obtained from the student information systems of the medical school. To calculate the European credits (ECs), credits from all courses passed within the semester within the programme of medicine were summed. The maximum number of credits that could be obtained per course was the same for each student as per the university rules. Extracurricular credits were not included.

The GPA was defined as the average grade per course, weighted for credits earned (ECs). In the present study only final passing grades were used (grade by which the student had earned credits and passed the course). Within this only courses with a numerical (1 to 10) final grade were included and only the highest (passing) grade was used to calculate GPA. This was done because we considered the highest grade more important than the attempt at which this grade was obtained, especially since these attempts were made within a very short period of time. Persistent efforts towards learning are as driven by motivation as best performance.

The GPAs of the students from years 2 and 3 were mainly based on courses with cognitive assessments or knowledge tests and practical examinations, whereas GPAs from the students from years 4, 5 and 6 mostly include courses with a mixture of cognitive and knowledge assessments and clinical performance appraisals. These scores were converted into z-scores within the respective groups to make them comparable. We did not assess cognitive and clinical performances separately as clinical performance grades are only available for the subgroup of students in the last phase of the medical study programme.

Statistical analyses

The software programme SPSS version 15.0 was used for our basic analyses. After checking for normal distribution of the data, linearity of relationships between variables and computing the basic correlations between the different variables, reliability tests for all the scales used to measure the different variables were performed. Multiple regression analysis was planned to determine whether age, gender, year of curriculum and method of admission affected the motivational variables and to compare the model between the groups among whom we found significant effects. Scores on all the variables were converted to z-scores to make them comparable. To compare scores on all variables between subgroups, males and females, and students selected through qualitative selection and weighted lottery, student's unpaired t-tests were performed.

Structural Equation Modelling (SEM) analysis was carried out using the software AMOS version 5.0. Comparison was done between the proposed and tested model for males and females and for students selected through qualitative selection and weighted lottery. The indices used for estimating goodness of fit of the model were Chi- square goodness of fit value>0.05, Comparison of Fit Index (CFI>0.09) and Root Mean Square Error of Approximation (RMSEA<0.05). The acceptable values for a good fit of the model are given in parentheses following each index.[15, 25]

Ethical approval

Medical Ethics Review Boards of university medical centers in the Netherlands usually exempt educational research from requirement of ethical approval, as the national legislation focuses on medical research carried out with patients. Since this study was started before the Netherlands Medical Education Ethics Review Board (NVMO-ERB) came into existence, it was exempt from obtaining ethical approval. We ensured alignment with the rules of Helsinki declaration by: obtaining written, informed consent, voluntary participation, guarantee of confidentiality and freedom to withdraw from the study at any point in time without any explanation.

Results

The response rate of the students was 26.6% (464/1742), which included 27.8% (129/464) males and 72.2% (335/464) females. The gender distribution was almost the same as compared to that in the normal medical student population. Students admitted through a weighted lottery selection procedure comprised 81.25% (377/464) and students had been admitted through a qualitative selection procedure comprised 18.75% (87/464). These percentages broadly correspond to the percentage of these students in the whole medical student population, so we consider the sample representative.

We performed analyses on the 383 students as the GPAs of 81 students could not be computed because these students were in an in-between phase in their study where they had completed the previous year, but could not start or finish enough exams to obtain GPAs in the first semester of 2009-2010. The gender and selection distribution characteristics were similar to the overall population, so excluding these students did not adversely affect our results.

The mean age for both, males and females, was 23.3 years (the range was 18-40 years).

The reliabilities of the scales used, i.e. Cronbach's alphas (See Table 1), ranged from 0.568 to 0.745, which were in line with those found in other studies.[16]

Table 1 Reliabilities of different scales used

Questionnaire used	Variables	Cronbach's alpha
AMS	IM	0.800
	IM to know	0.778
	IM Accomplishment	0.759
	IM Stimulation	0.777
	EM-Identified Regulation	0.631
	EM-Introjected Regulation	0.828
	EM-External Regulation	0.807
	Amotivation	0.833
	AM	0.745
	CM	0.737
R-SPQ-2F	DS	0.708
	SS	0.568
	GSS	0.621

The correlations between the different variables were as shown in Table 2. AM and CM were significantly positively correlated which was expected as it had been observed in earlier studies.[1] RAM was significantly positively correlated with AM and significantly negatively correlated with CM, which showed that the computation of RAM as a variable was well-founded. AM and RAM were significantly negatively correlated with amotivation. RAM was significantly positively correlated with Good Study Strategy and GPA. These correlations formed the basis for testing the model proposed in Figure 2.

Table 2 Pearson correlations between the variables of all students (n=383)

Variables	AM	CM	RAM	Amotivation	Good SS	Study effort	GPA
AM	-	-	-	-	-	-	-
CM	0.409**	-	-	-	-	-	-
RAM	0.240**	-0.764 **	-	-	-	-	-
Amotivation	-0.305 **	0.068	-.0269 **	-	-	-	-
Good SS	0.384**	-0.041	0.352**	-0.313 **	-	-	-
Study effort	0.091	0.029	0.042	-0.088	0.231**	-	-
GPA	0.147**	-0.009	0.121*	-0.097	0.218**	0.137**	-
ECs	-0.062	-0.006	0.050	0.027	0.108*	-0.153 **	0.158**

AM-Autonomous Motivation, CM-Controlled Motivation, RAM-Relative Autonomous Motivation, SS-Study Strategy, GPA-Grade Point Average, EC-European Credits, *p<0.05, **p<0.01, ***p<0.001

A regression analysis was performed to find out whether age, gender, year of curriculum and method of admission (qualitative versus weighted lottery selection) affected RAM and it was found that the effects of gender (R^2=0.046, p=0.000) and method of admission (R^2=0.015, p=0.009) were significant and the effects of age (p=0.071) and year of curriculum (p=0.368) were not significant.

Since gender had a significant effect on RAM, we performed student's unpaired t-test to compare males with females. We found that males had significantly higher CM, significantly lower RAM and significantly lower GPAs as compared to the females. (See Table 3)

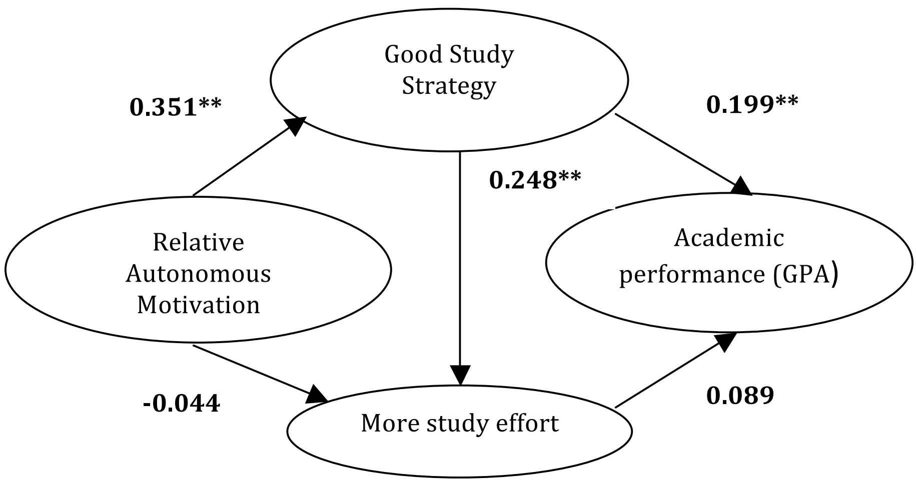
Table 3 Results of T test comparing Males (n=110) with Females (n=273) and students selected through weighted lottery (n=318) with qualitative selection (n=65)

Variable	Males (Mean±SD)	Females (Mean±SD)	95% CI between z-scores of means	P value for difference between z-scores
AM	5.309 ± 0.80	5.353 ± 0.67	-0.287, 0.161	0.582
CM	4.464 ± 1.11	3.996 ± 1.13	0.189, 0.628	0.000***
RAM	2.369 ± 2.97	4.047 ± 3.51	-0.717, -0.274	0.000***
Amotivation	1.490 ± 0.71	1.459 ± 0.78	-0.178, 0.258	0.719
Good SS	5.418 ± 0.96	5.559 ± 0.95	-0.362, 0.073	0.194
Study effort	14.399 ± 8.19	14.872 ± 7.38	-0.284, 0.161	0.586
ECs	22.247 ± 10.14	23.467 ± 9.09	-0.299, 0.078	0.252
GPA	7.177 ± 0.72	7.367 ± 0.79	-0.362, -0.016	0.000***
	Weighted Lottery Selection (Mean±SD)	**Qualitative Selection (Mean±SD)**	**95% CI between z-scores of means**	**P value for difference between z-scores**
AM	5.298 ± 0.719	5.548 ± 0.656	-0.620, -0.083	0.010*
CM	4.143 ± 1.14	4.069 ± 1.19	-0.204, 0.333	0.636
RAM	3.357 ± 3.42	4.584 ± 3.51	-0.633, -0.091	0.009**
Amotivation	1.507 ± 0.80	1.280 ± 0.52	0.028, 0.551	0.005**
Good SS	5.485 ± 0.97	5.690 ± 0.87	-0.475, 0.057	0.124
Study effort	14.805 ± 7.84	14.390 ± 6.46	-0.214, 0.323	0.654
ECs	23.64 ± 9.86	20.538 ± 6.24	0.110, 0.451	0.001**
GPA	7.40 ± 0.757	6.84 ± 0.733	0.364, 0.767	0.657

(*p<0.05, **p<0.01, ***p<0.001)

Since method of admission significantly affected RAM we performed student's unpaired t-test to compare students selected through qualitative selection and weighted lottery. We found that students selected through qualitative selection had significantly higher AM and RAM and significantly lower ECs and amotivation as compared to those admitted through weighted lottery. (See Table 3)

Figure 3 Structural Equation Model depicting relationship between motivation, study strategy and performance for all students



The structural equation model analyses , which included comparing the male and female groups, resulted in the model depicted in Figure 3 and had the following characteristics: n=383, df=3, Chi square=1.095, p=0.778 (>0.05) i.e. non-significant (Chi-square goodness of fit), so this model was a good model. CFI=1.000 (>0.09), RMSEA (Root Mean Square Error of Approximation) model fit was equal to 0.000 (<0.05), which was a good fit. The model fit both male and female groups very well (characteristics of the models remained the same as mentioned above), but the regression weights for the different relationships between both groups were different (See Table 4).

Table 4 Differences in Regression weights of variables between models for All, Males, Females, Qualitative Selection and Lottery Selection

Variables	Model Males	Model Females	Model Qualitative Selection	Model Weighted Lottery Selection	Model All
RAM on Good SS	0.321***	0.355***	0.324**	0.349***	0.351***
RAM on study effort	-0.118	-0.019	-0.121	-0.025	-0.044
Good SS on study effort	0.288**	0.227***	0.306*	0.240***	0.248***
Good SS on GPA	0.007	0.260***	0.319**	0.178**	0.199***
Study effort on GPA	0.205*	0.045	0.222Ŧ	0.063	0.089

*p<0.05, **p<0.01, ***p<0.001, Ŧp=0.059

We used the same model for the structural equation model analyses which included comparing the qualitative and weighted lottery selection subgroups and the model (See Figure 3) had the following characteristics: n=383, Chi square=4.709, df=3, p=0.194 (>0.50), therefore non-significant (Chi-square goodness of fit). The CFI= 0.990 (>0.09) and RMSEA model fit for this was 0.027 (<0.05), which is a good fit. The model fit both qualitative and weighted lottery selection subgroups very well (characteristics of the models remained the same as mentioned above),

but the regression weights for the different relationships between both groups were different (See Table 4).
We found in the present study that relative autonomous motivation is positively associated with the use of a good study strategy by the students, which is positively associated with high study effort and better GPA (See Figure 3 and Table 4). The relative associations for these relationships were different in males, females, qualitative and weighted lottery selection subgroups (See Table 4).

Discussion

In the present study, we found that relative autonomous motivation is positively associated with the use of a good study strategy by the students which is positively associated with higher study effort (also found by Wilkinson 2007, though not through SEM analyses)[26] and better GPA. Vansteenkiste et al. found that a similar model incorporating self-study hours within the variable "Optimal Learning composite" fit students in the same age group (mean age about 23 years) in a general education study well.[1] Relative autonomous motivation is significantly associated with higher GPA (also found by Sobral, but the relation seems to be more indirect, i.e. through use of good study strategy, instead of a direct relation.[19] The positive correlation of autonomous motivation with deep study strategy[19] and deep study strategy with academic performance is supported by other studies in medical education.[19, 27] We had expected to find significant positive association between relative autonomous motivation and study effort, but did not find this.

As expected, differences were found in the nature of relationships between males and females and qualitative and weighted lottery selection subgroups. Significant positive association of RAM on GSS and GSS on high study effort were found in all the four groups, so these relationships seem to be well-substantiated. With the exception of the males subgroup, GSS showed significant positive association with GPA in all subgroups. Study effort showed significant positive association with GPA only in the males and qualitative selection subgroups, and no significant positive association in the overall model. This means that some variables have stronger associations in some subgroups and weaker associations in others. RAM seems to have an indirect positive association with GPA (Pearson correlation=0.121, $p<0.001$) through its positive association with GSS, rather than having a direct association, in all except the males subgroup. In the qualitative selection subgroup, RAM seems to have an indirect positive association with GPA (Pearson correlation=0.121, $p<0.001$) also through its positive association with study effort. One of the criteria for admission through a qualitative selection was evidence of significant time investment in certain eligible activities parallel to full time education, including health-related work, of at least 160 hours per year. Our finding that this subgroup showed higher association of study effort with GPA serves as a validation for our findings. In the males subgroup, RAM seems to have an indirect positive association with GPA (Pearson correlation=0.121, $p<0.001$) only through its positive association with study effort.

Vansteenkiste et al. found differences in the scores of males and females on some variables, but did not compare their proposed model between male and female groups.[1] Our study thus adds to Vansteenkiste et al. study.

Findings of other studies in medical education support the differences found between males and females in the present study in the quantity of motivation (Females>Males)[28, 29, 30] and quality of motivation (females have higher autonomous or intrinsic and lower controlled or extrinsic motivation than males).[20, 31] The differences between the qualitative and weighted lottery selection subgroups in the quantity of motivation (Qualitative selection>Weighted lottery selection) are also supported by similar findings in other studies.[22] Thus, our study also adds to the study of differences between medical students selected by qualitative and weighted lottery selection.

Thus we found acceptable evidence for our proposed model which was based on a priori hypothesis derived from SDT.

Implications

Our study provides acceptable evidence that the quality of motivation is important in determining good performance among medical students through good study strategy and high effort. These findings imply that we should specifically attempt to target enhancing autonomous motivation among medical students in order to encourage an attitude towards deep learning and high effort and finally good performance.

Strengths and limitations

One of the strengths of our study is that we used a structural equation modelling approach and have found a well-fitting model for the relationship between motivation, study strategy, effort and academic performance. Another strength is that we have compared the model between male and female subgroups and qualitative and weighted lottery selection subgroups. Since this study was performed in the Netherlands we were in a unique position to compare the latter two subgroups.

The major limitation of our study was a low response rate. However, given the fact that the responding population seemed representative of the medical student population in general, and that the absolute number of responses allows for structural equation analysis, we consider reporting our findings to add to the existing literature. The other is that this study was carried out at a single university in the Netherlands and hence has limited generalisability. It can very well serve as a good starting point for more studies on the same aspect in medical education.

Conclusion

Relative Autonomous Motivation positively affects academic performance through deep strategy towards study and higher study effort. This model seems valid in medical education in subgroups such as males, females, students selected by qualitative and weighted lottery selection procedures.

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Chapter 8

Effects of age, gender and educational background on strength of motivation for medical school

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Abstract

Aim

The aim of this study was to determine the effects of selection, educational background, age and gender on strength of motivation to attend and pursue medical school.

Method

Graduate entry (GE) medical students (having Bachelor's degree in Life Sciences or related field) and Non-Graduate Entry (NGE) medical students (having only completed high school), were asked to fill out the Strength of Motivation for Medical School (SMMS) questionnaire at the start of medical school. The questionnaire measures the willingness of the medical students to pursue medical education even in the face of difficulty and sacrifice.

Results

GE students (59.64 ±7.30) had higher strength of motivation as compared to NGE students (55.26 ± 8.33), so did females (57.05± 8.28) as compared to males (54.30± 8.08). 7.9% of the variance in the SMMS scores could be explained with the help of a linear regression model with age, gender and educational background/selection as predictor variables. Age was the single largest predictor. Maturity, taking developmental differences between sexes into account, was used as a predictor to correct for differences in the maturation of males and females. Still, the gender differences prevailed, though they were reduced. Pre-entrance educational background and selection also predicted the strength of motivation, but the effect of the two was confounded.

Conclusion

Strength of motivation appears to be a dynamic entity, changing primarily with age and maturity and to a small extent with gender and experience.

Effect of age, gender and educational background on strength of motivation for medical school

Introduction

Medical students are known to be highly motivated students, if measured by drop-out rate and time investment and compared with other students in higher education.[1, 2] Strength of this motivation can be seen as an independent variable, predicting behaviour, but also as a dependent variable, affected by experiences in the past. Two fairly recent phenomena in undergraduate medical education may influence this strength, and indirectly its impact on academic success. One is the worldwide increase in the number of female students, who within a short period of time, often came to outnumber male medical students.[3-7] The other is the enrolment of students with a graduate background when they start medical school. North America has employed this two-cycle model for a long time as the only curriculum structure, but in Europe and Australia, the admission of students who have graduated academically, into a shortened medical course or in a higher program year of a regular course, is relatively new.[8, 9] So, in most countries, students are admitted into medical school at the age of 17-18 years, directly after high school, whereas in North America and Canada students are admitted to medical school around the age of 23 years.[10] Gender, academic background and maturity may well affect how motivated students are to pursue medical school, but the extent of these effects is not known.

There is reason to believe that younger students are less motivated for medicine than older students. In a study in Australia, it was found that only 52 % of newly admitted medical students actually had the ambition to enter medicine, 19 % entered due to interest in Biology, 13 % entered due to parental pressure and 12 % entered because they obtained high marks, but had no idea of their career and 4% could not give any specific reason.[11] Studies done with a view to find out whether medical students are aware of the responsibilities they are choosing for have shown that students in their first year of medical school are not very familiar with the varied aspects and responsibilities of the medical profession.[11-13] The conceptions of first year medical students about the medical profession are often limited to the social aspects. Their general understanding is about only two activities; talking with patients and acting in the operation room.[12] Many students have an almost total lack of knowledge about the career structures and working hours when they start.[11-13] This does not necessarily affect their strength of motivation for medical school, but the relationship between academic motivation and the validity of the image of the profession of these students is also not known.

If age and gender affect aptitude for medical school, this could be due to maturity being related to gender at ages between 14 and 20 years[14] and brain development[15, 16] and maturation[14, 15], continuing up to the age of 24 years or third decade of life. Males can be considered to lag behind females by 2 years in physical maturation.[17-19] There is evidence that the maturation of the brains of males lag behind the brains of females of corresponding age by 3 years, leading to a lag of 3 years in the emotional maturation of the males.[14] The psychosocial maturation and maturation of judgement also show a steady progress up to the age of 24 years.[20] In a study on medical school applicants in the United States, females were found to have significantly higher emotional intelligence (EI) as compared to males; the dimensions of the EI being maturity, compassion, morality, sociability, calm disposition.[21]

Moreover, there is the belief that at the age of 17 years, the brain is not yet mature enough to make significant career choices or it could make risky choices[22], hence there are many students dropping off or exchanging study[14]. This aspect of age at entry related to complex relations between gender and maturity and academic background has not been studied before in medical students.

