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RESEARCH ARTICLE

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Assessing changes in academic motivation across medical training stages: a longitudinal study in Malaysia

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ABSTRACT

Introduction: Sustained academic motivation is essential for the success and well-being of medical students. As students progress from pre-clinical to clinical training, the transition in learning environments is theorized to facilitate motivation internalisation, consistent with Self-Determination Theory (SDT). Unlike cross-sectional studies, a longitudinal approach allows tracking of individual changes over time, offering deeper insights into developmental trends. This study examined changes in academic motivation at the start of medical school, after pre-clinical training, and following two years of clinical training.

Methods: The Academic Motivation Scale (AMS) was administered to 292 students from a five-year undergraduate medical programme in Malaysia across three stages: entry, post pre-clinical, and after two years of clinical training. Three cohorts (2016–2018) were followed longitudinally over seven years (2016–2022). Analysis involved confirmatory factor analysis (CFA) to validate AMS and assess reliability using composite reliability (CR), followed by repeated measures ANOVA to examine motivational changes.

Results: CFA confirmed the AMS as valid and reliable. At entry, students showed moderate to high extrinsic and intrinsic motivation with low amotivation. Amotivation rose from Year 1 ($M=6.64$) to Year 3 ($M=8.51$) and Year 5 ($M=10.27$). Identified regulation remained high in Year 1 ($M=23.37$) and Year 3 ($M=23.57$) before declining in Year 5 ($M=22.47$). External and introjected regulation peaked in Year 3 ($M=18.92$, 19.42) then dropped or stabilized in Year 5. Intrinsic motivation declined steadily across all domains from Year 1 to Year 5 (all $p < .05$).

Conclusion: The decline in intrinsic motivation and rise in amotivation highlight challenges in sustaining motivation through medical training. These trends may impact academic performance, mental health, and professional growth, underscoring the need for curriculum adaptations, mentorship, and stress-reduction initiatives to better support students.

KEY MESSAGES

- The study revealed a moderate to significant decline in both intrinsic and extrinsic motivation subscales as medical students progressed through their training, accompanied by a gradual but notable increase in amotivation, suggesting emerging concerns about student engagement and well-being.
- The challenges and stressors inherent in medical education, such as cognitive overload and the evolving complexity of clinical responsibilities, contribute to these shifts in motivation, impacting students' learning experiences.
- Targeted interventions such as mentorship, academic support, mental health resources, and curriculum reforms alongside qualitative research into students' experiences, are vital for addressing declining motivation and supporting medical students' well-being throughout their training.

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Introduction

Academic motivation refers to the perceived reasons driving students to engage in learning, shaped by either external or internal factors [1]. It encapsulates students' desire to pursue academic activities, as evidenced by their interest, persistence and approach when their competence is assessed against a standard [2]. Self-Determination Theory (SDT) examines how biological, social, and cultural factors influence human capacity for growth, engagement, and well-being [3]. The theory positions motivation along a continuum ranging from amotivation to three types of extrinsic motivation (external regulation, introjected regulation, identified regulation) and three types of intrinsic motivation (to know, to accomplish, to experience stimulation) [3]. These seven types of motivation form the foundation of the Academic Motivation Scale (AMS), a widely used and validated instrument for assessing students' motivation to engage in learning. Understanding these types of motivation helps identify the motivational states exhibited by students. Amotivated students lack the drive to engage in learning. By contrast, extrinsically motivated students are influence by external rewards and pressures, while intrinsically motivated students are driven by the inherent satisfaction of the learning process.

Medical students are motivated by diverse factors. Intrinsically motivated individuals value altruism, an interest in medical science and the vocational nature of the field [4]. Extrinsically motivated students are propelled by family expectations, financial gain, the prestige of medicine academic achievements, familial health issues dignity, and career prospects [4]. Research has shown that intrinsic motivation is positively correlated with academic performance [5–8]. In a study exploring the relationship between SDT and academic performance through the creation of motivational profiles, it was found that students with high intrinsic motivation demonstrated positive study behaviours, such as dedicating more hours to study and adopting deep learning strategies, both of which contributed to better academic performance [7]. Additionally, research has also found that higher levels of task and effort that closely aligned with intrinsic motivation are positively associated with students' academic performance [6].