The studies done on motivation of medical students have always assessed the quality or type of motivation. A student may have a good or desirable quality of motivation, but his level or strength of motivation may not be optimal.[23] We were interested in knowing, measuring and understanding the strength of motivation. After reviewing the literature in search for a scale which measures the strength of motivation, only one questionnaire was found i.e. the SMMS (Strength of Motivation for Medical School) questionnaire.[23] To the best of our knowledge, there is only one other study[24] which has investigated strength of motivation in medical students, using the same questionnaire, and it investigates the relation between motivation and performance.

The aim of the study was to investigate what difference educational background, pre-entrance selection, age and gender would make on motivation of students choosing for medical school.

The Netherlands is a suitable country to compare the effects of selection versus non-selection, as the country employs a weighted lottery selection procedure for most of the medical students admitted to the traditional six-year course of medicine. Moreover, at the University Medical Center Utrecht, there also exists a four-year graduate entry course in medicine, which selects students who have a bachelor's diploma in life sciences or a related field and have to go through a selection procedure. We will call these students the Graduate Entry students (GE students). The six-year course students are admitted in to medical course after high school diploma, i.e. they do not have a bachelor's degree; hence we will call them Non-Graduate Entry students (NGE students). Though these groups were not experimentally made, they were available for the research as convenience samples. This presented a unique opportunity to compare groups that were selected and not selected and also study the effect of age, gender, maturity and educational background on the motivation to pursue medical study in a similar medical education environment. The research questions for the study were:

1. Do GE medical students have stronger motivation for medical school as compared to NGE students?
2. What is the contribution of the factors of age, gender, educational background and pre-entrance selection towards strength of motivation for medical school?

Methods

Subjects

The subjects were students joining either one of the two medical courses: (1) students from the NGE course, batches 2006-2007, 2007-2008 (N=540) and (2) students from the GE course, batches 2006-2007,2007-2008, 2008-2009 (N=153).

In all cohorts, the questionnaire was administered within three weeks of the beginning of medical school. The response rate for the students present on the particular day that the questionnaire was administered was 100%. The total number of NGE students admitted during this period was 620; hence the response rate was 87.1%. Most remaining subjects were not present because they had late enrolment and a few were not present that day for other reasons. The total number of GE students admitted was 161; hence the response rate was 95.0%. For 20 NGE students and 6 GE students there were missing data; therefore they were excluded from the analysis (age was missing for 12 NGE females and 7 NGE males and gender was missing for one. Age and gender were missing for 6 GE students). Twelve NGE students held a bachelor's degree and nine

GE students did not, hence were excluded from the analysis. Two GE students did not have a bachelor's degree, but had more than three years of biomedical education hence they were included in the analysis.

Instrument

The instrument used for determining the strength of motivation was the Strength of Motivation for Medical School (SMMS) questionnaire.[23, 25] The authors have defined strength of motivation for medical school as "the applicant's or student's readiness to start and continue medical training regardless of sacrifices, setbacks, misfortune or disappointing perspectives". The questionnaire contains sixteen items that are scored on a Likert point scale of 5, ranging from "Strongly Disagree" to "Strongly Agree". The minimum and maximum possible scores are 16 and 80 respectively. The higher the score, the greater is the strength of motivation. Nieuwhof et al. report favourable psychometric properties for this questionnaire; Cronbach's alpha for reliability of the scale was stated to be 0.79 and the test-retest reliability after 6 months period was 0.71. The validity was examined by Nieuwhof within the framework of prototypicality approach, i.e. validation was done by asking peers or expert judges (potential applicants and parents) to assess the prototypicality of the constructed items for motivation. The correlation of the judges' scores and the medical students' scores, given the small numbers, seems to be satisfactory. Construct validity was studied by Nieuwhof in a group of potential applicants to medical school in two ways: Pearson correlation of SMMS scores with 'Ambivalence towards studying' for medical school was found to be negative (- 0.28); Spearman correlation between SMMS score and 'determination to apply for medical school' was found to be positive (0.65).

The SMMS questionnaire was administered to medical students around the same time of the medical course in our study as compared to

Nieuwhof's study, also within the same institute. The scores were in line with the scores recorded by Nieuwhof, (Students admitted with lottery = 56.7 ± 8.1, Students admitted with Selection Procedure = 60.4 ± 6.6), though the total respondents in her study were much lesser.[23]

Conditions

The subjects were not randomly assigned to the two groups, but were rather readily available.

The groups differed in the following aspects:

1. The GE students were older than the NGE students, their mean ages being 23.3 years and 18.3 years respectively.
2. The GE students held a Bachelor's degree in Life/Health Sciences or Biomedicine, the NGE students held only a high school diploma.
3. The GE students were selected through a pre-entrance selection procedure, which was designed to select students who would be suitable for following the curriculum of the 4 year course. The NGE students were admitted through weighted lottery selection.

Therefore, there were differences in age, educational background and selection of the students between the two groups.

Procedure

At the end of a didactic lecture, the subjects were asked to fill out the SMMS questionnaire after informed consent. The participation was voluntary. The data obtained was accessible only to the researcher and anonymity was ensured.

Statistical analyses

For the nominal variable, gender, the Pearson's Chi-square test was used to determine whether gender and background are independent.

For the continuous variable, the SMMS score, Student's t test was used, to study differences between the two backgrounds and between the two genders.

For every statistically significant result, Cohen's effect size of the difference was determined.

SMMS scores were analyzed via multiple regression analysis to assess the effect of age, gender, maturity and background/pre-entrance selection.

Males mature later than the females. Since we wanted to investigate whether there was a gender difference, independently of maturity, a simple mathematical transformation of the age of the males was carried out to establish a new variable called maturity.

The assumptions for transforming the variable age into maturity in the present study were:

1. At the age of 24 years, males and females have completed their maturation process.[20]
2. But at the age of 18 years, the males are three years behind the females.[14]
3. The "catch-up" can be modeled as a quadratic function, meaning that the amount of catching up decreases as the difference in maturity becomes smaller.

Thus, the males were made younger by three or less years so that their SMMS score was comparable to females younger than them by three years or less.

Results

The SMMS questionnaire had sufficient reliability, with a Cronbach's alpha of 0.735 for the GE group and 0.783 for the NGE group.

The two groups were not significantly different in gender (Pearson's Chi-square = 0.463, df= 1, P = 0.496).

Table 1 Distribution of gender in the two groups

Group	Males	Females	Total
Non Graduate Entry	154	354	508
Graduate Entry	46	92	138
Total	200	446	646

Chi-square=0.463, df=1, p = 0.496

The first step was to determine whether there was a difference in the strength of motivation between the NGE and the GE group.
Results depicted in Table 2, t = -5.618, p = 0.000, show that this difference was statistically significant and Cohen's effect size for this difference was 0.559, i.e. more than a medium effect.

Table 2 SMMS scores of NGE and GE students

Group	N	Mean + SD	Mean age in years
Non Graduate Entry	508	55.26 ± 8.33	18.3
Graduate Entry	138	59.64 ±7.30	23.3

t=-5.618, p = 0.000

The second step was to determine whether there was a difference in the strength of motivation between males and females.
There was a significant difference between the scores of males and females (Table 3a and 3b): NGE group, t = -3.684, p = 0.000, Cohen's effect size = 0.360 i.e. between small and medium effect and GE group, t = -1.992, p = 0.048, Cohen's effect size of 0.351 i.e. between small and medium effect.

Table 3a SMMS scores of male and female medical students, groups combined

Gender	N	Mean + SD
Males	200	54.30± 8.08
Females	446	57.05± 8.28

t=3.927, p = 0.000

Table 3b SMMS scores of male and female medical students, separate groups

Group	Males	Females	t	p
Non-Graduate Entry	53.23±7.84	56.15±8.39	-3.783	0.000
Graduate Entry	57.91±7.93	60.51±6.84	-1.992	0.048

Cohen's effect size (NGE) = 0.360, Cohen's effect size (GE) = 0.351

In the third step, since there was a large variation in the ages of students within and between both the programmes, the correlation of SMMS score with the age was investigated. The Pearson's correlation of SMMS score with age in the GE students group was 0.009 (not significant, Figure 1) and in the NGE students group was 0.122 (significant, Figure 2).

Figure 1 Scatter plot of Age v/s SMMS score in the GE group

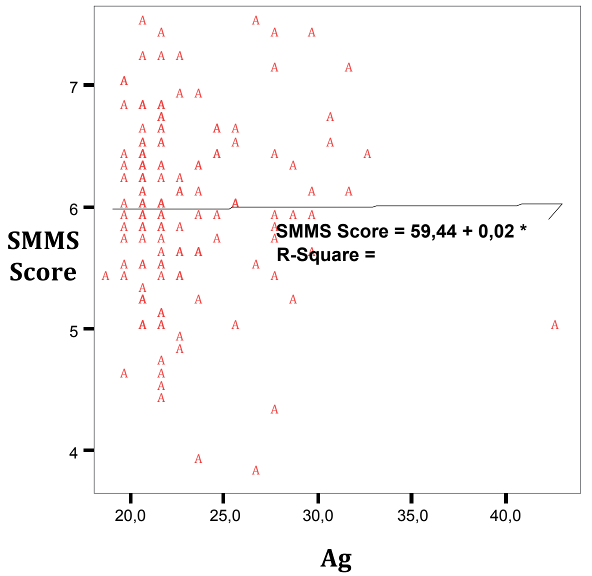
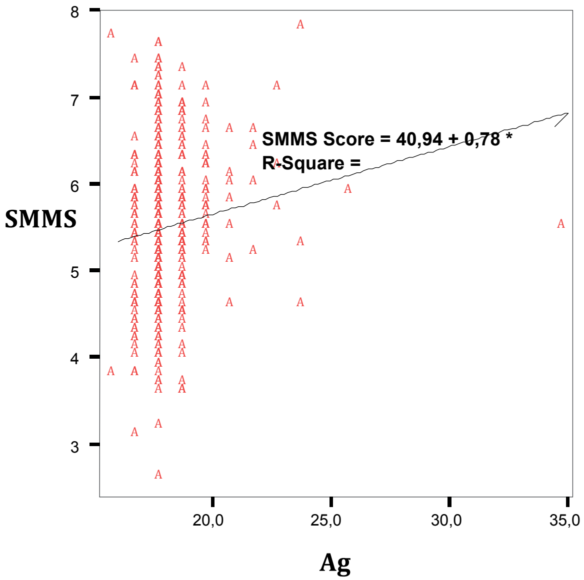


Figure 2 Scatter plot of Age v/s SMMS score NGE group



R square = 0.01

Since the GE group students were older, it was important to determine whether the higher motivation seen in them was due to the effect of age or due to the difference in the educational background or pre-entrance selection or both. We carried out a multiple regression analyses to determine the contribution of age, gender, background/pre-entrance selection, both with age as a variable (model 1) and with maturity instead as a variable (model 2) in Tables 4a and b.

Table 4a Model 1 of Linear Regression analysis

Model 1	Adjusted R^2	Std. error of the estimate
Age	0.039	8.15
Age **Gender**	0.067	8.02
Age **Gender** **Background**	0.074	7.99

Table 4b Model 2 of Linear Regression analysis (age replaced by maturity)

Model 2	Adjusted R^2	Std. error of the estimate
Maturity	0.061	8.06
Maturity **Gender**	0.071	8.02
Maturity **Gender** **Background**	0.079	7.99

This showed that the Model 1, containing only Age, explained 3.9% of the variance in the SMMS scores. By adding Gender, another 2.8% of the variance could be explained. On further adding Educational background as a variable, the model could explain an extra 0.7%. Model 2, in which Maturity was used as a predictor instead of Age, Maturity was able to explain 6.1% of the variance in the SMMS scores, Gender was able to explain another 1% and educational background was able to explain another 0.8%.

Discussion

Strength of motivation is not static; it appears to be a dynamic entity as it varies with age and maturity. The present study is a cross-sectional study which shows that strength of motivation increases with age, between the ages of 18 to 24 years. The SMMS scores in this study are in line with the scores obtained by Nieuwhof.[23] After the age of about 24 years the strength of motivation is more or less constant (Figures 1 and 2).

The pattern which the maturity of males follows to catch up with maturity of females is not really known, but we assume that it is not linear. Assuming that the amount of catching up decreases as the difference in maturity becomes smaller; we modeled the catch-up as a quadratic function. The merit in using this model is that it allows determining whether there is a true gender difference. With respect to maturation, an evidence-based model by doing a prospective study of the same subject group to determine the change in their strength of motivation for medical school with advancement of age is proposed for the future.

In the present study, age emerged as the single largest predictor of the strength of motivation. This finding is similar to another study, which compared medical students with and without a graduate degree and found age as the most important predictor of outcomes.[26] The probable cause could be that age and maturity help in making a clear career choice.[26] Age and maturity have been found to affect learning style and performance in medical school. A study done in Canada found that surface learning style positively correlated with younger age at admission to medical school and negatively correlated with pre-medical university experience.[27] A study done in the United States, found that students who were judged by the admissions committee to be higher in maturity and motivation were more likely to receive outstanding internship recommendations later.[28] The cause of these findings may be higher strength of motivation in these students, though it has not been measured in these studies.

The effect of gender on strength of motivation cannot be explained only on the basis of difference between the maturity of the males and the females, since it persists even after correcting for the confounding effect of the maturity. There exists only one study that has studied the strength of motivation between males and females and it reported no difference.[24] It is possible that the authors could not find a difference between the strength of motivation in their study whereas our study could, because the sample size in the our was much larger and the response rate of the participants was 91% as opposed to 76% in the Hulsman study, which might have not been representative of the whole student population. Other studies have investigated the difference in quality of motivation between males and females. These studies have found that females appear to display lower levels of external control, but higher levels of internal control than males.[29] The females are more intrinsically motivated and less extrinsically motivated.[30] These findings have been replicated in different age group profiles.[31, 32] Thus, the gender effect on motivation appears well-supported and seems to extend almost across the life span.[30] This concurs with the finding that female medical students perform better than male medical students and they are more likely to attain an honours degree.[33, 34]

The difference between the two groups as far as entrance criteria are concerned is two fold the educational background and pre-entrance selection. For the GE group, the variables educational background and selection are not separable. Every student in the GE group has a bachelor's degree and is selected through a selection procedure. So the effect of these two factors is confounded. Selection by itself could be expected to increase the motivation of the students. The NGE students were selected through weighted lottery depending on their overall grade for the high school diploma. The selection procedure for the GE course was much more difficult and the applicants put in a lot of hard work to prepare for it. This Selection Procedure included Multiple Choice Questionnaire exam, grading of Curriculum Vitae, Scientific Essay, Personal Interview and Patient Interview/ Study Sample Assessment Procedure.[35] SMMS scores did not correlate with the selection procedure scores as a whole (Pearson's correlation coefficient 0.06) or any of its sub-elements. We would expect that the educational background of the students could give them a working knowledge about the science of medicine and time to ponder over whether they find it interesting. This type of in-depth thinking could make the students surer about their choice of career and more motivated. This is in line with the findings of an earlier study.[26] A study done in Finland established that GE students are a special group within medical students who have greater theoretical and practical commitment to their studies and strong work life orientation as compared to students joining medical school after high school.[36] In another study, having a prior degree also increased the co-cooperativeness, goal orientation and achieving motive.[26] We do not know to what extent experience, as in educational background, affects strength of motivation.

Though it has a significant effect, it explains only an extra 0.8% of the variance in the strength of motivation in our study.

It would be worthwhile to think about the reasons why these GE students did not enter medical school after their high school. One of the possible explanations could be that these students did not have a GPA above 8 to obtain a direct entry into the medical course and did not get chosen in the weighted lottery. It is possible that they tried repeatedly, looked for other means to enter medical school and then tried for the graduate entry course. The other plausible explanation is that their initial choice of career was not medicine, but the interest in medicine was developed somewhere along the way. The third explanation could be that there is a group of students who believe that obtaining a bachelor's degree in the life sciences and then joining medicine is the better path to become a doctor than choosing for a traditional medical course after high school. All these explanations point to a more informed career choice and stronger motivation.

Limitations

Our study has several limitations. The construct validity of the SMMS questionnaire has been explored only in one study, with a low number of respondents.[23] More studies are needed to establish firmly the construct validity of this questionnaire. This could be an area for future research.

The variables studied in this study explain only 7.9% of variance in the strength of motivation for medical school. A major part of the variance remains unexplained. Other factors like personality traits, educational background of parents and nationality need to be evaluated as predictors of strength of motivation.

Age of the students was a confounding factor for assessing the effect of the educational background. But when age was entered into the model, it explained much larger part of the variance in motivation as compared to the educational background.

In our study, it was not possible to separate and measure the effects of educational background and selection. The effects are very much confounded.

The study does not really connect strength of motivation to performance in medical school. This presents an opportunity for further research in this field and it would also be also interesting to determine the change in the strength of motivation over the course of the medical study.

We do not know to what extent we can generalize our findings because the study was carried out in only one institution in The Netherlands. But another study done in New Zealand corroborates our findings.[26] Nevertheless, we recommend repeating a similar study in other institutions in and outside The Netherlands.

Conclusion

Strength of motivation appears to be a dynamic entity, changing primarily with age and maturity and to a small extent with gender and experience.

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Chapter 9

How Self-Determination Theory can assist our understanding of the teaching and learning processes in medical education

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Abstract

Background

Self-determination Theory (SDT), designed by Edward Deci and Richard Ryan, serves among the current major motivational theories in psychology. SDT research has been conducted in many areas, among which are education and health care, but its applications in medical education are rare. The potential of SDT to help understand processes in medical education justifies this Guide.

SDT is explained in seven principles, one of which is the distinction of three innate psychological needs of human beings: for competence, for autonomy and for relatedness. Further, SDT elaborates how humans tend to internalise regulation of behaviour that initially has been external, in order to develop autonomous, self-determined behaviour.

Implications

Implications of SDT for medical education are discussed, with reference to preparation and selection, curriculum structure, classroom teaching, assessments and examinations, self-directed learning, clinical teaching, students as teachers and researchers, continuing professional development, faculty development and stress among trainees.

How Self-Determination Theory can assist our understanding of the teaching and learning processes in medical education

Introduction

Learning, as educational psychology views it, requires cognitive, affective and metacognitive conditions to be successful[1, 2], that is learning requires understanding of content, willingness to invest effort in studying and the ability to regulate one's learning. In other words, the *what, why* and *how* of learning are important for its success.[3] In this Guide we focus on the affective component of learning, and more specifically on the motivation to learn. Self-determination Theory explains motivational processes and can help medical educators to understand and foster this important component of learning.

A guide for the "self-determination" of students and teachers sounds like a paradox. How can self-determination be guided by others? Yet the topic and the theory behind it is so important, practical and relevant for medical education that a detailed description of the Self-Determination Theory (SDT) is of particular interest to the field of medical education. We hope and anticipate that medical educators who read this Guide will view education, their own efforts and the process of learning in medical students, residents and practicing doctors differently. We expect these readers to understand more of the causes of failures and successes and of mechanisms to steer and remediate the teaching and learning processes after reading this Guide.

Self-determination Theory, developed by Edward Deci and Richard Ryan at the University of Rochester[4] is currently one of the major theories, if not *the* major theory, in the psychology of motivational processes. The SDT field is dynamic; this theory, based on early studies and the first theoretical description in the 1970s, is still the object of ongoing experimental research. It occupies a community of devoted researchers over the world who find and test applications of it in many domains of life—among which are health care and education— all of which further build its validity.

SDT is little known within the medical education community. Outside the Rochester group, only few references were found to discuss this theory related to medical education. Williams et al.[5,6] provided early publications on SDT related to medical education and argue for the use of more measures that stimulate autonomous motivation in medical students, involving volition, agency and choice, and less measures that control motivation by regulations, requirements, pressures and external rewards (derived from behaviorist theories that stress the usefulness of external rewards for motivation building). White and Gruppen[7, 8] explain the relevance of SDT for self-regulated learning.

This Guide is not written as a comprehensive literature review or a theoretical exposé of how SDT mechanisms work based on empirical studies; although we will cite such studies when relevant. A separate review covers this for the medical education domain.[9] The current AMEE Guide rather aims to provide more practical applications of SDT in different components of medical education. It may reveal notions that many readers recognise as familiar but never labeled this way. From this different lens, we hope to facilitate educators and teachers in fostering authentic self-determination, both in themselves and their learners.

Self-Determination Theory

The Self-Determination Theory is a theory of motivation and can be best described as a set of psychological mechanisms relating to the self, founded on a series of principles generally proved valid in experimental investigations.[4, 10] It is not possible to show the full richness of findings and writings on SDT but we will provide a condensed overview and refer the readers to the founding literature.

General principles

I. Humans are growth-oriented and naturally inclined to develop, internalise and integrate psychic elements to build an integrated and unified sense of the self. They are also inclined to integrate into larger social structures. This natural developmental tendency can be stimulated or hampered by internal and external forces.

II. Three innate psychological needs determine the ongoing psychological growth of human beings toward integrity and well-being: (a) a need for autonomy, (b) a need for competence and (c) a need for relatedness to others, i.e. to the social environment.

III. Motivations that determine human behaviour vary on a qualitative scale from lack of motivation (called “amotivation”), through extrinsic motivation to intrinsic motivation. Extrinsic motivation for an activity is driven by external control, demands or requirements such as rewards and punishments. Intrinsic motivation is a state that causes free engagement in an activity out of interest or for inherent satisfaction.

IV. An internalisation process of external self-regulations can change the nature of motivation. External self-regulations can transform through this process into internalised habits and motives and generate a feeling of autonomous self-regulation and value. The concept of internalisation has been explained in detail later in the Guide.

V. To remain present, intrinsic motivation requires the satisfaction of the need for autonomy and the need for competence and strongly benefits from the satisfaction of the need for relatedness. Intrinsic motivation is always associated with the satisfaction of these three basic psychological needs.

VI. High intrinsic motivation, e.g. learning out of interest, curiosity or enjoyment, and autonomous forms of self-regulation are associated with better learning, better conceptual understanding, better academic performance and achievement, and higher levels of well-being, than high extrinsic motivation.

VII. The regulation of behaviour and the ascribed cause of one's behaviour match the type of motivation (Figure 1). The full series of four types of regulation within extrinsic motivation are referred to as:

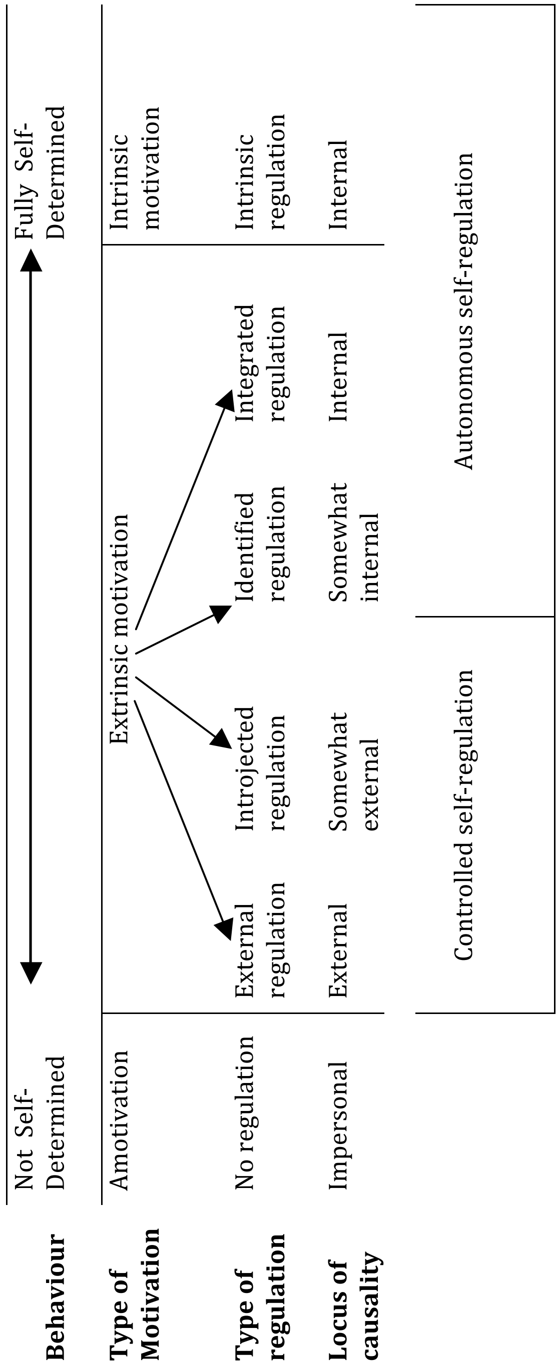
1. *external* regulation (e.g., conforming to a rule that one does not accept as valid, but because of pending punishment)
2. *introjection* of regulation (accepting a rule made by others)
3. *identification* of regulation (sincere understanding of the significance of a rule made by others),
4. *integration* of regulation (connecting rules to own norms and values). The more extrinsic levels of regulation (external and introjected) are often called "*controlled self-regulation*" in

contrast with "*autonomous self-regulation*", that includes identified, integrated and fully intrinsic regulation.

Purely intrinsic motivation is theoretically distinguishable from the most autonomous form of extrinsic motivation (integrated regulation), but in practice this difference is not relevant.

The reader should be aware that SDT designates the term "self-regulation" to any form of behaviour regulation that is carried out by the individual, even if the origin of the regulation lies externally (called external control) or is partially internalised (called introjection). Identified self regulation and integrated self-regulation are further internalised self-regulations along the extrinsic self-regulation continuum (See Figure 1). Thus, even external control and introjected behaviour regulations, are called self-regulations, because the individual has chosen this behaviour, but the reasons the person is showing the behaviour is because they feel like they are outside of the self (under external control) or only partially within the self (introjected).

Figure 1 The spectrum of motivation according to Self-Determination Theory



Three basic psychological needs

The three needs, mentioned in principle II form the core of Self-Determination theory. These three act in, as Deci and Ryan like to call this, an *organismic-dialectic* framework. Organismic refers to the natural growth and development tendency of human beings, and dialectic to the fact that the interaction with the environment determines how growth and development are fostered or hampered.

The need for *autonomy* refers to the desire to be one's own origin or source of behaviour. Autonomy reflects the experience that behaviour is an expression of the self and generates a complete feeling of free will, also called volition, to choose whatever a person desires or considers useful to do.

The need for *competence* refers to the desire to feel effective in whatever actions one pursues and performs. This need leads people to seek challenges that are optimal for their capacities and to persistently attempt to maintain and enhance skills and capabilities. Competence is not meant as attained skill or ability *per se*, but rather a perception of confidence and effectance.

The need for *relatedness* refers to the desire to feel connected with others, to caring and being cared for and to having a sense of belongingness, both with significant other individuals as well as with a significant community. Relatedness, as being accepted and valued by others, is meant as a psychological construct, not necessarily as a formal membership of a group or a relationship.

From extrinsic to intrinsic motivation and the process of internalisation

People naturally tend to grow and develop through acquiring knowledge, skill and habits, observed in the outside world. Much of this development can be considered an internalisation process, which turns learned behaviour into one's own style of action. The mere choice to carry out actions that stem from external sources or directives shows how some internalisation of these directives takes place. As this happens, there is a natural tendency to change external regulation of behaviour into self-determined regulation. SDT holds that this internalisation is not a process that, by itself, is forced through external pressures, incentives or reinforcement, but rather is a natural process.

The internalisation process, from external regulation to self regulation, can be considered as having the four distinct types of motivation that were mentioned in a previous paragraph. In the first type, that of *external* regulation, actions are motivated to satisfy external demands, i.e. to obtain a reward or to avoid a punishment. The locus of causality for actions is perceived to be fully external. The next stage is that of *introjected* regulation. Here, the subject has partly internalised the regulation of behaviour, but not truly accepted it as one's own. The behaviour may be guided by a desire to avoid shame or guilt or to attain ego-enhancements or feelings of self-worth and may stop as soon as external motives become less apparent. When behaviour follows regulation through *identification*, the subject values a behavioural goal consciously and accepts it as personally important. Identified regulation leads to more persistence, higher commitment and higher performance than lower stages of extrinsic motivation, as behaviour is felt as more autonomous and self-determined. *Integrated* regulation of behaviour involves the linking of identified motives with personal values that are already present. The locus of causality is now perceived as internal and external regulation of behaviour has been internalised as autonomous self-regulation. Extrinsic motivation, guided by integrated regulation of behaviour is close to intrinsic motivation. It has been rather consistently shown that the internalisation process, up to the level of identified regulation, has a positive impact. The advantages include a more volitional persistence, better relationships in one's social groups, more effective performance and greater health and well-being.[10]

To understand the psychology of the internalisation process, Organismic Integration Theory (OIT), a mini-theory within SDT[10], suggests that the innate psychological needs play a key role. The need for autonomy provides the primary ground on which to understand internalisation, as human beings have a strong desire to integrate any behaviour regulation, in order to self-regulate it and self-determine one's behaviour as much and as soon as possible. The environment, including peers, parents and teachers, can affect the type and strength of a person's motivation, or, in other words, can affect the internalisation process. Significant others can create more introjected modes of motivation, by externally controlling it with pressures, rules and demands and stimulating effort with external rewards. Or they can stimulate more autonomous modes of motivation by fostering competence, autonomy and relatedness. An early and quite consistent finding in SDT research is that extrinsic rewards, such as money, or punishment in case of failure, undermine intrinsic motivation.[11] This is consistent with the SDT postulate that, without any external incentives, humans have an innate, natural tendency to develop toward autonomy and self-determination. External rewards may prompt people to modify behaviour, but if this behaviour regulation is not internalised, the modified behaviour will cease to exist, or fall below its initial level, when the rewards are removed. At the same time, the growth of intrinsic motivation is hampered. Here is an example:

If students do not show optimal participation in small group sessions, an external reward system may be introduced, e.g. awarding marks for physical presence, to qualify for participation in a final exam. This mere introduction may shift students' reasons to be present from a more intrinsic motive, e.g. to acquire knowledge, to a more extrinsic motive; to collect the minimum number of points to be able to take the exam. This may turn into a collective culture (why attend any further, if sufficient points have been collected?) that distracts from a more natural habit of being present and engaging in learning the relevant material.

Supporting autonomy to foster self-determination

The concept of autonomy support describes an interpersonal climate in which an authority figure (e.g. physician or a teacher) takes the perspective of the person with whom they are interacting into consideration, provides relevant information and opportunities for choice, and encourages the individual to accept personal responsibility (e.g. for healthy behaviour or for learning). Autonomy support also includes interactions that involve asking the individual what he or she wants to achieve, encouraging questions, providing meaningful and satisfactory answers to questions and refraining from judgment or evaluation when obtaining information about past behaviour. Thus, autonomy support involves minimal pressure, judgment, and control.[4, 12] In contrast, a controlling interpersonal climate involves pressuring people with rewards, punishments, threats, or evaluations and by being judgmental.

Individual and cultural differences in motivation

Individuals differ in the extent to which they act out of extrinsic and intrinsic motivation and how readily they internalise the regulation of their behaviour. These differences may be linked to their personality, as some individuals tend to feel controlled (have a control orientation) in most situations whereas others tend to feel autonomous in those situations (have an autonomous orientation). A second distinction pertains to aspirations of individuals. Intrinsic aspirations, such as affiliation, personal growth and community contribution are distinct from extrinsic aspirations, such as wealth, fame and image. Intrinsic aspirations and their attainment are positively related to well-being indicators and negatively to anxiety, depression and physical symptoms, whereas extrinsic aspirations showed the opposite.[13-15] Associations have been found in the way individuals perceive their parents. Students, who perceived their parents to be autonomy-supportive, showed less health-compromising behaviours (use of tobacco, alcohol and marihuana) than those who perceived them to have more controlling parental style.[16] Next to individual differences, cultural differences may exist, up to the point that some researchers doubted the applicability of SDT in non-western cultures[17]; for instance in Eastern cultures, independence from parents and society would be valued differently. SDT recognises the Eastern culture of "interdependence", because people are more dependent on significant others in their values to shape their own behaviour. Here it is important to bring out the difference between independence and autonomy. Autonomy does not mean acting without help from others, it means having feelings of volition and free will in whatever actions are carried out. Within this, the feelings of volition may vary from individual to individual. One may think that a person engages in a behaviour because he values and endorses his cultural values, another deliberately decides to engage in a particular behaviour because the society expects so; a third may counter-react to values of a previous generation while feeling "free" to act her "own" way. SDT hypothesises that the general framework of Figure 1 holds true in non-western cultures as well. Studies with Russian, Chinese and Pakistani students show that autonomous self-regulation has similar beneficial effects.[17-19]

Self-determination Theory applied to healthcare

The wide application of SDT includes both the domains of healthcare and education. As doctor-patient relationships in some respects resemble teacher-student relationships, it is useful to mention some findings in this domain.

Traditionally medical practitioners tend to take a controlling approach with their patients and clients.[20] In contrast, autonomy support has been demonstrated to lead to greater internalisation of autonomy and perceived competence for prescribed health behaviours.[21-23]

Internalisation of autonomous self-regulation and perceived competence have been facilitated in person to person interventions as well as in settings where patients interface with a computer programme and then meet with a practitioner.[22, 23] Likewise, when teachers of medical interviewing and smoking cessation counseling have been autonomy-supportive, greater autonomous self-regulation and perceived competence have been internalised by the learners-practitioners.[6, 24] SDT has also been applied to a variety of health behaviours, including attendance in an alcohol treatment programme, participation in a weight loss programme, adherence to medication prescriptions, blood-sugar monitoring and smoking cessation.[6, 12, 25-28] These studies focused on motivation for behaviour change as well as the social contexts in which behaviour change occurs. Ryan et al.[28] (1995) assessed participants' motivation for attending a mandated, 8-week alcohol-treatment programme. Participants who had more autonomous reasons for participating attended treatment meetings more regularly and were rated by their treatment counselors as more involved in the treatment process. Across a series of recent studies, SDT interventions resulted in positive behaviour change and increased autonomous self-regulation for health behavior.[16, 22-25] Further, changes in autonomous self-regulation accounted for significant independent change variance in health behaviours. These results are consistent with autonomous self-regulation being in the causal path for health behaviour change and support the unique and important role that autonomous self-regulation plays in patient health as a mechanism through which health behaviour is changed and maintained.[29]

Self-determination Theory applied to education in general

As self-determination indicators correlate with performance, education is clearly a promising domain to apply SDT. If education is to foster self-determination and intrinsically regulated behaviour, there should be ways to support learners' sense of competence, autonomy and relatedness. In an overview of research done in this field, Reeve[30] (2002) stresses the importance of an autonomy-supportive teaching approach. Two major conclusions are drawn:

1. autonomously-motivated students thrive in educational settings and
2. students benefit when teachers support their autonomy.

While most research has been carried out in primary and secondary education settings, lessons learnt may well apply in medical education.

Figure 2 Controlling and autonomy-supportive teaching behavior

Controlling teaching behavior	Autonomy-supportive teaching behavior
• Following instructional materials	• Listening to and acknowledging students' perspectives
• Giving directives and commands	• Giving time and opportunity for autonomous work
• Using statements to take control over situations (including praise and criticism about students)	• Praising quality of performance and providing constructive effectance feedback
• Providing solutions for problems	• Inquiring what students want
	• Being empathic with students

The author[30] (Reeve) stipulates what are considered autonomy-supportive teaching behaviors, as opposed to controlling teaching behavior (Figure 2). Teachers tend, for many reasons, to use a controlling approach, but can learn to be more autonomy-supportive. Reasons for a controlling habit are several. Many people believe in providing punishments and rewards to control and reinforce behaviour. Taking students' perspectives and supporting student interest and curiosity is difficult, and is usually not a part of teacher training. Many teachers experience controlling and pressuring circumstances in their own job and tend to transmit these to the learning climate that they create for their students. Many believe that the higher the incentives, the greater will be the motivation. Teachers need to be instructed that fostering intrinsic motivation and autonomous self-regulation asks for a different, more autonomy-supportive approach. Acquiring autonomy-supportive behavior requires insights and practice. Reeve concludes with the advice to let teachers support three qualities in students: an internal locus of causality to foster self-control, volition to foster free will and a perception of choice to foster a feeling of autonomy.

Self-determination Theory applied to medical education

Applying SDT to medical education processes is framing our observations and experiences of medical education within this theory. The approach we took is to ask ourselves questions such as:

- How do we explain phenomena that we observe in medical education from the perspective of extrinsic versus intrinsic motivation?
- Can we observe contexts that stimulate or hamper the internalisation of external behaviour regulation?
- Can we identify loci of causality?
- Above all, can we identify processes in medical education that hamper or foster feelings of competence, autonomy and relatedness?

Most of these observations are not evidence-based. But by applying what we know about SDT, hypotheses about mechanisms in medical education can be readily formulated. These assumptions can help to guide research and development of medical education.

The power of motivation to become a doctor

Probably the most basic asset of Self-Determination Theory is that human beings have a natural, organismic tendency to develop and aim for self-determination. Most medical students have invested substantial energy to enter medical school to become a physician. Medical students are known to be highly motivated from the start of their study of medicine. If medical educators recognise this innate motivation and create learning environments to support learners' intrinsic desire to care for patients, to master new material, and to support patients and each other, this would have far reaching implications for medical education. Most students are ready to encounter barriers and duties and are willing and capable to cross hurdles to pursue their chosen profession. Some barriers are created by the medical school entrance requirements and curricula and some may be personally determined. The organismic tendency predicts that students with high levels of autonomous self-regulation will overcome these hurdles one way or another, no matter what they are. Some may even leave their country, learn a different language and graduate elsewhere as a doctor if it takes that much effort to become one. The routes to the MD degree vary greatly across the globe and the adaptive power of autonomous behaviour of medical students means that many will find their way, no matter what demands they face in which type of curriculum.

From the *organismic-dialectical* perspective, students are organisms with their own learning needs, such as to acquire a great deal of information, and to develop a new professional identity and new values relating to their future role as physicians. The educational environment forms their outer world that shapes the development of their identity and values and that can foster or undermine self-determination. Cognitive Evaluation Theory (CET), an early mini-theory within SDT, suggests that the needs for competence and autonomy are strongly integrated with intrinsic motivation; and that contextual events, such as the medical curriculum, are likely to affect intrinsic motivation to the extent that they are experienced as supporting versus thwarting the satisfaction of these needs.[31] In this view, medical students have substantial autonomy to follow the path to graduation and the educational environment has potential to accelerate or hamper this course. The function of education, from this viewpoint, could be more limited than we are usually led to believe.

We tend to think that education must be carefully designed to provide optimal outcomes. Or to put it differently, many teachers and institutions tend to think that they are most successful if they control most of student activities, based on a carefully designed curriculum and well chosen teaching methods. However, SDT informs us that by not allowing the students to choose how to learn for themselves they are less likely to identify with the material or to integrate it and thus will be less likely to remember what they have learned, and what they do retain will be less integrated into their identity as developing physicians. Given most medical students' natural tendency to develop autonomous regulation of behaviour and intrinsic motivation to learn and take on challenges to become a physician, it is very likely that when we control our students we will probably inhibit this development much more then we think. We tend to believe that education must be evidence-based, and with this evidence we can control student behaviour. Thus far, alas, we have not found strong evidence of the superiority of any one educational approach over the other. In fact, it has been very hard to provide support for guaranteed, superior learning results from any specific teaching method, even those based on major curriculum reforms.[32-34] There may be a lack of sufficiently strong research methodology, but more important may be that the influence of the personal will of students to reach their goals may overrule and obscure most of the differences in effects of educational interventions.