Such students value deep learning over rote memorisation [5,9]. and exhibit a stronger professional identify [10]. They also sustain a career long desire to help people [5]. Conversely, amotivation undermines professional identity [10]. and is associated with elevated rate of burnout and depression among medical students [11–13]. These findings highlight the pivotal role of academic motivation in medical students' academic success and well-being. Integrating the concept of SDT into medical education has shown to be beneficial in promoting medical students' learning experience such as autonomy, self-regulation and reduced stress [14].

Given its importance, academic motivation has been widely studied in medical education either as a dependent or independent variable [5]. As a dependent variable, it has been analysed across different stages of study [15–18], demographics [11,15], personality traits [11], educational strategies [13,19,20], and psychological well-being [19]. As an independent variable, it has been linked to academic achievement [7,13,21] and professional identity [10]. The substantial volume of research highlights the significance of this aspect for medical students.

However, the understanding of medical students' motivation is largely based on cross-sectional research, which offers only partial insights into its development [12,22,23]. Cross-sectional designs are limited by their susceptibility to confounding variables that can reduce the strength of the evidence and inability to capture the dynamic nature of motivation [24]. Motivation evolves as students gain academic and life experience [10,15, 16,18]. While cross-sectional studies provide snapshots of motivation for a specific timepoints, they lack the depth afforded by longitudinal research a few. Although studies have tracked motivation within a single academic year [12], there is limited research following motivation throughout an academic programme. Consequently, the literature offers an incomplete understanding on how academic motivation develops over and calls for more longitudinal studies [12,23,25].

Longitudinal designs address many limitations of cross-sectional research by mitigating threats to internal validity [25,26]. However, such studies are relatively scarce due to the time and resource demands and high risk of participant dropout [25]. Guided by SDT, this study aimed to examine longitudinal changes in medical students' academic motivation across three stages of undergraduate medical education: the start of medical school (Year 1), after completing pre-clinical training (Year 3), and after two years of clinical training (Year 5). Previous studies have shown that students exhibit different levels of

motivation at various stages of medical education, particularly during pre-clinical and clinical stages [27]. These transitions often reflect changes in the learning environment from lecture-based, theory-heavy instruction in the pre-clinical phase to hands-on, problem-solving, and patient-centered learning in the clinical years. Using the AMS, our objective was to track changes in intrinsic motivation, extrinsic motivation, and amotivation over time, and to explore whether these trends align with or diverge from expectations outlined in SDT. Based on the findings, we seek to identify patterns in motivation development and inform strategies for academic support [15,25].

Material and methods

A longitudinal study was conducted at a public institution offering a five-year undergraduate medical programme. Participants comprised medical students from three cohorts (2016, 2017, and 2018), who completed the AMS at three different stages of their medical training over a seven-year period, from 2016 to 2022. Ethical approval for the study was obtained from the Universiti Malaya Research Ethics Committee (UMREC).

Study design and setting

This study employed a longitudinal cohort design to investigate changes in academic motivation among medical students over the duration of their five-year medical training. The study was conducted at a public institution offering a five-year undergraduate medical programme.

Sample/participants

The study sample comprised students from three cohorts enrolled in the undergraduate medical programme in 2016, 2017, and 2018. The students were successful applicants to the programme, having been exceptional high school graduates selected through the Biomedical Admissions Test (BMAT) and multiple mini-interviews. All first-year students from each cohort were invited to participate voluntarily during their academic year's welcome week *via* a bulletin board announcement. Inclusion criteria were: (1) enrolment in the undergraduate medical programme during the 2016, 2017, or 2018 academic intake; (2) first-year status at the time of recruitment; and (3) digital informed consent were provided prior to completing the survey. Students who declined participation, did not provide consent, or did not complete the survey at one or more of the three designated time points were excluded from the final analysis. A total of 436 students from three cohorts (2016, 2017, and 2018 intakes) participated in the study. A total of 292 participants completed all three rounds of the survey. The required sample size was calculated to be 205, using Raosoft online software (http://www.raosoft.com/samplesize.html) with a confidence level of 95% and margin of error of 5%.