Following SDT-CET, the educational context, with all its rules and regulations, may only be a limited determinant of educational progress, while the internalised, autonomous self-regulation to become a doctor could very well be the major cause of variance in measured outcome of education. We may over-estimate the potential of educational interventions, and neglect what other motives energise individual students.[35] In 1996, Albano et al.[36] showed how medical students in different countries and very different curricula, proceed differently in their knowledge development, as measured with a standardised test, but also how they show surprisingly similar scores at the end of medical school. More than ten years earlier, a similar finding was reported among Dutch medical schools, and the authors posed the question of whether medical students have a natural tendency to acquire knowledge over time, no matter what education they receive.[37]

In conclusion, SDT can help to understand why research on outcomes of educational interventions show so little evidence of the superiority of one teaching method or curriculum approach over another. Another lesson may be that much of the energy invested in education by curriculum developers might be best spent in ways to stimulate autonomous forms of motivation and integrated or intrinsic regulation, rather than trying to determine the best moment to provide information or the best didactic method to teach it.

In the next sections we will examine how SDT can help understand more specific processes in medical education.

Preparing for and entering medical school

As medical school and the medical profession are both very demanding, students must be prepared to show high motivation and work hard. Stress and burn-out in undergraduate and postgraduate medical education is not uncommon and may be associated with low motivation.[38] Interestingly, many students do not have a clear view of medical education and the medical profession before they start[39, 40] and a significant number of them start medicine because of parental pressure[41]. If a student perceives her/his reasons for entering medical study as externally controlled, according to the SDT, s/he may not have much intrinsic motivation for studying medicine. Also if her / his ideas about her / his future profession do not match with the reality, but getting in was a prestigious thing to happen, he or she will continue in the study with feelings of external regulation, giving less chance for success. Prior vocational guidance and mentorship support during early years of medical school might stimulate feelings of volition, autonomy and relatedness. Mentorship support could also be specially directed towards creating an understanding within the student of the value of medicine as a profession and towards a gradual internalisation of this value. Examples are given by Teharian & Shekarchian[42].

Selection procedures for medical school have been an object of considerable debate as many common procedures have low predictive validity.[43] To select only highly motivated candidates is very difficult, as candidates may give socially desirable information in application procedures that is extremely difficult to weigh. Hulsman et al.[44] in a study using post-selection measurement of the strength of motivation, found that students entering medical school through a qualitative selection procedure showed higher strength of motivation than others who entered through a lottery system. This may point at an important 'Hawthorne' effect, in other words, a demanding selection procedure may *generate* motivation by itself. This conclusion is still somewhat speculative and needs to be substantiated, but SDT might be used to explain this phenomenon. Overcoming a selection hurdle may give the candidates a feeling of competence and relatedness *("now I belong to a highly selective group")*.

Curriculum structure and classroom teaching

Traditionally, the medical curriculum has been composed of carefully selected content, chosen by experts in medical and pre-medical disciplines, based on their best knowledge of the subjects. The curriculum would then be efficiently arranged to schedule all this content in lectures, lab classes and clerkships, to expose all students optimally to this content. Many generations of medical students have been brought up this way. Viewing the changes in medical curricula that have taken place in the past decades from an SDT perspective, it should be concluded that many changes are in concordance with an increased self-determination of medical students: student-centered education, horizontal and vertical integration within the curriculum, problem-based learning, learning in small groups, the introduction of electives and other advances all aim to stimulate motivation in students explicitly or implicitly. One established result of research of problem-based learning is that it motivates students[45]; SDT may help to explain why. PBL may create feelings of autonomy, as students must formulate their own learning objectives and are relatively free to choose sources of information. It stimulates relatedness, as groups of students must collaboratively work on problems. It may create at times a satisfactory feeling of competence, when mastered content is explained to peers. This differs from the traditional learning, in which there is solitary study with subsequent exhibition of knowledge in written exams resulting in an acquired score which is without interaction or feedback– hence, a typically extrinsic reward.

Even in the relative freedom of PBL but certainly in more traditional education, it cannot be expected that all students will always be motivated. The mere concept of self-determination implies that students may develop specific interests within medicine that exclude other areas. Teachers should realize that even in students with a high level of global motivation, i.e. with a general motivational attitude[46], some classes may not appeal to their interest. Unmotivated or bored students can be troublesome and very demotivating for teachers and fellow students. How do we deal with these students? SDT would advise that teachers work to create an environment that supports student internalisation of a value for learning the required activities. So an originally externally regulated behaviour will be internalised by a student if he is helped to see the value of the behaviour in a long term context, if possible in the area of his choice of specialisation. This could be achieved by working in small groups where the teachers get a chance to know the students personally and there is good communication between the teacher and student. The same goes for early patient contact in a vertically integrated curriculum. Medical students sometimes tend to get demotivated during their basic science years when there is a basic misalignment between learning basic sciences and the reason why they pursue medicine, i.e. to work with patients. Again, the value of learning basic sciences could be integrated into the curriculum through a clinically oriented approach and connection with early patient contact.

Vertical integration is often defined as clinical experience from early on in the curriculum in conjunction with basic sciences throughout the years.[47] More broadly defined, vertical integration does not only involve differences in the number and distribution of hours of clinical training and basic science teaching across the curriculum, but includes a philosophy that supports progressive increases in the responsibility and independence allowed to medical students.[48, 49] Increasingly, medical students are trusted with more clinical responsibilities in senior clerkships that greatly foster their feelings of autonomy and competence. Provided that supervision is adequate, such responsibility may in turn help to speed up the learning curve, so that responsibilities can indeed be increasingly given. Acknowledgement and reward from the clinical staff may in turn create a tremendous feeling of relatedness as well, as students are being taken seriously as emerging colleagues.

Assessments and examinations

Examinations typically represent extrinsic stimuli for learning and marks or scores are typical extrinsic rewards. Given this, the question is how can examinations be used according to SDT to stimulate intrinsic motivation in students?

One way of thinking about this is from a perspective of what would enhance student autonomy with respect to examinations. Examinations often are large scale events, in which students are all tested identically at the same time, for reasons of reliability and fairness. Autonomy however would mean that students would plan their own moments of assessment, whenever they feel they ready to be tested. This basic idea of individualized learning for mastery, an old but useful behaviourist approach[50, 51], would create and require flexible learning paths, as cohorts of students would not proceed with equal speed. This approach agrees with current thoughts about competency-based medical education, in which attained competence in clinical education should prevail over clinical rotations with pre-set time frames.[52-54] It stimulates autonomy in students when they can determine their own learning path.

Individualised test creates huge challenges for medical schools, but modern technology may help. Computer-based assessment creates practical possibilities that may replace collective written tests.

To explain how extrinsic regulations (such as working toward an examination) can combine with intrinsic motivation (to become a doctor), Vallerand and Ratelle have extended self-determination theory by adding three levels of generality motivation: global, contextual and situational.[46] The global level can be viewed as representing a rather stable, general motivational inclination to interact with the outside world. A highly motivated medical student in the *global* sense could, if studying medicine was not an option, would become a highly motivated other professional.

The *contextual* level represents a more focused motivation. If contextual determinants lead a student to take up medicine, the general will and choice to become a doctor will be a moderately stable motivational orientation. The *situational* level pertains to specific activities at specific times. Preparing for an examination typically requires extrinsic motivation at the situational level, probably not much more internalised than at the 'introjected' stage. But the overarching contextual level of motivation can at the same time be highly integrated.

Self-directed learning

Much of the time students spend in the preclinical phase of medical school is self-directed. Classes typically take no more than half of the time available. Self directed time is spent on learning from books and the internet, preparing for classes, problem-based tutorials or other, and preparing for examinations. To make this time most useful, students should learn how to regulate their learning, to be prepared not only for classes and exams but also for later life with less external guidance and extrinsic pressure. The University of Michigan Medical School uses a structured approach to train students to become self-regulatory learners, applied in a four-stage cycle: planning-learning-assessment-adjustment.[8] The planning phase includes two elements: goal-setting and motivation to acquire knowledge and skills. This is where teachers can help to support students' autonomy. For the learning and the assessment phases, students are instructed about learning styles and strategies and specific learning methods, followed by self-monitoring and the acquiring of feedback on their competence. The adjustment phase pertains to reflecting on accomplishments and making correct causal attributions of achievement, to guide further learning.[8] The authors stress the usefulness to work with peers in the development of self-regulation skills and cite Self-Determination Theory as one foundation of their approach. Indeed autonomy (in the planning phase), competence (in the assessment phase) and relatedness (working in a peer group) may be considered SDT related components of this promising approach.

Clinical training

Clinical training in undergraduate education is typically experiential in nature. Most of the knowledge and skills are acquired “along the way” and not because of deliberate teaching by faculty. Much of what students and graduates learn from clinical experience heavily depends on their own behaviour, attitude and conception of learning. It is critical to consider how clinical teachers and the clinical context can support this. Dornan has found that success in clinical clerkships particularly draws on the way the workplace learning climate motivates students by supporting their participation in patient care.[55, 56] Lave & Wenger[57] have introduced the concept of “legitimate peripheral participation” to signify how new apprentices should gradually become part of a professional community of practice. This is consistent with the assumptions of SDT. Serious participation in the clinical workplace means that autonomy in clinical functioning is valued. If the students’ role in the clinical practice is taken seriously, their competence is likely to be boosted. If learning-in-context is effective, it is probably the commitment of students to be *part* of this context that stimulates learning.[58] Lang and colleagues found a significant correlation of students’ US National Board of Medical Examiners subject exam scores with the number of *new* patients these students had admitted, as compared to the number patients attended that were already admitted by others.[59] SDT might explain an increased learning effect from a greater feeling of responsibility with such new patients than when students must re-examine already admitted patients. Serious participation in a professional community, for either peripheral or minor tasks, clearly stimulates feelings of relatedness. The earlier in the curriculum this can be realised, the better it might be for student learning.[60, 61]

How should this autonomy-support be organised? We would like to highlight two elements: the role of feedback and the significance of entrusting professional activities to trainees.
Receiving feedback is an essential component of experiential learning in the clinical workplace, as it is essential to build a self-image of strengths and weaknesses, and trainees can be actively stimulated to seek feedback.[62] When providing one-on-one feedback to medical trainees, as happens daily in clinical settings, the phrasing of feedback messages is important and should reflect the intention to scaffold the learner's development.[63] Even after shaping a safe environment, many people still find receiving feedback difficult, as it triggers their vulnerability and leads to undue emotional caution by the feedback receiver, as the hidden message often is *"I am in the position to tell you what your weaknesses are; you are far away from me"*.

When considering the feedback process from an SDT perspective, the question is how to enhance feelings of competence, autonomy and relatedness through the phrasing of feedback messages. It is particularly important that student autonomy be supported if feedback is expected to increase student perceived competence. When feedback is provided carelessly, all three conditions may easily be violated. Boosting of motivation may profit by three approaches:

1. shifting the focus from the individual to the context. Not *"you fail to do what we are good at"*, but *"This case/skill/procedure is quite difficult to master; let's see how to get there"*. In the latter wording, failure of competence is not primarily at stake as it normalises early failures, and it supports student initiation of the new behaviour.

2. shifting from instructional messages to self-regulation and shifting the focus from the perspective from provider to receiver of the feedback. Not *"I will tell you exactly what you must do"* but *"How do you think you would handle this next time? Ask me for help if you need me"*, can stimulate feelings of autonomy, and relatedness.

3. pulling the trainees into the professional group. Not *"you trainees must learn to eventually be like us"* but *"this is what we all went through; we all must practice to attain such new skills"* will much more enhance the feeling to be related and understood by future colleagues.

These phrasings may seem like subtle nuances, but they can make a large difference in how motivation to improve skills and behaviour after receiving feedback is affected.

Another element, entrusting professional activities to medical trainees, has been elaborated in the literature in conjunction with competency-based medical education.[49, 53, 54, 64] In competency-based medical training, the length of training should be determined by the acquisition of competence, and not bound to a pre-set, fixed length. Using the concept of Entrustable Professional Activities (EPAs), it is possible to grant full responsibility to trainees for specific tasks in which they have demonstrated mastery. The impact of such an approach to clinical training is potentially far reaching, as the development of a medical specialist would be the gradual acquisition of responsibility for the building blocks (EPAs) in a flexible time frame, rather than the following and completing a pre-determined training route and the reception of a diploma or registration for the full responsibilities for the profession at the end of the training. This may sound like a future vision, but the model has been applied in health care education.[65] Viewed from an SDT perspective, this approach would likely have an effect on the development of autonomy and on a better quality of motivation. Awarding full responsibility for limited tasks earlier, for instance, during a postgraduate residency, may well generate feelings of competence, autonomy and relatedness, as the trainee gradually becomes more and more a serious partner of the clinical staff.

Clinical training has, in general, not become easier in the recent decades. The relatedness component in clinical training, requiring sufficient interaction with peers, clinical staff and patients, has been at stake. Recent developments in academic healthcare endanger these relationships; working- hour restrictions, the short stay of patients in hospitals, fragmentation of health care over specialties and health care providers, and the increased pressures upon clinical faculty all lead faculty to create controlling learning environments. The lack of sustained relationships among students, teachers, and patients is a major current problem in medical education[66] and a threat to the development of intrinsic motivation in medical students. In response to this failure of the medical education system, examples of successfully restored continuity in clinical training have been developed by a different scheduling of clerkships.[67] Autonomy-supportive clinical clerkships in internal medicine and surgery have been shown to increase the likelihood of students choosing these branches for their specialty training.[5, 68]

Medical students as teachers and researchers

Schools, looking for opportunities to provide students, during their training, with serious responsibilities should not only think of entrustment of responsibilities in patient care but also in other, more academic areas such as teaching and research. There is a growing body of literature that shows how medical students can very well serve as teachers for less advanced students (Ross & Cameron 2007). The act of near-peer teaching has been shown to have specific benefits for those medical students who teach, without necessarily compromising the learning of their younger peers. Benefits can be mapped in cognitive, affective and metacognitive levels of the learning process.[64]

A student or resident, placed in the position of a teacher of near-peers, experiences a different relation to them. Acting as a relative expert makes one *feel* like a relative expert. It generates feelings of competence, relative autonomy to determine what and how to teach and esteem before others, which in turn can motivate the peer-teacher to spend further energy in studying – as 'success breeds success'.[64]

Something similar holds for research. Students may be energised in research electives if they can autonomously work out a project, present results, be allowed to speak at a conference and even to be a first author of a journal paper. In Dutch medical schools, not infrequently, medical students graduate co-authoring one or more journal papers in the scientific literature.[69]

Continuing professional development

Motivation is clearly at stake in continuing medical education and continuing professional development. Outside a formal training or learning framework, doctors must autonomously acquire a habit of spending time and effort in keeping up to date with medical knowledge. This requires some self-regulation. SDT has been used to predict how practicing clinicians internalise autonomous self-regulation for tobacco dependence counseling. Interestingly, the medical literature[70] indicates that it is the lack of efficacy or perceived competence and time pressures[71] from busy practice that stops clinicians for providing counseling and prescriptions for tobacco dependence. Williams et al.[24] demonstrated in a pre-post, non-randomised design that when practicing clinicians perceive autonomy support from the insurer and from the CME facilitator, they internalise autonomous self-regulation about the counseling and that this predicts change in behaviour and self-reported time spent counseling. These findings, in addition to those in general education and with medical students, point to the importance to create learning environments that facilitate internalisation of valuing the importance of learning materials, and not to simply provide information and training skills. Medical treatments are constantly being updated based on advances in our evidence base. CME learning environments that generate interest and curiosity as well as facilitate autonomous self-regulation to incorporate new treatments and information into practice, are more likely to be effective for patient outcomes, and to enhance the quality of practice life for clinicians, than many current didactic CME lecture-based courses.

Teaching

Teaching of medical students is a task that is almost invariably combined with other tasks. Basic scientists have research obligations and clinicians have patient care duties and research tasks. SDT predicts that faculty will be most intrinsically motivated for those tasks that evoke the highest feelings of competence, autonomy and relatedness. In contrast with most of the teaching, research may lead to strong feelings of competence once a researcher starts publishing and showing selective acquaintance in specific domains, acknowledged by the scientific community, viewed as a group one would like to belong and “relate” to. Patient care has the potential to feed signs of success back to the clinician. Patients can display satisfaction and clinical signs can show the effect of treatment, both working as signals of clinical competence. Relatedness to colleagues is continuously present, as most clinical work is team-based. And finally, physicians have a defined professional autonomy to act to the best of their knowledge.

Teaching has a different dynamic. Modern medical curricula do not particularly stimulate the three SDT features more than research and patient care. In student-centred, problem based curricula, the teachers have fewer opportunities to display their knowledge and experience thus leading to lower feelings of competence as compared to traditional lecture-based curricula. Relatedness to a community is less developed as much of the teaching performance is rarely seen and discussed among colleagues. In a recent survey among 250 University Medical Center Utrecht teachers about their views on what would stimulate their motivation to teach, respondents chose the following factors: teaching about my own expertise, noticeable appreciation of my teaching skills by my direct manager, teaching small groups, freedom to determine the content of my teaching and feedback on my teaching performance. One of the motivators identified by these teachers, which was not a part of the list of factors provided to them, but was very often received as a remark in an open ended question, was *'teaching highly motivated students'*.[72] What holds for students, holds for teachers too. Highly student-centred and centrally regulated, integrated curricula may be useful to students, but may not particularly stimulate individual teachers in their educational tasks. To stimulate intrinsic motivation in teaching, visibility of teaching performance, drawing on the teacher's expertise and some autonomy in determining the mode of teaching seems to be needed.

Not all clinical and basic science faculty are intrinsically motivated to teach. If they would be able to connect their values, e.g. for research or clinical practice, with teaching this could enhance their motivation to teach. Talking and teaching in a generalised way about research and patient care can stimulate their own thinking and serve their more primary goals, e.g. using their own work as examples to generalise upon. Feeling competent through constructive feedback and feeling related to other teachers and colleagues in the department could go a long way in motivating them intrinsically for teaching. Teaching needs to be a value; encouraged and internalised into the culture of the department and institution. The teachers need to be able to identify with their work of teaching and see it as a worthy activity. Having "Teacher communities" as a group to relate to could potentially help in getting teachers together to discuss their experiences, linked to their feeling of competence, difficulties and solutions to common problems faced in teaching.

Stress, depression and burn-out among medical students and residents

Low motivation has been proposed as both a cause and consequence of medical student distress.[38] Not only that, but well-being in general affects motivation in daily work and overall career; lower motivation leads to feelings of ambiguity in career choice and higher well-being leading to greater zeal towards purpose in medicine and intrinsic passion for work.[73]

How does SDT explain this and what could be done from that perspective?
Stress in medical school can be caused by several factors. It is possible that a student, who is intrinsically motivated for the medical study, finds it difficult to strike a balance between gaining medical knowledge to satisfy his intrinsic motivation and studying and delivering high performance in his assessments owing to the huge time demands and constraints of the profession. This could lead to feelings of the controlling nature of the study of medicine, hampering the student's intrinsic motivation, leading to significant distress. Mentorship support could go a long way in helping these students to regain a feeling of autonomy in their learning, by planning their own study events in accordance with their interests, without giving up preparation for assessments.