Theoretical framework

SDT [3] anchors the theoretical framework of this study. This theory provides a foundation for postulating the dynamic development of academic motivation among medical students, that is, they should gradually develop greater intrinsic motivation, reduce extrinsic motivation, and avoid amotivation during medical training [5].

SDT can be interpreted in the context of medical training based on their learning experiences and how they relate to the seven subscales of motivations. Amotivation may be seen in a student who feels overwhelmed by complex subjects like anatomy and believes that regardless of effort, success is unattainable, leading to disengagement or absenteeism. Among the types of extrinsic motivation, external regulation is reflected in students who study to avoid reprimanding or to secure external rewards such as scholarships. Introjected regulation is evident when students engage in learning activities, such as practicing clinical skills, out of guilt or fear of failure rather than interest. In contrast, identified regulation occurs when students value the relevance of their studies. For example, they diligently learn anatomy because they see it as vital to become a competent doctor. Within intrinsic motivation, motivation to

know is illustrated by a student who independently explores research such as on autoimmune diseases out of genuine curiosity. Motivation to accomplish appears in students who repetitively practice skills like suturing for the satisfaction of mastery, while motivation to experience stimulation is reflected in those who thrive on the excitement and challenge of high-pressure environments, such as emergency simulations or on-call duties.

Measurement tool(s)/study materials

AMS, developed based on Self-Determination Theory [1], was used to assess students' academic motivation levels. Permission to use the AMS was obtained from the copyright holder. This instrument has been validated and used in studies involving medical student populations [4,7,18]. The AMS consist of 28 items rated on a 7-point semantic differential scale ranging from 1 ('does not correspond at all') to 7 ('corresponds exactly'). It evaluates seven subscales of academic motivation: amotivation; external motivation (EM) - external regulation, EM - introjected regulation, EM - identified regulation, and intrinsic motivation (IM) - to know, IM - to experience stimulation, and IM - towards accomplishment. Scores for each domain range from a minimum of 4 maximum of 28. Motivation levels are classified as low (0–13), moderately low (13–16), moderately high (17–20), high (21–28) [28].

Data collection (procedures)

Data collection was carried out at three stages: Year 1 (the start of medical school), Year 3 (after completing pre-clinical training), and Year 5 (following two years of clinical training) of the medical programme. The same version of the AMS was used at each stage to ensure consistency. The study protocol that depicts the flow of the data collection is as shown in Figure 1.

First data collection point (Year 1 - the start of medical school)

During the welcome weeks of the 2016, 2017, and 2018 academic years, all first-year medical students from each respective cohort were invited to participate in the study. Invitations were distributed *via* official bulletin board announcements on the university's learning management system. The survey was self-administered and hosted on a secure online platform. Before accessing the questionnaire, students were required to complete a digital informed consent form. This survey served as the baseline measurement, capturing students' initial perspectives as they began medical school. To enhance participation, a follow-up reminder was sent one week after the initial invitation through the same platform for each cohort.

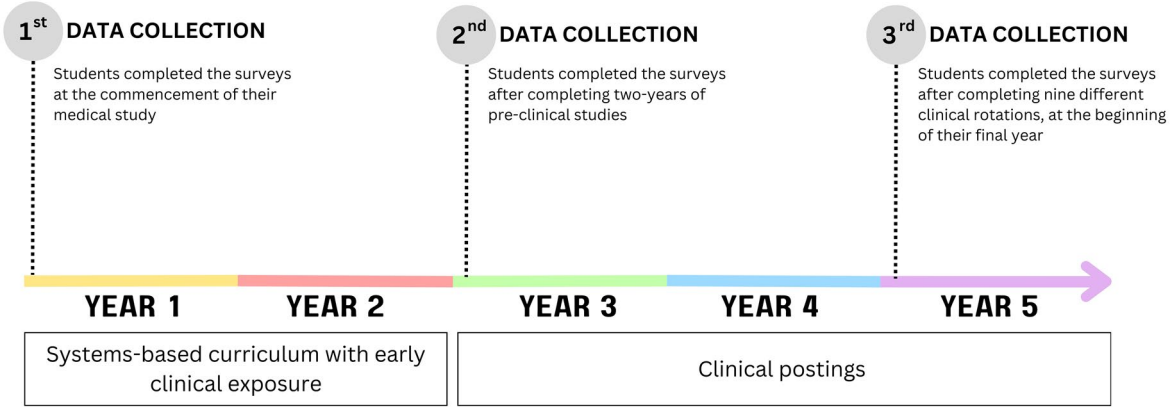

Figure 1. Data collection points.

Pre-clinical training (years 1–2)

During the first two years, students completed pre-clinical studies within a system-based integrated curriculum (e.g. musculoskeletal sciences, renal, and urology). Teaching strategies included problem-based learning (PBL) and early clinical exposure, such as history taking, physical examination, and procedural skills training in the clinical skills laboratory.

Second data collection point (Year 3 - after completing pre-clinical training)

In 2018, 2019, and 2020 respectively, the 2016, 2017, and 2018 cohorts who just entered Year 3 to begin clinical training were re-invited to complete the same online survey. This phase captured their perspectives and experiences after engaging in pre-clinical training.

Clinical training (years 3–4)

Clinical training in Years 3 and 4 consisted of nine core postings: surgery, paediatrics, medicine, otorhinolaryngology and ophthalmology, acute care, psychological medicine, obstetrics and gynaecology, orthopaedic surgery, and public health.

Final data collection point (Year 5 - following two years of clinical training)

The final round of data collection occurred in 2020 (cohort 2016), 2021 (cohort 2017), and 2022 (cohort 2018), at the beginning of each cohort's Year 5. Students were once again completed the identical survey, reflecting their medical journey following clinical training.

Data analysis

Responses from the three surveys were paired, and participant identities were anonymised through a numbering system to protect personal information. Data analysis proceeded in two stages. First, a confirmatory factor analysis was conducted using IBM AMOS version 28 to validate the AMS and ensure its reliability. Second, descriptive and inferential statistics were performed using IBM SPSS to analyse categorical data and the relationships between variables. Repeated measures ANOVA was employed to compare academic motivation across the three programme stages: the start of medical school (Year 1), after completing pre-clinical training (Year 2), and following two years of clinical training (Year 3). To conduct repeated measures ANOVA analysis, the sphericity of the data was assessed (whether variances across conditions are equal covariances between pairs of conditions are equal). For sphericity estimates of lower than 0.75, the Greenhouse-Geisser estimate was applied while the Huynh-Feldt estimate was applied for estimates greater than 0.75. Based on the sphericity test, the corresponding test of within-subject effects was applied. If this test is significant at $p<.05$, a pairwise comparison was conducted with the Bonferroni method. All missing data are due to students who did not complete the survey at one or more of the three designated time points and thus will be removed from the final analysis.

Results

This study aimed to examine changes in academic motivation among medical students across three key phases of their undergraduate medical training, the start of medical school (Year 1), after completing pre-clinical training (Year 3), and following two years of clinical training (Year 5). By administering the AMS at these time points, the study sought to identify longitudinal patterns in intrinsic motivation, extrinsic motivation, and amotivation throughout the medical training. A repeated measures ANOVA was conducted to assess significant changes in each AMS subscale across the three time points.

Demographic data

A total of 292 participants completed all the three rounds of the survey. The mean age of Year 1 students was 19.2 years, with 60.5% females and 43.5% of Chinese ethnicity (Table 1).

Table 1. General characteristics of respondents.