Controlling behaviour by superiors has been found to be an antecedent of work-home interference leading to decreased feelings of well-being and burnout among medical residents.[74] Here too, the problem leading to stress and burnout could be tackled by encouraging more autonomy-supportive climates. Lack of autonomy support has also been identified as the leading problem producing burnout among practicing doctors.[75] Autonomy-supportive climates are as important in medical practice as in medical education for the promotion of well-being.

Lack of intellectual and emotional integration have been proposed to underlie the experience of burnout in medical students when they are actively in contact with patients and support of the three basic needs of autonomy, competence and relatedness have been proposed to reduce burnout.[29]

In the second half of this Guide we selected a series of components of medical education and student learning to illustrate how SDT may serve to understand and possibly enhance the educational process. Other elements could have been chosen as well, but we hope readers will now have acquired enough ground to think of application of SDT in whatever other part of the medical education continuum is of interest to them, to test them, and to draw their own conclusions.

Measuring motivation

After this discussion on different types of motivation and the preferred types, it might be helpful to briefly review how motivation used in SDT can be measured. Deci and Ryan have developed and copyrighted many questionnaires which cover measurement of almost all concepts described within the theory. The *Academic Self-Regulation Questionnaire (SRQ-A)* gives separate scores on intrinsic motivation, identified regulation, introjected regulation and external regulation. Integrated regulation is difficult to measure and till date there is no scale to measure it. The *Self-Determination Scale (SDS)* assesses the extent to which people tend to function in a self-determined way. The *General Causality Orientations Scale (GCOS)* measures autonomy, controlled and impersonal orientations in an individual. The *Learning Climate Questionnaire (LCQ)* measures the students' perception of autonomy-support in their educational setting or more specific scenarios like a certain lecture. The *Perceived Competence for Learning Questionnaire (PCLQ)* measures how students' perceive their competence in their learning. The *Basic Psychological Needs Scale (BPNS)* measures the extent to which an individual feels his needs for autonomy, competence and relatedness are satisfied in general life or at work. The *Motivators' Orientations Questionnaires* measure a relatively stable orientation in adults toward their approach to motivating others. These questionnaires and many others (measuring SDT concepts in other contexts like health care and work) are freely available on SDT website:

http://www.psych.rochester.edu/SDT/questionnaires.php

Another scale, developed by Vallerand and colleagues is the *Academic Motivation Scale (AMS)* which also gives scores on intrinsic motivation, identified regulation, introjected regulation and external regulation and amotivation. Intrinsic motivation (IM) scale has 3 further sub-scales measuring IM to know, IM towards accomplishment and IM to experience stimulation. This scale too does not have items for measuring integrated regulation. References of AMS are provided in Vallerand & Ratelle.[46] AMS has been used in medical education research.[76, 77]

Further references to most of the literature existing on SDT, both empirical and scholarly, are available from the SDT website.

Conclusion

The lens of Self-determination Theory provides us with a different view of processes in medical education. SDT stresses the importance of creating feelings of competence, autonomy and relatedness in medical students. Despite the large body of research in the domain of this theory, including many studies in health care, the applications seen currently in medical education are scarce. Through logical reasoning and applying the elements of the theory we come to several hypotheses to understand processes in education that have high face validity. Is it justifiable to discuss these assertions? We believe it is. Much of medical education methods and curricular structures applied in medical schools are constructed with a focus on practicality and based upon tradition. Some modern approaches are more theory-based, but many lack such foundation. And even if they have, there is often little evidence to predict that one method will yield superior results, compared to other methods, as medical education research is not rocket science.[78] This should not restrain us from seeking mechanisms to understand what could cause successes and failures in medical education. This Guide has been meant to help this thinking.

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Chapter 10

Twelve tips to stimulate intrinsic motivation in students through autonomy-supportive classroom teaching derived from Self-Determination Theory

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Abstract

Background

Self-Determination Theory (SDT) of motivation distinguishes between intrinsic and extrinsic motivations. Intrinsic motivation is observed when one engages in an activity out of genuine interest and is truly self-determined. Intrinsic motivation is the desired type of motivation for study as it is associated with deep learning, better performance and well-being in comparison to extrinsic motivation. It is dependent on fulfilment of three basic psychological needs described by SDT. These are the needs for autonomy, competence and relatedness. According to SDT, autonomy-supportive teaching is important, because it makes students feel autonomous and competent in their learning and also supported (relatedness) by their teachers.

Aim

The concept of autonomy-supportive teaching is relevant to medical education, but less known. Through this article, we aim to make this concept understood and practically used by medical teachers.

Method

We used SDT literature as a basis to formulate these twelve tips.

Results

We present twelve practical tips based on SDT, for teachers in health professions, on how to engage in autonomy-supportive teaching behaviours in order to stimulate intrinsic motivation in their students.

Conclusion

These tips demonstrate that it is not difficult to engage in autonomy-supportive teaching behaviour. It can be learned through practice and self-reflection on teaching practices.

Twelve tips to stimulate intrinsic motivation in students through autonomy-supportive classroom teaching derived from Self-Determination Theory

Introduction

Medical educators have tried to determine to what extent medical students are intrinsically or extrinsically motivated.[1-6] This discussion aligns with Self-Determination Theory (SDT) of motivation which distinguishes between intrinsic and extrinsic types of motivations.[7, 8] Intrinsic motivation is observed when one engages in an activity out of genuine interest and is truly self-determined. Extrinsic motivation is observed when one engages in an activity for a particular benefit or because of pressure from others.[8, 9] Intrinsic motivation is considered the desired type of motivation in students[8, 9] and it has been shown to be associated with deep learning, better performance and well-being[7-9] in comparison to extrinsic motivation. Moreover, intrinsic or extrinsic motivation is not a permanent or personality characteristic of an individual. Extrinsic motivation for a task can change to intrinsic motivation and vice versa.[10] For this change the right elements need to be present in the learning environment.[11]

Intrinsic motivation is dependent on fulfilment of three basic psychological needs described by SDT.[7-9] These are the needs for autonomy, competence and relatedness. The need for autonomy is the need to feel that one is carrying out a task of his own choice. It is not forced or coerced in any way. The need for competence in learning is the need to feel capable of learning the study or course material. The need for relatedness is the need to feel a connectedness or a sense of belonging with fellow pupils and the teachers.[7-9] A recent qualitative study in The Netherlands found that non-fulfilment of the needs for autonomy, feedback and emotional support leads to dropout or consideration of stopping training among graduate doctors who are in training.[12] We find the results of this research are in line with SDT. Autonomy-Supportive Teaching proposes to satisfy these needs in order to stimulate intrinsic or self-determined motivation among students[13-15] as opposed to Controlling Teaching Behaviour. Probably the most correct term to describe this concept would be Self-Determination Supportive Teaching, but Autonomy-Supportive Teaching has been used in SDT literature.

Autonomy-supportive teaching is important because it makes students feel autonomous and competent in their learning and also supported by their teachers, fostering relatedness. In medical education, autonomy in learning[16] and autonomy-support by teachers in medical education has been found to not only make students motivation more autonomous[17], but also make the students themselves more autonomy-supportive towards patients and in their health practice[4, 5, 15]. The concept of autonomy-supportive teaching is relevant to medical education, but is relatively less known.[11] We present here twelve practical tips based on SDT, for teachers in health professions, on how to engage in autonomy-supportive teaching behaviours in order to enhance intrinsic motivation among their students. For more in depth information on types of motivation and applications of SDT in medical education, we would like to refer our readers to AMEE guide 59 on SDT.[11]

Tip 1 Identify and nurture what students need and want

Make an attempt to understand what students want out of the teaching sessions and structure the format of teaching around these needs. This is to make the learning more relevant, intriguing and interesting, thus stimulating among the students a genuine interest in the subject. E.g. if a teacher finds out from course evaluation that the students are interested in learning glucose metabolism as seen in a real patient rather than in theory, he could choose to construct a case-based learning session on glucose metabolism cycle highlighting each step where there could be complications and medical interventions would be justified. This is a scenario where the content taught, remain constant, but the format of teaching is in congruence with the students' needs.

Tip 2 Have students' internal states guide their behaviour

Structuring the lesson around the needs of the students helps to create a state of self-determined motivation (internal state) among these students. Allow this autonomous motivation state to further guide the study behaviour of the students instead of trying to provide incentives like telling students that "this topic is important for the exam" or providing them rewards or withholding rewards. Students, who are genuinely interested in learning about the topic, invest time and effort in reading more about the subject, come prepared to the class and also are more attentive. Thus their behaviour, both in and out of class, reflects their interest in the subject. Having one's own "internal state" guide one's study behaviour, rather than use incentives to guide their behaviour, is a highly effective stimulus for persistent interest and efforts in the study.

Tip 3 Encourage active participation

Encourage active participation from the students during the class. This makes learning more autonomous, makes it easy to provide feedback during discussion of ideas and increases feelings of relatedness among the students and with the teacher. Dividing the students into two groups, giving each group the responsibility for discussing and summarizing part of the topic is one way of ensuring active participation. This approach stimulates discussion among the students and every student is actively involved in the learning process. A seating arrangement, an important element of this process, which facilitates the interaction of the students with each other and the teacher, is recommended.

Tip 4 Encourage students to accept more responsibility for their learning

Encourage students to accept more responsibility for their learning. Having responsibility for their own learning has been shown to stimulate students' motivation.[18] Ways of encouraging students to accept more responsibility for their learning are: ending the session with further questions to be discussed in the next sessions and allotting some "nice to know" topics for self-study. Only giving students more responsibility for their learning is not enough though, the teachers need to communicate these expectations to the students clearly and early on in the course. Active participation of students in learning sessions transfers some of the responsibility for learning from the teacher to the students making learning more autonomous.

Tip 5 Provide structured guidance

Provide structured guidance to the students during the teaching sessions. Transferring responsibility for learning to the students does not mean that the teacher is only in the background leaving students to do everything themselves. It rather means that the teacher is providing structure to the session, gently urging the students along the right path and providing a more active and definitive role if the session starts going completely in the wrong direction. This calls for a delicate balance between letting the students take the lead and bringing in own expertise in the subject matter whenever required. It has been seen in research that combining highly autonomy-supportive and highly structured teaching sessions bring about the best learning outcomes.[14]

Tip 6 Provide optimal challenges

Provide optimal challenges during the teaching session. E.g. give the students small topics for preparation and presentation in groups. This not only helps the students feel autonomous and competent in their learning and but also helps them to practice other softer skills (like presenting to an informed audience) which is of value to them in the long run. Students should not be forced to take part in these activities, but participate out of their own volition. It would also mean giving students, who are not well-prepared for such challenges, more time to gather their courage and mentally prepare for them. Thus the challenges need to be optimal[19, 20], neither too difficult nor too easy, the idea being to make the students feel competent in their learning. Feelings of competence greatly enhance intrinsic motivation.[9]

Tip 7 Give positive and constructive feedback

Give timely, positive and constructive feedback to the students on the process of learning to show the gap between the current and the desired understanding rather than the task of learning (i.e. grades).[21] The manner of giving feedback should be non-threatening, directed towards learning issues and not towards the person, phrased in a positive way and giving tips for improvement in the future. Pendleton's rules[22] (first the students says what went well, followed by what the teacher thinks went well; then the student talks about what could be improved and how, followed by what the teacher thinks could be improved and how) for giving feedback provide useful guidelines for training oneself to give feedback to others in an effective manner. Giving positive feedback does not mean that corrective feedback for errors made should not be given. It rather means that this feedback should be phrased as “points for improvement” thus isolating it from any negative connotations. The tone of the feedback is equally important. Points for improvements should be presented as “suggestions” and not as “directives”.[14]

Tip 8 Give emotional support

Create an environment of emotional support for the students. Emotional support entails creating a warm, positive and sharing atmosphere in the classroom where students feel safe to express their feelings, doubts and questions. Having positive interaction with the teacher is likely to make students more interested in the subject matter. This feeling of “relatedness” with the teacher supports the enhancement of intrinsic motivation of the students.[9] It creates a community feeling and students may feel more committed to the study of medicine because they now have the feeling of belonging to a “medical community” which includes not only their teachers, but their fellow students as well.

Tip 9 Acknowledge students’ expressions of negative affect

Listen patiently to the students and empathize with them if students express their disinterest or dissatisfaction with a particular topic or a particular method of teaching. If the teacher refuses to accept negative feelings from the students, the students are likely to lose all interest in the further teaching sessions. Students need to feel heard, think that their feelings are important to the teacher and that they can influence some things in the teaching sessions with their constructive feedback. E.g. the students might be generally interested in the topic being taught, but may be disinterested on a particular day because of an impending exam. If they communicate this to the teacher, the teacher should empathize with them, try to look at the situation from the point of view of the students and maybe even recount his own experiences as a student. Even the feeling of the teacher being approachable because of "relatedness" might be enough for the students to try to make an attempt to concentrate on the teaching on a particularly tough day. It is important to not be judgemental when students communicate their feelings.

Tip 10 Communicate value in uninteresting activities

It is unlikely that all activities or teaching sessions are interesting for every student. Students who are not motivated can have a negative effect on the motivation of other students in the group[23] and even on the motivation of the teacher. Hence it becomes important to think about how to handle these students or how to motivate these students to engage in the expected behaviours. To make the expected behaviour of these students self-determined, a teacher could communicate the value of doing these uninteresting activities to the students.[11] This means providing rationales for engaging in the requested behaviours. E.g. for students who are not interested in Biochemistry as a subject or particularly in glucose metabolism, the teacher could explain how it is relevant and important in medical practice, how many patients with diabetes they could expect to encounter in their lives and what would happen if this diagnosis is missed. The teacher could also ask students whether they have any family members suffering from diabetes and thus make the topic relevant to all the students. If the students understand the value of studying this subject for their medical career, they will autonomously choose to study it, thus shifting their motivation towards the self-determined motivation, rather than it being controlled by the teacher's expectations. Accepting certain behaviours because one values them makes learning more permanent due to a more self-determined motivation.

Tip 11 Give choices

Give choices to the students whenever it is possible in order to bring in autonomy. These choices could include what could be the sequence of topics in a particular course, could there be a short evaluation after the course, what could be the way to do it, would the students like to do presentations on the topic, who would volunteer to present etc. Being involved in some of the planning helps the students feel closely related to the course and enhances their intrinsic motivation to do the things required for the course due to their feelings of being stakeholders in the teaching-learning activities.

Tip 12 Direct with "can, may, could" instead of "must, need, should"

Use the right words while guiding students in their work. While addressing the students, the words typically used by controlling teachers are: "you **must** learn this", "you **should** do this", "this is **obligatory**", "if you want to succeed, you **need to** learn this", "if you study this I will **reward** you", "if you don't do this I will give you a **bad** grade" etc. Autonomy-supportive teaching behaviour would entail use of words like: "you ***can*** learn this", "maybe you ***could*** do it in this way", "it is ***your choice***", "if you want to know this topic well, it ***would help*** to include this in your study", "if you study this it ***will increase your understanding*** of related conditions", "if you don't study this you ***may lose out on understanding*** some topics in the future sessions" etc. Phrasing comments and suggestions in the right way i.e. which is not binding on the students, but gives them the chance to decide for themselves (hence autonomous), is very effective in enhancing their intrinsic motivation.

Conclusion

Autonomy-supportive teaching is beneficial to enhance students' intrinsic motivation for medical study. The 12 tips mentioned in our article demonstrate that it is not too difficult to engage in autonomy-supportive teaching behaviour. It can be learned through practice and self-reflection on teaching practices. Having autonomously motivated and interested students in teaching sessions may well enhance teachers' intrinsic motivation for teaching through feelings of competence and relatedness.
These twelve tips can be applied in different types of teaching sessions like large groups, interactive lectures, clinical presentations etc. and also in problem-based learning sessions. In problem-based learning sessions where the teacher is not a content-expert, some of the tips would be applied at the level of the course coordinator.

Finally, it is ironic that to adhere to the style of the "Twelve tips" series, we had to word our tips as directives instead of suggestions or choices for enhancing the intrinsic motivation of teachers to incorporate these tips into their teaching styles. But readers must be aware that we merely would like to encourage their self-determination.

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Chapter 11

Discussion

Discussion

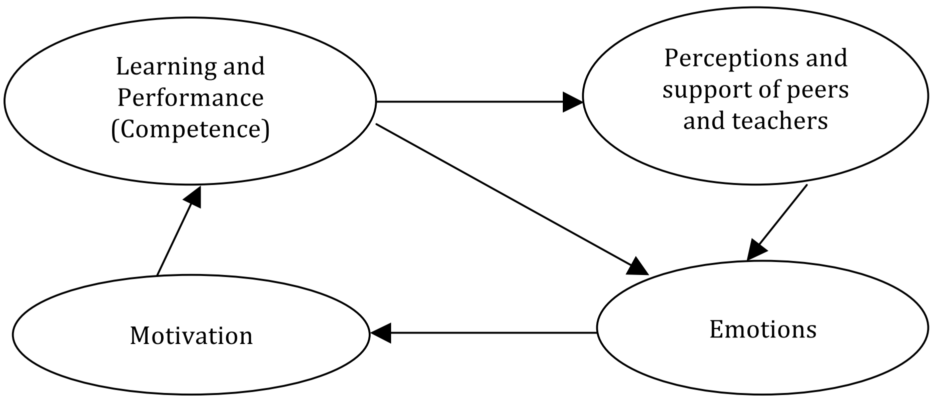
This thesis mainly studies the concept of motivation through motivation theory literature review, investigates motivation as a dependent and an independent variable through a literature review and research studies, establishes validity evidence for an instrument to measure the strength of motivation of medical students and attempts to explore effect of motivation on learning and performance. Based on the research findings and reviewing the relevant literature, it gives recommendations on approaches to motivation research in medical education, designing of curricula and teaching methods in medical education.

This discussion chapter first explores in detail the findings of the thesis as a whole, followed by perspectives on different aspects of medical education and motivation which have been developed from the research and review findings, followed by the strengths and limitations and finally proposes new research questions for further study.

Main findings of this thesis

Everyone in education knows and feels that motivation in students is essential for their success in learning. Teachers seek out motivated students and students seek out motivated teachers. This process is probably done so unconsciously that people overlook giving the motivational aspect enough consideration while designing curricula. Importance is given to the content of learning, methods of learning and instruction, methods of accurate assessments of competencies, students' knowledge about their own learning beliefs, methods of self-assessment, self-regulated learning, reflection etc. Thus the cognitive and metacognitive aspects of learning are adequately addressed. The "affective component" which includes motivation is mostly neglected. These three components, i.e. cognitive, affective and metacognitive, constitute the Learner-Oriented Teaching (LOT) model[1, 2] which has been modelled from the research in cognitive psychology.[3, 4] Students experience varied emotions during learning depending on how well they perform in their learning, how this is perceived by their peers and teachers and how their teachers support them.[5] Their emotions affect their motivation[5] and this motivation affects their further learning and performance (See Figure 1).

Figure 1 How motivation affects learning and performance and vice verse



Student motivation is clearly important for learning. "Motivation is the desire to learn which a student brings with himself to medical school".[5] It follows that motivation should receive enough consideration while designing curricula. Chapter 2 of this thesis reviews medical curricular designs since inception of medical education and motivation theories to determine whether motivation has been given enough consideration while designing these curricula. Medical education has incorporated different curricular designs over the last century: Apprenticeship model, Flexner model, Problem-Based Learning, Integrated curricula, Outcome-Based model, Spiral and Z-shaped curricula, Experience-based learning model, Longitudinally-Integrated Clerkships etc. Curriculum development has focused on educational development that fosters the cognitive component of learning: better understanding, longer retention, better availability of knowledge when needed, reducing redundancy, confusion and repetition of concepts.[3] It sometimes fosters the metacognitive regulation component of learning: orienting, planning, monitoring, testing, diagnosing, adjusting, evaluating and reflecting one's learning behaviour and approach.[3] Consideration of motivational elements in the designing of medical curricula is something that is currently undervalued in medical education.[6] This review recommends that measures to fulfil the three basic psychological needs of autonomy, competence and relatedness, identified by Self-Determination Theory (SDT) to stimulate intrinsic motivation among students, should be integrated into the design of medical curricula.[6]

Another finding of this thesis after reviewing motivation theories and research done on motivation in medical education (Chapter 3) was that motivation is a dependent as well as independent factor in medical education.[7] Research on motivation in medical education is still in the developmental stage and may not always be well-informed by theory in motivation. The results are studies with low quality of methodology (excluded studies[8]), contradictory findings of studies performed with good methodology[9, 10], motivation studied as either a quantitative or a qualitative entity[9, 10] (in isolation from each other), studies attributing findings to motivation without studying or measuring motivation[8] and lack of good instruments to measure motivation in medical students. Motivation as an independent variable in medical education was found to affect learning and study behaviour, academic success, choice of medicine as a career, choice of specialty and intention to continue study.[7] High motivation and intrinsic motivation were associated with better learning in most studies. They were associated with better performance in some studies and did not have any significant effect in other studies. It was not possible to positively conclude from the studies done in medical education that motivation positively influences academic success and this notion had to be supported from the findings in domains of education other than medical education.[7] Thus an important research question was identified from this review which led to designing of two research studies (Chapters 5 and 7) to answer whether motivation influenced academic performance in medical education. Motivation was found to be positively associated with intention to continue studies in medical education.[7] Finding evidence that motivation was an independent variable in medical education laid down the rationale for investing time in studying it as a dependent variable. Motivation as a dependent variable in medical education was found to be affected by factors that cannot be manipulated, such as age, gender, ethnic, socioeconomic and educational background, year of curriculum and parent and teacher support; and by factors that could be manipulated, such as the three basic psychological needs identified by SDT, namely autonomy, competence and relatedness. Medical students do value autonomy in learning.[11-13] It is reflected in their liking of Problem-Based Learning (PBL), valuing teachers who support autonomy and by themselves supporting autonomy in their patients.[12, 14-16] Feelings of competence in learning, supported by feedback on performance from teachers, greatly increased student motivation.[10, 17-21] Emotional support by teachers and peer group also increased student motivation.[22-24] Thus evidence was found in this review that student motivation in medical education could be enhanced by supporting autonomy, competence and relatedness. The role of faculty is actually limited to provide medical students with opportunity, encouragement and guidance.[5] Opportunity could be viewed as giving students autonomy in learning, encouragement as constructive feedback leading to feelings of competence and guidance as means of fostering feelings of relatedness.

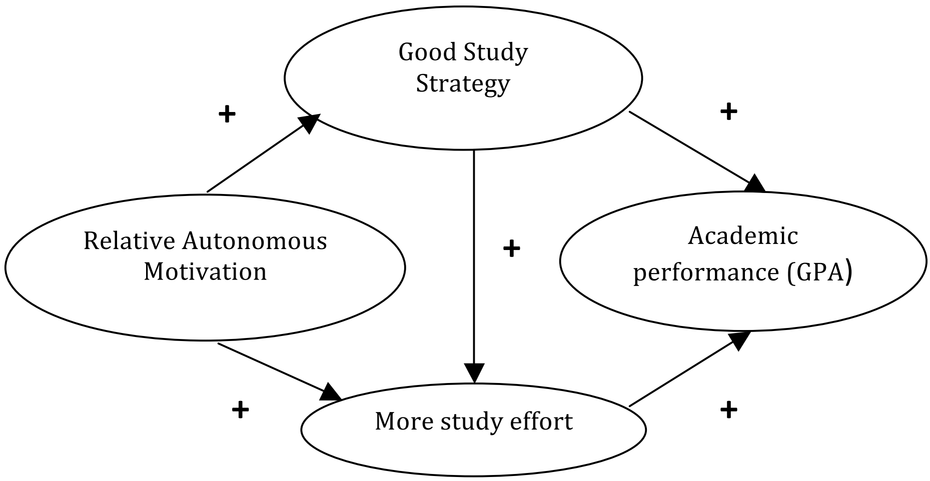
Since it was found that motivation was not always objectively and validly measured in medical education research, a study (Chapter 4) was conducted to validate an instrument that measures motivation particularly for medical school. This instrument had been earlier developed in University Medical Center Utrecht and was called "Strength of Motivation for Medical School" (SMMS) questionnaire which had content validity, but the construct validity and reliability needed further study.[25, 26] Evidence was found for construct validity of this instrument by performing an exploratory factor analysis which yielded three subscales namely *Willingness to sacrifice, Readiness to start and Persistence*.[27] These three subscales signified that they contributed independently to the construct of strength of motivation for medical school. Concurrent validity was established by correlating the SMMS subscale scores with the scores on a more well-established scale on motivation, Academic Motivation Scale (AMS) and the exhaustion subscale of Maslach Burnout Inventory – Student Survey (MBI-SS). Good evidence was found for reliability of the three subscales and the scale as a whole for measurement of strength of motivation for medical school. Thus the findings of this study supported the validity and reliability of SMMS questionnaire in measuring strength of motivation for medical school. SMMS questionnaire is a valid and reliable tool for measurement of strength of motivation for medical school and the recommended use is for post-hoc checking of selection methods for admission to medical study and to determine the quantity of motivation during the medical study, but not as a tool for selection. This is because students can exhibit the "required" kind of motivation in high stakes situations like medical entrance procedures.[25, 28, 29]

Since it was found in the literature review that medical education research studies showed contradictory findings on investigating effect of motivation on academic success, two studies were performed on this issue using two different approaches (Chapters 5 and 7).

One study (Chapter 5)[30] used what is called a person-centered approach and the other (Chapter 7)[31] used a variable-oriented approach. The person-centered approach (Chapter 5) was based on combining quality and quantity of motivation. Quality of motivation could be intrinsic or controlled and quantity could be high or low. The methodology of this study was adapted from a study performed in general education[32] and it was aimed to help in understanding the motivational processes within individual students. This was possible as the participants were grouped into different motivational profiles depending on their motivational characteristics through cluster analysis.[32] Combination of quality and quantity of motivation were expected to give rise to 4 different motivational profiles: High Intrinsic High Controlled (HIHC) motivation, High Intrinsic Low Controlled (HILC) motivation, Low Intrinsic High Controlled (LIHC) motivation and Low Intrinsic Low Controlled (LILC) motivation. The hypotheses for this study were: HILC motivational profile would be associated with deep learning, better academic performance and low exhaustion from study; LIHC and LILC motivational profiles would be associated with surface learning, poorer academic performance and high exhaustion from study; HIHC profile would be associated with good academic performance (though according to SDT principles HIHC profile was not a desirable profile[32], hence would not be associated with desirable learning characteristics and performance). All these hypotheses were supported by the findings of this study. It was also found that HIHC profile showed high deep learning, good academic performance and low exhaustion from study, though it also showed high surface learning.[30] Vansteenkiste et al. found that HIHC profile performed significantly lower as compared to HILC profile, but this finding was not replicated in our study.[32] This was probably found as the students in this study with this profile had higher intrinsic motivation scores than controlled motivation scores. This study found evidence to establish that desirable quality and quantity of motivation is associated with deep learning and good academic performance, thus adding to the literature on motivation in medical education research. It also took the findings of Vansteenkiste et al.[32] a step further as actual academic performance scores were used instead of self-reported academic performance scores used in their study.

The second study investigating "motivation influences academic performance" employed a variable-centered approach where autonomous and controlled motivations were studied as group variables, i.e. for the entire study population. Structural Equation Modelling (SEM) was performed to study the relationships between autonomous motivation, good study strategy and academic performance. The reason for employing this approach was that if there is a priori hypothesis, SEM can be employed in research for reliably testing the relation of different variables with each other where more than one relationship can be tested at a time.[33, 34] The hypothesis was that Relative Autonomous Motivation (sum of weighted autonomous and controlled motivation with negative sign given to all components of controlled motivation) would be positively associated with good study strategy (Deep Strategy-Surface Strategy) and study effort, which in turn would be positively associated with academic performance in the form of Grade Point Averages (GPAs). We found good evidence for the hypothesized model (See Figure 2). Thus, this study also adds to the literature on motivation influencing academic performance in medical education. A similar model has been tested and established in general education.[35]

Figure 2 Hypothesized model for motivation influences performance



Employing the abovementioned two approaches in studying the relationship between motivation and academic performance is beneficial as these approaches complement each other.[32] One approach studies the relationship of motivation and academic performance within individual students and the other studies it in a group setting. The person-centered approach can provide helpful suggestions on differential monitoring and mentoring of students depending on their motivational profiles and the variable-centered approach provides the evidence for validity of these relationships and their directions in the context of medical education.

On the basis of the findings from the study on motivational profiles of medical students[30], a separate article (Chapter 6) was made on the rationale for combining quality and quantity of motivation in medical education, the validity of this approach and how it can be beneficial in both research and practice[31] in medical education. Combining quality and quantity of motivation and then analysing the relationships with learning and performance helps to understand these processes within individual students. This can yield complementary information to the approach investigating these relationships in a large group. It can also be useful in practice as students with different motivations may need different types of emotional and strategic support, counselling and opportunities which can be optimally challenging for them, in order to enhance their intrinsic motivation. Students with predominant controlled motivation may need mentoring support on the values of the medical profession and what place it has in the society and in the mind of patients. Students with predominant autonomous motivation may need strategic support on study planning so as to avoid conflict of interest. This conflict of interest could arise from two conflicting demands, their genuine interest in a particular topic and the other study requirements of the syllabus. This could lead to feelings of external control diminishing their intrinsic motivation. Students with predominant autonomous motivation may also need more opportunities and challenges in their study to maintain their autonomous motivation and avoid boredom with the syllabus.[36] “Presented with a challenging experience that is clearly relevant, a medical student’s motivation leads him to achieve, and with success comes the confidence that encourages him to move on to increasingly difficult and more complex tasks.”[5]

Since evidence was found in the literature review on motivation being a dependent variable in medical education[7], a study (Chapter 8) was designed to research this aspect of motivation. The effect of some of the variables identified in the review like age, gender and educational background on strength of motivation for medical school, were studied.[37] It was found that maturity explained more variance in strength of motivation as compared to age alone. Separate scores for maturity were not collected, but the maturity of the students was modelled on the basis of their age, gender and pattern of maturation reported in developmental science.[38, 39] The hypothesis was that males and females start at the same level of motivation, but by the age of 18 years, males lag behind females by 3 years in their maturity and catch up in a quadratic fashion by the age of 24 years, after which their maturity levels are more in line with females, but not quite the same. Mathematical formulae were used for this conversion. The positive effect of age and maturity on motivation has been found in some studies in medical education.[40, 41] In the present study, it was found that maturity explained 6.1% of variance in the strength of motivation scores. Even after maturity was accounted for, gender still had a distinct small effect on the strength of motivation. Educational background, i.e. having a bachelor's degree background as compared to high school background, also had an independent effect on the strength of motivation. This variable was confounded with selection as all students with a bachelor's degree had also entered the medical school through a qualitative selection procedure. Thus we found empirical evidence for motivation being a dependent variable in medical education. The finding that females had higher strength of motivation than males was expected and confirmed as there are studies which have shown difference in quantity[42] and quality[43-47] of motivation between males and females. Males and females seem to have different type of motivations for choosing to study medicine. Though the top reasons for choosing medicine irrespective of gender are helping people and interest in science or biology, males are more inclined towards extrinsic motives like money and fame and females are more inclined towards intrinsic motives like fulfilment and sense of achievement.[43, 48-54] Females also have more autonomous motivation for study than males who have more controlled motivation.[48] As per the history of study of motivation, it was for a long time studied only in males.[55] The first attempts to study motivation particularly in females were made by Martina Horner[55], followed by Janet Spence[56], who found distinct differences between the motivations of the two genders. Horner found that females had a distinct "Fear of success" in their motivational construct which arose from fear of losing friends and femininity due to success.[55] Spence found that females scored higher than males on the desire to work hard and males scored higher than females on mastering a task and performing better than others.[56] This showed a difference in the orientation of motivation between the two genders: the motivation of females having a more intrinsic orientation and the motivation of males having a more extrinsic orientation. Thus this study added to the literature on gender effects on motivation. Concerning educational background, other studies have found it to play an important role in motivation of medical students.[40, 57]

Self-Determination Theory (SDT) of motivation was found to be relevant in medical education.[7, 58-62] SDT can provide recommendations for stimulating intrinsic or autonomous motivation among medical students during their medical education and also during their health care practice. Supporting the three basic psychological needs of autonomy, competence and relatedness can help to enhance intrinsic motivation among students for learning in large groups, small groups, tutorials, problem-based learning, case-based learning, experience-based learning, self-regulated learning, self-assessment and attaining the required competencies at the required levels. Based on this, a guide (Chapter 9) for medical educators was put together which could help them understand how SDT can help in understanding teaching-learning processes in medical education. One of the powerful messages of SDT is the capability of the human mind to internalise values and motivation so deep within the self that it becomes practically impossible to distinguish it from intrinsic motivation.[63-65] The human mind tends to internalise values which are initially perceived as external in origin and control, if it understands the importance of their existence for itself or for harmony in the society.[65] This presents medical educators with a powerful tool to manipulate controlled motivation and change it to more autonomous forms of motivation. This guide describes how to harness this ability to internalise in order to make medical students more intrinsically motivated for their study, choice of specialty and patient practice.

Students like motivating teachers and teachers like motivated students. But when it comes to measures to enhance motivation, many would welcome effective approaches to work with. Using the principles of SDT, twelve tips have been recommended in chapter 10 to enhance intrinsic motivation in medical students. These tips are all based on supporting autonomy, competence and relatedness among medical students. Allowing students to participate in planning learning based on their learning needs, encouraging them to actively participate during learning sessions rather than be passive listeners, making them more responsible for their learning along with giving structured feedback, guidance and emotional support and giving them choices by using words that are perceived as suggestions rather than directives, help students in feeling intrinsic motivation for their learning. The important message is that autonomy-support is a skill that can be learnt and practised by teachers if they understand the importance of supporting the three basic psychological needs among the students. The article on "Twelve tips..." was compiled with an objective to help many medical educators who have been looking for changing their teaching practices and also to inspire others who haven't given much thought to their current teaching practices.

The next section of this discussion chapter provides perspectives on different aspects of medical education and motivation which have been developed from the research and review findings of this thesis.

Perspectives on different aspects of medical education

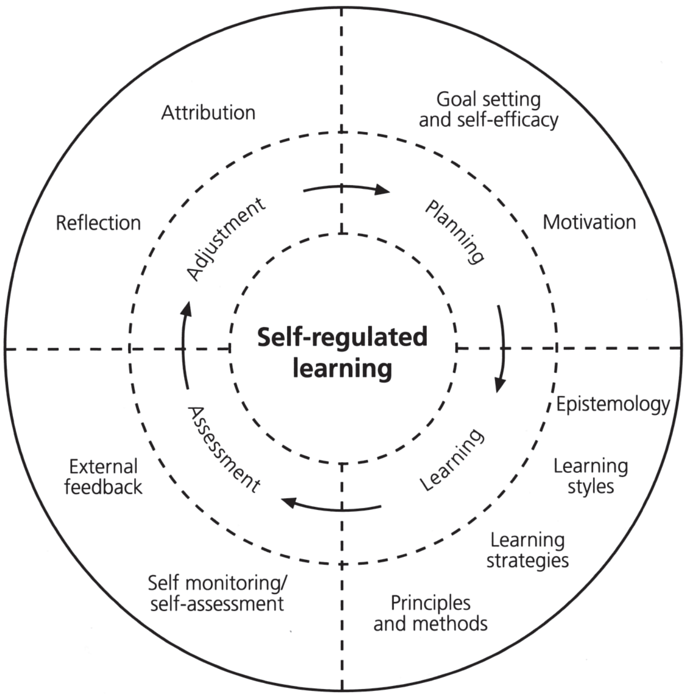
Motivation and Learning Learning is viewed as an active, constructive process which can be influenced by the learner.[66] Learning involves change in the behaviour of the learner.[5] Cognitive psychology considers the mental processes of the learners involved in learning, i.e. cognition, as one part of learning and metacognition i.e. knowledge about own conceptions of learning and use of strategies to bring about learning as the other part of learning.[3, 66] Behavioral psychology also considers the emotional processes involved in learning as a part of learning, which is motivation.[66] These three components are brought together in the Learner-Oriented Teaching (LOT) model.[1, 2] Motivation affects the amount of time that students are willing to devote to learning.[67, 68] Autonomous motivation has been found in medical education to be associated with deep learning[9, 30, 31] and reflection in learning[9], better academic performance[30, 31] and low exhaustion from study[30, 31]. This relationship can be well-substantiated by theory as if a student perceives that he wants to learn because of genuine interest or because he finds learning something valuable, he will definitely put more effort in his study and engage in understanding the meaning of the material to be studied[5], i.e. deep learning.[69] Feeling competent in one's learning on the other hand can enhance further intrinsic motivation for learning.[63] Motivation not only enhances learning in individual students, but also enhances learning and performance of tutorial groups of students or PBL groups[70], health-related extra-curricular activities[10], participation in peer teaching and optional credit courses[71]. An anonymous US senator once said, *"There are only three things about learning: motivation, motivation and motivation".* Weiner remarks in 'History of motivational research in education'[72] that, "*The study of motivation for the educational researcher has been confounded with the field of learning; indeed, motivation often is inferred from learning, and learning usually is the indicator of motivation for the educational psychologist*."

Gender and Motivation From the findings of this thesis[30, 37] and other studies[43-47] done before, it is clear that there are differences in motivation among males and females. Females exhibit higher levels and intrinsic or autonomous motivation as compared to males who exhibit more extrinsic or controlled motivation.[31, 36] The important consideration that we need to think about is that if selection for medical school is made on the basis of motivation, there is a danger of deselecting males from the medical population. The current percentage of females in medicine stands at approximately 70% in most countries.[73-77] If students are selected on the basis of motivation, especially quality of motivation, it is likely that this percentage will increase considerably in the coming years. The consideration of this difference is especially important because motivation of males catches up (though not completely) with females around the age of 24 years[37] and that motivation can change from extrinsic to intrinsic depending on the characteristics of the learning environment[63]. It means that motivation of males could be changed from extrinsic to intrinsic with maturity and autonomy support, feelings of competence and emotional support[63]; and that selecting them "out" at entrance to medicine because of their motivational characteristics might not be fair to them in the longer run.