Characteristics	Mean (SD)	Min-Max	Frequencies (%)
Age (Year 1)	19.2 (.58)	18–27	
Gender			
Male			115 (39.4)
Female			177 (60.6)
Ethnicity			
Malay			112 (38.4)
Chinese			127 (43.5)
Indian			41 (14.0)
Others			12 (4.1)
Either parent is a doctor			
Yes			27 (9.2)
No			265 (90.8)

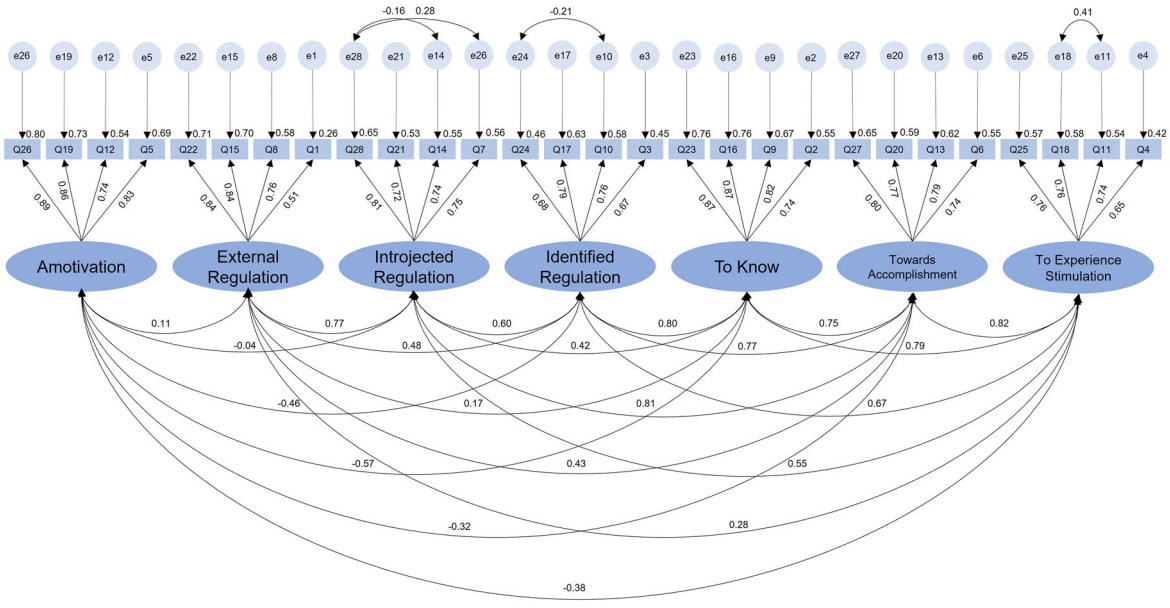

Figure 2. Seven-factor model of the Achievement Motivation Scale (AMS).

Validity and reliability of the instrument

The seven-factor model was examined and analysed using the original constructs of the AMS (Figure 2). The goodness-of-fit statistics for the model were as follows: CMIN/df (Chi-square divided by degrees of freedom) = 3.97, NFI (Normed Fit Index) = 0.92, RFI (Relative Fit Index) = 0.91, IFI (Incremental Fit Index) = 0.94, TLI (Tucker-Lewis Index) = 0.93, CFI (Comparative Fit Index) = 0.94, RMSEA (Root Mean Square Error of Approximation) was 0.06, and SRMR (Standardized Root Mean Square Residual) = 0.048. All factor loadings (standardised regression weights) exceeded 0.50. The indices NFI, RFI, IFI, TLI, and CFI were above 0.90, RMSEA was below 0.08, SRMR was below 0.50, and factor loadings exceeded 0.50, indicating a good fit and demonstrating construct validity [29,30]. Additionally, the composite reliability coefficients for the factors amotivation, external regulation, introjected regulation, identified motivation, to know, towards accomplishment, and to experience stimulation, were 0.90, 0.83, 0.84, 0.82, 0.90, 0.86, and 0.82, respectively. As coefficients exceeded 0.70, these statistics confirmed the instrument's acceptable composite reliability [31].

Motivational profiles of medical students

The academic motivation profiles of the medical students at Years 1, 3, and 5 are shown in Figures 2, 3, 4 and 5. After undertaking 4 years in pre-clinical and clinical studies, the students had low levels of amotivation (mean = 10.27), demonstrated moderately high or high levels of extrinsic motivation (means = 18.12, 18.46, 22.47 for external regulation, introjected regulation, identified regulation, respectively),