Assessments and Motivation A well-known assertion in medical education is "Assessment drives learning".[78-81] This philosophy is even the basis of some curricular structures.[82, 83] The belief that asessment enhances learning is supported by empirical evidence[84] through teachers' experiences with students and cognitive science research[82]. On the face of it, assessment seems to drive learning[84]; hence there is a temptation to think it drives student motivation as well. It is important to reflect on whether the kind of motivation it drives is the one that results in deep learning and understanding which is retained for a long time. Most medical educators would think that medical education is lifelong learning, but it is important to examine whether this is sufficiently inculcated as a value among medical students and future doctors. Many authors have written in favour of assessment as a driver of learning.[8, 81, 82] There could be several reasons why this phenomenon is observed. Medical education is typically a high stress period with a heavy cognitive load and comparatively less time to digest this load. In these circumstances, Mattick and Knight have found that medical students employ an approach towards study which is pretty unique and is called a vocational study approach.[84] It means that students learn what they think is important in their curriculum as far as clinical relevance is concerned. During the period of study, students' perception of what is important is majorly driven by what they expect the teachers to ask them in the exams.[78] This could be the main reason why it is observed that assessment drives learning. Van der Vleuten & Schuwirth make a valid argument about how assessment should be an integral part of instructional design of a curriculum, with the objectives of the assessments clearly laid out.[79] Most authors also try to make a distinction between formative and summative assessments and the differences in the purposes they serve.[78-81, 85] Formative assessments are primarily used as a feedback method for students to gauge their knowledge and performance, whereas summative assessments are used for qualification and entrusting responsibility.[86] Both these types of assessments have their own independent, important roles in medical education.[78] Assessments act as incentives for learning, the rewards being the grades students receive for their performances. These kind of extrinsic rewards, according to Self-determination theory of motivation, lead to stimulation of extrinsic motivation among students which is controlled by factors external to the students[5, 58, 87]. Intrinsic rewards like feelings of competence and feeling of autonomy, i.e. "I study this because I want to" stimulate intrinsic motivation among students.[5, 58, 87] Intrinsic motivation is associated with deep learning strategy[30], better academic performance[30], positive well-being and satisfaction[87]. This is the kind of motivation which should be targeted for stimulation among medical students[88, 89]. Misch has highlighted that escaping from stimulating extrinsic motivation among medical students is very difficult because of the requirement of summative or qualifying assessments to provide licensure.[90] Though Misch's view that this cannot be completely avoided seems valid, concrete steps can be taken in the direction of consciously stimulating intrinsic motivation rather than extrinsic motivation through assessments. Both, better learning and intrinsic motivation are desirable in order to make learning long-term and to inculcate the value of lifelong learning. Deriving from the principle that the intent behind formative assessments is to provide rich feedback to the students about their knowledge and performance[79], one of the ways forward could be make good use of formative feedback. One of the novel solutions for summative assessments is providing feedback based on attainment of the required competencies which complements this process. There are medical schools like Cleveland Clinic which practice this philosophy[91]. The students have mentors who guide them throughout their study through students' e-portfolios. These e-portfolios are used as the main tools to give rich timely, both constructive and corrective feedback, so that students achieve all the required competencies within the expected time. They are used for summative assessments which are thus feedback-rich and not based on grades. The other novel solution is the use of Entrustable Professional Activities (EPAs), an approach which is slowly but surely catching on in The Netherlands and the USA.[92] Entrustable Professional Activities help supervisors in determining the competence of their trainees and decide whether a trainee can be trusted to bear responsibility to perform a professional activity. EPAs serve as good feedback points for students' performances and also foster their feelings of competence at particular professional activities. EPAs could be used as assessments for attaining competencies. Assessments need to be more feedback-based than grades-based to stimulate intrinsic motivation among students.[86] Summative assessments cannot be avoided in a professional education such as medicine as a basis for qualification is necessary. But a shift to a pass-fail system and doing away with grades is certainly possible. This is currently being done in some medical schools in Canada (E.g. University of Dalhousie, Halifax) and certainly can be emulated by other medical schools.

Motivation and Self-Regulated learning White and Gruppen[59, 93] have proposed a model for self-regulated learning which has four core components (inner circle, see Figure 6): planning, learning, assessment and adjustment. They also proposed the processes working behind these four components (outer circle, see Figure 10), one of these being motivation.

Figure 10 Model of self-regulated learning[59, 93]



Though White and Gruppen indicate that motivation as a factor influences only the planning stage of self-regulated learning[59, 93], there is reason to believe from the findings of this thesis that motivation also affects the learning, assessment and adjustment stages. Assessment i.e. self-assessment and external feedback, itself may in turn affect motivation through feelings of competence. Reflection and attribution are also dependent on motivation. So motivation seems to be having influence on all stages of self-regulated learning and the underlying processes. Thus if medical students are to be self-regulated learners, it would serve well to pay greater attention to motivational processes in students.

Motivation as a selection criterion Motivation is used sometimes as a criterion for selection of students for medical school.[29, 94] Not only do interviewers try to grade level of motivation, but also try to grade the type of motivation i.e. intrinsic or extrinsic and the motives for choosing medical study.[95] It has been shown that these methods of grading are generally based on arbitrary understanding of motivation and are definitely not objective or standardized.[94, 95] To further complicate issues, students exhibit the essential motivation during high stakes situations which may not represent the real picture.[25, 28, 29] Also as mentioned earlier in the "Gender and motivation" section, selection on the basis of motivation may lead to selecting "out" of more number of males, which may not necessarily be the well-founded since motivation can change and can be changed with time and arrangements in the curriculum.[63] This does not mean that unmotivated students should be admitted to medical study, but if students are to be selected on the basis of motivation, there is a definite need to use instruments or interview techniques that can remove the bias related to presenting one's most motivated self at such a high stakes selection.[28] Further classifying students' motivations into intrinsic and extrinsic categories also may not be the optimal selection strategy to go about assessing their motivation since this motivation can change[63] and since interviewers are not trained in grading and categorizing motivation[95]. If selecting on the basis of motivation is limited to finding out students who are really unmotivated to study medicine, i.e. if it is used as a filtering or screening rather than selection criterion, it would be a useful addition to the selection procedures. Also this procedure would work effectively provided all interviewers are trained in objective grading of motivation in a standardized manner.

Motivation and Continued Medical Education (CME) and Continued Professional Development (CPD) Continued Medical Education (CME) and Continued Professional Development (CPD)[96] are very important in medicine in order to keep abreast with new knowledge, developments and technological advances in the field and renew and improve skills in diagnosis, management and treatment.[66] In the current system in most countries attending CME/CPD sessions and obtaining credits is obligatory for doctors to retain their license to practice. It means that all doctors do engage in CME/CPD, but the how much of it is active participation, how much knowledge and skills they gain from this and actually use these is practice is debatable[96]. For doctors to actively benefit from such activities, having training in self-regulated learning is important. Regehr & Eva opine that there is far too much reliance on adult motivation to learn in Continued Medical Education (CME) and that “Internal motivation to learn may not always outweigh the inertia of maintaining current practice”.[97] Another perspective to this could be that it is difficult for doctors to self-assess and self-regulate their learning because they have been in a system which was grades-based for a considerable amount of time, especially during their medical education. Deci & Ryan have consistently written about the deleterious effect of extrinsic motivation, driven through rewards, on intrinsic motivation.[98]. The more we make our learning environment target intrinsic motivation, the better learning and attitude towards lifelong learning or CME/CPD our students will have. If doctors are really to become lifelong learners, this attitude needs to be inculcated as a value among them early-on in their education. For this, building a learning environment where medical students learn to channel their intrinsic motivation and internalize this behavior over time, thus making it easier for them to continue with this behavior during their medical practice, is important.

Motivation of Medical Teachers This thesis is about motivation of medical students and how teachers can help in enhancing their intrinsic motivation. Equally important is “teacher motivation”. A teacher would be interested and willing to work on student motivation only if he or she himself or herself is motivated for teaching. A teacher not only can provide autonomy, competence and emotional support to students, but also be a positive role model. A teacher can have profound influence on the attitudes of students towards the learning and practice of medicine. For a teacher to be motivated for teaching, his or her three basic psychological needs of autonomy, competence and relatedness should be satisfied. Thus it is important for teachers to have autonomy in their teaching practices. Syllabus dictates the content to be taught, but choice of teaching methods can be autonomous. Just as students need feedback to boost their feelings of competence, so do teachers. Thus, constructive feedback from students about teaching can increase teachers’ feelings of competence. Teachers could fulfil their need for relatedness by discussing their difficulties in teaching with their peers and also generating solutions. This would lead to a feeling of belongingness to a community where they can freely express their opinions and insecurities and hope to find solutions and emotional support.

Strengths and Limitations

This thesis is based on theoretical foundations which have been used in designing all the research studies. Since this has been proposed as a kind of challenge in medical education research[99, 100], it constitutes a strength of this thesis.

The other important strength is that the research approaches and methods, e.g. combining quality and quantity of motivation, use of structural equation modelling analyses etc., used in this thesis are novel in medical education research on motivation.

Another strength is that this thesis does not stop with the research conducted, but explores how the findings of this research and the literature reviewed can be applied in practice to medical education. Thus the implications of this thesis for research and practice in medical education have been explored in depth.

This thesis has also validated an instrument for particularly measuring the strength of motivation for medical school. Since the instruments for measuring this construct are limited, it is an addition to the literature and practice.

One of the biggest limitations of this thesis for lack of time is that a longitudinal study could not be conducted to determine how motivation changes during the medical study and with different experiences in the learning environment. This is also a limitation of the broad research on motivation that longitudinal or follow up studies are not commonly done.

The second limitation is that the size of correlations found ranges from small to medium (Cohen's effect size), which is common in general education and psychology studies, but not in medical education. This is probably due to the complex construct of motivation and way the measurement instruments are constructed.

The third limitation is that in the "Effect of age...." study, only a small percentage of variance (7.9%) in the strength of motivation for medical school could be explained. This could be because only 4 factors, i.e. age, maturity, gender and educational background, were collected and tested. This study could have been improved by including more background factors of the students like personality traits, ethnic background, socioeconomic status, parental autonomy-support etc., which are expected to influence motivation.

The fourth limitation is that all the studies in this thesis have been carried out in only two universities in the Netherlands, UMC Utrecht and VUmc Amsterdam, and hence do not have an international flavour, nor have the perspective on validity of these findings in different cultural settings. The generalization of the findings of this thesis should therefore be done with caution.

Future directions

The findings of this thesis are embedded in the foundation of theoretical principles. So the basic idea and methodology is strong and sound, which makes it a good starting point for designing international and cross-cultural research studies along the same lines.

This thesis has attempted to integrate the principles of Self-Determination Theory in medical education and practice through the reviews, conceptual papers and application papers which have been published in the most widely-read medical education journals.

In the future, hopefully the findings of this thesis will be of help to more researchers in medical education to use SDT approaches in their research studies, more medical teachers to integrate SDT recommendations in their teaching methods and philosophies and more medical curriculum developers to consider motivational elements in planning their curricula.

Further Research Questions

The completion of this thesis is not the end of this research on motivation. There are concrete plans to continue research in other areas of motivation which have been identified through the research and literature reviews performed in this thesis and the research presentations and discussions at conferences. Some of the research questions that have been identified for future studies are:

1. How does student motivation, both quantity and quality, change over the course of medical study (a longitudinal study)?
2. Does autonomous motivation lead to better doctors during actual medical practice as compared to controlled motivation?
3. Do motivational profiles of medical students change over the course of medical study (a longitudinal study)?
4. Does High Autonomous Low Controlled (HALC) motivational profile lead to good doctors and good medical practice?
5. Is there differential activation in the brain during intrinsic and extrinsic motivation conditions?
6. What is the causal pathway between intrinsic and extrinsic motivation and the study strategy, academic performance and well-being of medical students (an experimental study) and what is the direction of effects?
7. How do assessments and grading during medical study influence quality of motivation?
8. What are the intrinsic and extrinsic motivations of medical students in self-assessment of performance and how do they affect the self-assessment?

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Summary

Summary of thesis

This thesis is about all aspects of motivation of medical students and has a strong base in Self-Determination Theory (SDT) of motivation. It covers different topics ranging from review of the relevant literature, research studies to answer specific research questions where gaps were found in the literature up to applications of the principles of SDT in medical education.

Chapter 1 This introduction chapter introduces the concept of motivation, different definitions of motivation and the history of development of motivation theories. It discusses motivation as a stable as well as a dynamic entity which can be manipulated to stimulate student learning and performance. It gives a detailed account of Self-Determination Theory (SDT) of motivation as this was found to be applicable in medical education. It then gives the explanation for the importance of carrying out research on motivation of medical students, the outline of this thesis, and ends with the research questions addressed in this thesis.

Chapter 2 Motivation theorists have been always stressing on the importance of motivation in education and its outcomes. It follows that motivation should be an important determinant of curriculum development. To determine how the motivation dimension of learning has guided curriculum developments in medical education, in this chapter, the theories of motivation and the major developmental reforms in medical education were reviewed. Major developments in understanding the field of motivation related to education have been that motivation drives learning and influences academic performance, that gender differences

exist in motivational mechanisms, that there is a the shift of focus from quantity to quality of motivation and its determinants, and how they stimulate academic motivation. Major developments in medical curricula have been the introduction of standardized, regulated and licensed, problem-based, learner-centred, integrated teaching, outcome-based and community-based education approaches. It was found that motivation has been an undervalued component in medical curricular development. Self-Determination Theory (SDT) was found to be relevant and applicable in medical education and recommendations were given on how SDT can be used to structure arrangements in the curriculum to optimally enhance students' intrinsic motivation to learn. Enhancing student autonomy, taking adequate time, and giving importance to appropriate and effectively provided feedback to students on their learning and providing emotional support to the students were discussed as concrete actions that could be taken to stimulate intrinsic motivation among students.

Chapter 3 In this chapter all the existing medical literature on motivation research in medical students was reviewed in order to tease out important research questions. It was found that research on motivation in medical education is scarce, especially in comparison with that in general education. Motivation could be viewed as an independent variable, i.e. it influences outcomes in education, and motivation can also be viewed as a dependent variable in medical education, i.e. it is influenced by factors in the learning environment. There seemed to be some research on outcomes of motivation such as learning, academic performance, choice of medicine as a career, choice of specialty and continuation of medical study. Though motivation had a positive effect on learning, the effect on academic performance could not be substantiated very well because of contradictory findings from different studies. Motivation as a dependent variable appears to be affected by age, gender, ethnicity, socioeconomic status, personality, year of medical curriculum and teacher and peer support, all of which cannot be manipulated by medical educators. Motivation is also affected by factors that can be influenced, among which are, autonomy, competence and relatedness, which have been described as the basic psychological needs important for intrinsic motivation according to SDT. Research on factors influencing motivation was a precious little and we identified this gap in the literature and also identified some research questions for this thesis such as “Does motivation affect academic performance? What are the mechanisms involved in this?” (Chapters 5 and 7), “How should motivation be studied in medical education?” (Chapter 6), “Do we have validated, reliable instruments for measuring motivation especially in medical students?”, “What are the factors that can affect motivation?” (Chapter 8).

Chapter 4 Strength of Motivation for Medical School (SMMS) questionnaire measures the strength of motivation of medical students to enter, sacrifice and persist in medical school. This chapter describes a study which analyzes the validity and reliability of measurement of the strength of motivation using the SMMS questionnaire. Evidence was found for the construct validity of SMMS questionnaire through exploratory factor analysis which showed a 3-factor structure. The three subscales were: Willingness to sacrifice, Readiness to start and Persistence, with reliabilities (Cronbach’s alphas) of 0.70, 0.67, 0.55. The reliability of the full SMMS scores was 0.79. Concurrent validity was determined by comparing the scores of the subscales with the scores on a better-known, validated and reliable questionnaire on motivation called Academic Motivation Scale (AMS) and the exhaustion subscale of Maslach Burnout Inventory-Student Survey (MBI-SS). Significant positive correlations with AMS subscales of intrinsic and identified motivation, a pattern of decreasing correlations from the intrinsic to the extrinsic motivation and significant negative correlation with amotivation, were found. The conclusion was that SMMS questionnaire is a valid and reliable questionnaire for measurement of strength of motivation particularly for medical school.

Chapter 5 This chapter describes a study that was designed based on the combined approach to motivation derived from the review of the literature in chapters 2 and 3. This approach is useful in studying effects of motivation in individual students. Quality and quantity of motivation scores of medical students were collected and grouped into different clusters according to a combination of their intrinsic and controlled motivation scores. Then the effects of these different motivational profiles on study strategy and hours, academic performance and exhaustion from study were studied. Evidence was found for four motivational profiles, namely High Intrinsic High Controlled (HIHC) motivation, High Intrinsic Low Controlled (HILC) motivation, Low Intrinsic High Controlled (LIHC) motivation and Low Intrinsic Low Controlled (LILC) motivation, among medical students. HILC profile was found to be associated with the most desirable learning profile with high deep strategy, low surface strategy, good GPA and low exhaustion from study. LILC and LIHC profiles were associated with the least desirable learning profiles with low deep strategy, high surface strategy, low GPA and high exhaustion from study. HIHC profile was also found to be associated with high deep strategy, good GPA and low exhaustion, but it was also associated with high surface strategy. Thus evidence was found for our hypotheses.

Chapter 6 After reviewing the literature on motivation theories, it was concluded that motivation has been considered in general through either a qualitative or a quantitative approach. This chapter explores an approach to motivation in medical education, which is a combination giving importance to both, quality and quantity of motivation. This type of combination can give rise to four motivational profiles: High Autonomous High Controlled (HAHC) motivation, High autonomous Low Controlled

(HALC) motivation, Low Autonomous High Controlled (LAHC) motivation and Low Autonomous Low Controlled (LALC) motivation. The validity, the importance and the implications of this approach and profiles in research and practice were discussed. It was concluded that an approach to motivation combining the two dimensions of quality and quantity is useful in creating understanding of motivational processes influencing learning and academic performance in medical education within individual students. Such an approach can help educators in differential mentoring and monitoring of medical students according to their specific needs.

Chapter 7 This chapter describes a study that evaluates motivation as a group variable and explores relationships with learning and academic performance. Structural equation modelling, a less commonly used approach in medical education, has been used to study these relationships based on priori hypotheses which were constructed on the theoretical foundations of SDT. Relative Autonomous Motivation (Autonomous Motivation – Controlled Motivation) was found to positively affect good academic performance through Optimal Study Strategy (Deep Strategy – Surface Strategy) and higher study effort as mediator variables. We found that the proposed model worked well in sub-groups namely males and females and students admitted through weighted lottery selection and those admitted through a qualitative selection procedure, though the size of correlations between different variables were different for the sub-groups. Significant positive effects of Relative Autonomous Motivation (RAM) on Good Study Strategy (GSS) and Good Study Strategy on self-study hours were found in all the four sub-groups. Significant positive effect of Good Study Strategy on GPA was found in all sub-groups except males. Self-study hours showed significant positive effects on GPA only in the males group and qualitative selection group, and no significant positive effect in the overall model. RAM seemed to have an indirect positive effect on GPA through its positive effect on GSS, rather than having a direct effect in all except the males group. In the qualitative selection group, RAM seemed to have an indirect positive effect on GPA also through its positive effect on self-study hours. In the males group, RAM seemed to have an indirect positive effect on GPA only through its positive effect on self-study hours. It was concluded that motivation positively affects academic performance through deep strategy towards study and more study hours.

Chapter 8 This chapter describes a study which was designed to study some of the factors, found in chapter 3, which can influence motivation as a dependent variable. The effect of factors like age, gender and educational background on the strength of motivation for medical school were evaluated. It was found that maturity more than age influences the strength of motivation in medical school. Maturity, gender and educational background were able to account for 7.9% of the variance found in the strength of motivation for medical school. Even after accounting for the difference between males' and females' strength of motivation because of the difference in their maturation, a distinct small effect of gender on strength of motivation was found. A small significant effect of educational background of the students was also found. Thus, evidence for motivation being a dependent variable in medical education was found, but only some factors that could not be manipulated in medical education were studied.

Chapter 9 This chapter was published as an AMEE guide for medical educators. The series of AMEE guides about educational theories, that this chapter will be a part of, is aimed to create greater understanding of application of educational theories in medical education. In this guide a detailed account of all areas of medical education is given, namely preparing for and entering medical school, curriculum structure and classroom teaching, assessments and examinations, self-directed learning, clinical training, medical students as teachers and researchers, continuing professional development, teaching and stress, depression and burn-out among medical students and residents, which can benefit from application of the principles of SDT.

Chapter 10 Using the principles of SDT, twelve tips have been recommended in this chapter to enhance intrinsic motivation in medical students. These are: “Identify and nurture what students need and want, Have students’ internal states guide their behaviour, Encourage active participation, Encourage students to accept more responsibility for their learning, Provide structured guidance, Provide optimal challenges, Give positive and constructive feedback, Give emotional support, Acknowledge students’ expressions of negative affect, Communicate value in uninteresting activities, Give choices, Direct with can, may, could instead of must, need, should”. These tips have been derived from the understanding of the concept of student motivation for learning and the applications of Self-Determination Theory of motivation in medical education. This chapter describes how to engage in autonomy-supportive teaching in medical education. It serves as a hands-on guide for medical teachers to stimulate intrinsic motivation among their students.

Chapter 11 This chapter is a general discussion chapter about the overall findings in the thesis, their interpretations and implications. It includes a detailed discussion on the strengths and limitations of this thesis. It also provides perspectives on different aspects of medical education and motivation which have been developed from the research and review findings of this thesis, namely Motivation and Learning, Gender and Motivation, Assessments and Motivation, Motivation and Self-Regulated learning, Motivation as a selection criterion, Motivation and Continued Medical Education (CME) and Continued Professional Development (CPD) and Motivation of Medical Teachers**.** In the last section of this chapter, the findings of this thesis have been used to develop further research agenda and questions which are intended to be pursued and studied over the next few years.

Samenvatting

Samenvatting

Dit proefschrift gaat over studenten en hun motivatie binnen het domein van de geneeskundeopleiding. In dit proefschrift wordt een overzicht gegeven van de meest relevante literatuur en wordt onderzoek beschreven over motivatie van geneeskunde studenten. De Self-Determination Theory (SDT) ligt ten grondslag aan dit onderzoek. In dit proefschrift wordt deze theorie gebruikt en in onderzoek toegepast om de principes hiervan in het medisch onderwijs te onderzoeken.

Hoofdstuk 1 Inleiding. Dit hoofdstuk introduceert het concept motivatie, de verschillende definities en de geschiedenis van de ontwikkeling van motivatie theorieën. Enerzijds wordt motivatie bezien als een stabiele entiteit. Anderzijds is motivatie een dynamische entiteit en kan worden beïnvloed om het leren van studenten te stimuleren om prestaties te verbeteren. In dit hoofdstuk is een gedetailleerde beschrijving van de Self Determination Theorie (SDT) opgenomen. Het belang van het verrichten van onderzoek naar motivatie van geneeskunde studenten wordt toegelicht. Dit hoofdstuk eindigt met een introductie op de onderzoeksvragen die in dit proefschrift zijn bewerkt .

Hoofdstuk 2 Wetenschappers met het aandachtsgebied motivatie leggen steeds de nadruk op het belang om aandacht te besteden aan het aspect motivatie in het onderwijs. Motivatie van studenten dient te worden bezien als een belangrijke determinant van het succes van curriculumhervormingen. In dit hoofdstuk worden grote curriculumhervormingen in het medisch onderwijs onder de loep genomen met de vraag of motivatie als dimensie van het leerproces in overweging is genomen. Belangrijke ontwikkelingen zijn de bevindingen dat motivatie leren stimuleert en de academische prestaties beïnvloedt, dat er tussen de geslachten verschillen zijn in mechanismen om motivatie te stimuleren, dat er een verschuiving is geweest van aandacht voor de kwantiteit naar kwaliteit van motivatie en de determinanten daarvan, en hoe deze academische motivatie kunnen stimuleren. Belangrijke ontwikkelingen in de medische curricula zijn de invoering van probleem-gestuurd onderwijs, de student centraal, geïntegreerde onderwijsmodules, outcome-based en community-based onderwijs. Uit de literatuur blijkt dat aandacht voor motivatie hierin geen grote rol heeft gespeeld. De Self-Determination Theory (SDT) blijkt relevant en toepasbaar te zijn in het medisch onderwijs. Aanbevelingen zijn gegeven hoe de SDT kan worden gebruikt in het ontwerp van het curriculum, zo dat het de intrinsieke motivatie om te leren optimaal stimuleert. Het belang van de autonomie van de student, het nemen van voldoende tijd, het geven van effectieve en passende feedback op het leerproces en emotionele ondersteuning zijn genoemd als concrete maatregelen die kunnen worden genomen om de intrinsieke motivatie te stimuleren.

Hoofdstuk 3 In dit hoofdstuk is de medische literatuur gereviewed op onderzoek naar motivatie in medische studenten met als doel om hieruit belangrijke onderzoeksvragen te destilleren. Het aantal artikelen hierover is beperkt, zeker in vergelijking met publicaties in het algemene onderwijsdomein. Motivatie kan worden gezien als een onafhankelijke variabele, dat wil zeggen dat motivatie de prestatie beïnvloedt/bepaalt. Motivatie kan ook worden gezien als een afhankelijke variabele, dat wil zeggen dat de mate van motivatie kan fluctueren door tussenkomst van factoren in de leeromgeving. Er is een beperkt aantal studies naar de invloed van motivatie op academische prestaties, leren, de keuze van een medische carrière, keuze van specialisme en voortzetting van de medische studie. Hoewel motivatie een positief effect heeft op leren, zijn er tegenstrijdige bevindingen ten aanzien van het effect op academische prestaties. Motivatie als een afhankelijke variabele wordt beïnvloed door leeftijd, geslacht, etniciteit, sociaal-economische status, persoonlijkheidskenmerken, het jaar in de studie en de docent en peer support. Dit zijn factoren, waar de opleiding geen invloed op kan uitoefenen. De opleiding kan wel invloed uitoefenen op andere factoren, zoals de mate van autonomie, competentie en verbondenheid. Dit zijn de zogenaamde psychologische basisbehoeften en randvoorwaarden voor de intrinsieke motivatie, zoals die beschreven zijn in de SDT. Er is een beperkt aantal studies naar het effect van motivatie op outcome parameters zoals bijvoorbeeld academische prestaties. In dit proefschrift wordt hier aandacht aan besteed. Onderzoeksvragen in dit proefschrift zijn "Heeft motivatie invloed op academische prestaties? Wat zijn de mechanismen die hieraan ten grondslag liggen?" (Hoofdstukken 5 en 7), "Hoe kan motivatie in het medisch onderwijs worden bestudeerd?" (Hoofdstuk 6), "Hebben we gevalideerde en betrouwbare instrumenten om motivatie van medische studenten te meten?", "Welke factoren kunnen motivatie beïnvloeden?" (hoofdstuk 8).

Hoofdstuk 4 De 'Strength of Motivation for Medical School' (SMMS) vragenlijst meet de mate (sterkte) van de motivatie van medisch studenten om met de opleiding te beginnen, om persoonlijke offers te brengen en om te volharden. In dit hoofdstuk wordt de validiteit en betrouwbaarheid van deze vragenlijst (SMMS) onderzocht. Met behulp van een exploratieve factoranalyse is de constructvaliditeit van de vragenlijst aangetoond. De vragenlijst bestaat uit drie factoren/subschalen: Willingness to sacrifice (de wil om persoonlijke offers te brengen voor de studie), Readiness to start (verlangen om de studie te gaan volgen), en Persistence (doorzettingsvermogen) met betrouwbaarheden (Cronbach's alpha) van 0,70, 0,67, 0,55. De betrouwbaarheid van de volledige SMMS scores is 0,79. Concurrente validiteit is bepaald door vergelijking van de scores van de subschalen met scores op een gerenommeerde, gevalideerde en betrouwbare vragenlijst over motivatie, de zogenaamde Academic Motivation Scale (AMS) en de Exhaustion (uitputting) subschaal van de Maslach Burnout Inventory-Student Survey (MBI-SS). Significante positieve correlaties zijn aangetoond met AMS subschalen van intrinsieke en 'identified' motivatie. Naarmate de motivatie van intrinsiek naar extrinsiek verschuift, nemen de correlaties af. Een significante negatieve correlatie is met amotivatie aangetoond. De conclusie is dat de SMMS vragenlijst een valide en betrouwbare vragenlijst is voor het meten van motivatie in het medisch onderwijs.

Hoofdstuk 5 De studie die in dit hoofdstuk is beschreven, is gebaseerd op studies/theorieën uit de literatuur, die beschreven zijn in hoofdstuk 2 en 3. In deze studie worden de effecten van motivatie bij individuele medische studenten bestudeerd. Scores op kwaliteit en kwantiteit van motivatie zijn verzameld en in verschillende clusters ondergebracht op basis van een combinatie van scores voor intrinsieke motivatie en voor extrinsieke (controlled) motivatie. Deze studie leverde vier motivatieprofielen op, namelijk sterke intrinsieke motivatie in combinatie met sterke extrinsieke motivatie (High Intrinsic, High Controlled (HIHC)), sterke intrinsieke motivatie met geringe extrinsieke motivatie (High Intrinsic, Low Controlled (HILC)), geringe intrinsieke motivatie met sterke extrinsieke motivatie (Low Intrinsic, High Controlled (LIHC) en geringe intrinsieke motivatie met geringe extrinsieke motivatie (Low Intrinsic, Low Controlled (LILC)). Vervolgens zijn deze verschillende motivatie profielen bestudeerd in relatie tot studie-strategie ('deep or surface study strategy') en zelfstudie-uren, academische prestaties en 'exhaustion' (uitputting/vermoeidheid door de studie). Het HILC profiel is geassocieerd met het meest wenselijke profiel, namelijk met een sterke 'deep study strategy' en weinig 'surface strategy', hoge GPA ('grade point average', gemiddeld cijfer) en een geringe 'exhaustion' door de opleiding.

LILC en LIHC profielen zijn geassocieerd met de minst wenselijke leerprofielen met een zwakke 'deep study strategy', en sterke 'surface strategy', lage GPA en een hoge score op de 'exhaustion' schaal. Het HIHC profiel is ook geassocieerd met 'deep strategy', hoge GPA en geringe vermoeidheid, het is echter ook geassocieerd met een sterke 'surface strategy'.

Hoofdstuk 6 Motivatie theorieën die in de literatuur beschreven zijn, kunnen worden onderverdeeld in een kwalitatieve of een kwantitatieve benadering. In dit hoofdstuk wordt het belang van beiden onderkend en wordt de mogelijkheid geëxploreerd om kwantiteit en kwaliteit van de motivatie van medisch studenten te combineren. Dit leidt tot vier motivatie profielen: grote autonomie en sterke extrinsieke motivatie ('High Autonome, High Controlled' (HAHC)), grote autonomie en geringe extrinsieke motivatie ('High Autonome, Low Controlled' (HALC)), geringe autonomie en sterke extrinsieke motivatie ('Low Autonome, High Controlled' (LAHC)) en geringe autonomie en geringe extrinsieke motivatie ('Low Autonome, Low Controlled' (LALC)). De validiteit, het belang en de implicaties van deze indeling in deze profielen zijn bediscussieerd. Geconcludeerd kan worden dat het combineren van de twee dimensies van kwaliteit en kwantiteit nuttig is voor het inzicht van motivationele processen, die ten grondslag liggen aan leer- en academische prestaties van individuele studenten in het medisch onderwijs. Inzicht in motivatieprofielen op basis van kwaliteit en kwantiteit kan docenten helpen met de monitoring van de individuele student en om de begeleiding af te stemmen op specifieke behoeften.

Hoofdstuk 7 In dit hoofdstuk wordt een studie beschreven waarin motivatie als groepsvariabele wordt gerelateerd aan leer- en academische prestaties. Hiervoor wordt de Structural Equation Modeling (SEM) methode gebruikt. Dit is een minder frequent gebruikte methode in onderzoek van medisch onderwijs. Met deze methode is het mogelijk om een studie te doen naar relaties op basis van a priori hypothesen, die gebaseerd zijn op de theoretische grondslagen van de SDT. Relatieve Autonome Motivatie (Autonome Motivatie – extrinsieke motivatie ('Controlled Motivation')) heeft een positieve invloed op academische prestaties. 'Optimal Study Strategy' ('Deep study Strategy – Surface study Strategy') en een grotere studie-inspanning zijn hierin belangrijke variabelen. SEM is een goede methode voor de analyse van subgroepen, zoals mannen en vrouwen, studenten toegelaten via gewogen loting en die toegelaten zijn door middel van een kwalitatieve selectie procedure. De grootte van de correlaties tussen de verschillende variabelen verschilt voor de subgroepen. Significante positieve effecten van de 'Relatieve Autonome Motivation' (RAM) op 'Good Study Strategy' (GSS), en GSS op zelfstudie-uren zijn aangetoond in alle subgroepen. Een significant positief effect van de Good Study Strategy op het GPA is aangetoond in alle subgroepen met uitzondering van die van de mannen. Alleen in de subgroep mannen en de subgroep van de kwalitatieve selectie is er een significant positief effect van het aantal zelfstudie-uren op het GPA gevonden, en geen significant positief effect in het overall model. Met uitzondering van de subgroep mannen, heeft RAM door het positieve effect op de GSS een indirect positief effect op het GPA, in plaats van een direct effect. In de kwalitatieve selectie groep heeft RAM een indirect positief effect op het GPA ook mede door het positieve effect op het aantal zelfstudie-uren. In de subgroep mannen heeft RAM een indirect positief effect op het GPA alleen door het positieve effect op het aantal zelfstudie-uren. Uit deze studie kan geconcludeerd worden dat motivatie 'Deep Strategy' stimuleert en het aantal zelfstudie-uren doet toenemen en daarmee een positief effect heeft op academische prestaties.

Hoofdstuk 8 Dit hoofdstuk beschrijft een onderzoek dat is opgezet om een aantal factoren te kunnen bestuderen, die eerder in hoofdstuk 3 vermeld zijn en die invloed kunnen uitoefenen op motivatie. In deze studie is het effect van factoren zoals leeftijd, geslacht en opleidingsniveau op de sterkte van de motivatie voor de medische opleiding onderzocht. Maturiteit blijkt meer dan de leeftijd een effect te hebben op motivatie. Maturiteit, geslacht en opleiding zijn verantwoordelijk voor 7,9% van de variantie in de sterkte van de motivatie voor de medische opleiding. Na correctie voor het verschil in maturiteit tussen jongens en meisjes blijkt er een klein verschil te zijn in motivatie tussen jongens en meisjes. Tevens is een klein, doch significant effect van eerdere opleidingen aangetoond. Deze studie toont aan dat motivatie een afhankelijke variabele kan zijn, die beïnvloed kan worden door factoren, waar de opleiding geen invloed op kan uitoefenen.

Hoofdstuk 9 Dit hoofdstuk is als een AMEE guide gepubliceerd. Dit hoofdstuk is onderdeel van een reeks van AMEE guides, waarin aandacht wordt geschonken aan educatieve theorieën, die door docenten en onderwijskundigen in het medisch domein toegepast kunnen worden ten behoeve van onderwijsinnovaties. In deze guide worden de beginselen van de SDT toegelicht in relatie tot diverse aspecten van het medisch onderwijs, die met deze theorie hun voordeel kunnen doen. Het gaat om aspecten, zoals voorbereiding voor en toelating van aankomende studenten, curriculumopbouw, klassikaal onderwijs, toetsing en examens, 'self-directed' leren, klinisch onderwijs, medische studenten in de rol van docent en onderzoeker, continue professionele ontwikkeling, teaching en stress, depressie en burn-out onder medisch studenten.

Hoofdstuk 10 In dit hoofdstuk zijn twaalf tips opgenomen, die gebaseerd zijn op de SDT om de intrinsieke motivatie van medische studenten te stimuleren. Deze zijn: identificeer en koester wat studenten willen en nodig hebben, laat studenten hun eigen activiteiten zoveel van binnenuit bepalen, stimuleer actieve deelname, moedig studenten aan verantwoordelijkheid te nemen voor hun eigen leerproces, bied structuur in de begeleiding aan, draag zorg voor uitdagend onderwijs, geef positieve en constructieve feedback, geef emotionele steun, onderken uitingen van negativiteit, vermeld de noodzaak van ogenschijnlijk oninteressante activiteiten, bied keuzes aan, stuur met termen als kunnen, mogen en zou kunnen in plaats van 'je moet'. Deze tips zijn ontleend aan het concept van motivatie in relatie tot leren en de toepassingen van de Self-Determination Theory in het medisch onderwijs. Dit hoofdstuk geeft tips ter ondersteuning van de autonomie van de student in het medisch onderwijs. Dit hoofdstuk dient als een hands-on gids voor docenten om de intrinsieke motivatie van de studenten te stimuleren.

Hoofdstuk 11 Dit is een afsluitend hoofdstuk met een discussie over de algemene bevindingen in dit proefschrift, interpretaties en implicaties. Aandacht wordt besteed aan sterke punten en beperkingen van dit proefschrift. Daarnaast worden bevindingen uit de literatuur en het onderzoek uit dit proefschrift gebruikt om te komen tot nieuwe inzichten ten aanzien van factoren die een rol spelen bij de motivatie van studenten in het medisch onderwijs en hoe medisch onderwijs de motivatie kan beïnvloeden. Aandacht wordt besteed aan motivatie en leren, gender en motivatie, toetsing en motivatie, motivatie en zelfregulerend leren, motivatie als een selectiecriterium, motivatie en de vervolgopleiding en professionele ontwikkeling, en motivatie van docenten in het medisch onderwijs. In het laatste deel van dit hoofdstuk wordt, gebaseerd op de bevindingen van dit proefschrift, een voorstel gedaan voor een onderzoeksagenda voor de komende paar jaar.

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"Aryaman shows an intrinsic motivation to learn, which is far beyond his age level".

Thank you, Aryaman.

Curriculum Vitae

Curriculum Vitae

Rashmi Kusurkar was born in Mumbai, India on 18th February 1975. She completed her graduate and post-graduate medicine at Lokmanya Tilak Municipal Medical College, Sion, Mumbai, India. Rashmi started teaching medical, physical therapy, occupational therapy and nursing students during her post-graduation in Human Physiology. During this time she was also involved in many multi-disciplinary research projects studying physiological aspects of yoga training in geriatric people, effect of tactile and kinaesthetic stimulation on pre-term and full-term neonates, psychosomatic illnesses in adults etc. and completed a dissertation on comparison of physiological, psychomotor and psychological parameters between children with learning disabilities and controls. After completing her post-graduation, Rashmi joined Seth GS Medical College & KEM Hospital as a Lecturer in Physiology. During her tenure there, she performed many senior teacher responsibilities like being an examiner and assessment development at the university level apart from her regular teaching and teaching coordination responsibilities.

During this time, she developed an interest in the teaching-learning process and started doing research in medical education. She took training for this through a certificate course and a fellowship (conducted by the internationally acclaimed FAIMER- Foundation of Advancement in International Medical Education and Research, Philadelphia, USA) in medical education for 2 years. She completed two research projects in medical education. In addition, she was faculty on the institutional Medical Education Unit and carried out teacher trainings at university level.

During this time she moved to The Netherlands with her family. Here she secured a PhD position in medical education in UMC Utrecht and began her thesis on motivation of medical students. She served as faculty on UMC Utrecht student teacher training programme for 6th year medical students. She has been awarded the BKO (Basis Kwalificatie Onderwijs) certificate by UMC Utrecht. She has conducted workshops on "How to enhance intrinsic motivation in medical students?" not only for medical faculty in The Netherlands, but also for international medical faculty during AMEE 2011 in Vienna. She has co-authored an AMEE guide on "How SDT can assist our understanding of teaching-learning processes in medical education?" with her promoter Prof dr Olle ten Cate and Prof dr Geoffrey Williams, University of Rochester, USA. Rashmi has successfully built a profile of an expert on motivation research through her in-depth understanding and analyses of not only her own research work, but also the theoretical underpinnings of motivation. She has worked hard in order to transfer her understanding of motivation to the world of medical education through her research publications and her conceptual and application-oriented papers.

Rashmi currently lives with her husband, Aniruddha, and sons, Aryaman and Yohaan, in Amsterdam and works as the Research Team Leader, Research in Medical Education, Institute of Research and Training, VUmc Amsterdam.