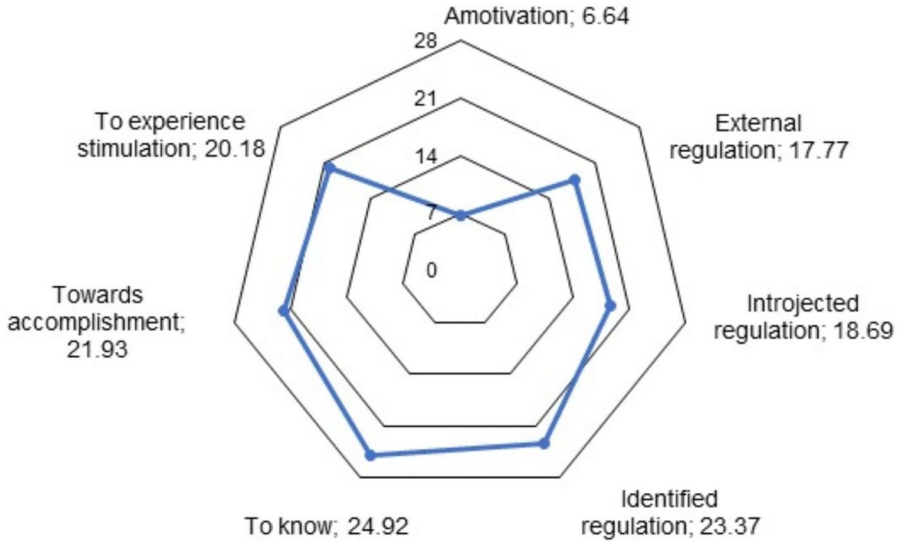

Figure 3. Academic motivation profile of Year 1 medical students.

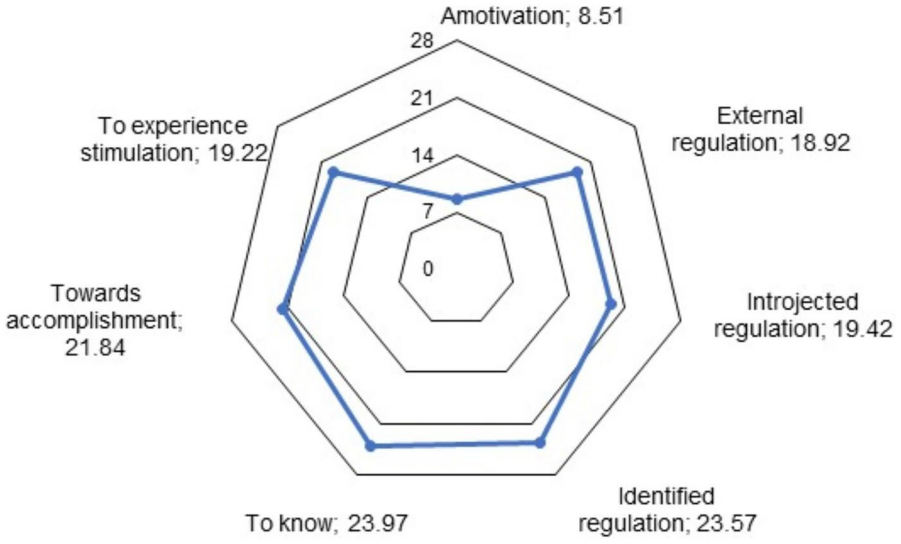

Figure 4. Academic motivation profile of Year 3 medical students.

and posed moderately high or high levels of intrinsic motivation (means = 22.49, 20.73, 18,13 for motivation to know, towards accomplishment, to experience stimulation).

A repeated measures ANOVA was conducted to compare academic motivation across the three stages of the student's medical training (Table 2). Detailed steps of the statistical analysis are provided in the Appendix.

Changes in amotivation

Based on repeated measures ANOVA (Table 2), medical students demonstrated low amotivation (mean = 6.64) at the start of the study, which increased significantly after completing the pre-clinical years (mean = 8.51), and further increased after two years in clinical studies (mean = 10.27). The upward trend in amotivation was statistically significant ($p < 0.05$) across all three time points.

Changes in extrinsic motivation

The students demonstrated moderately high levels of external regulation at the study's start (mean = 17.77), which significantly increased after completing the pre-clinical years (mean = 18.92) and remained

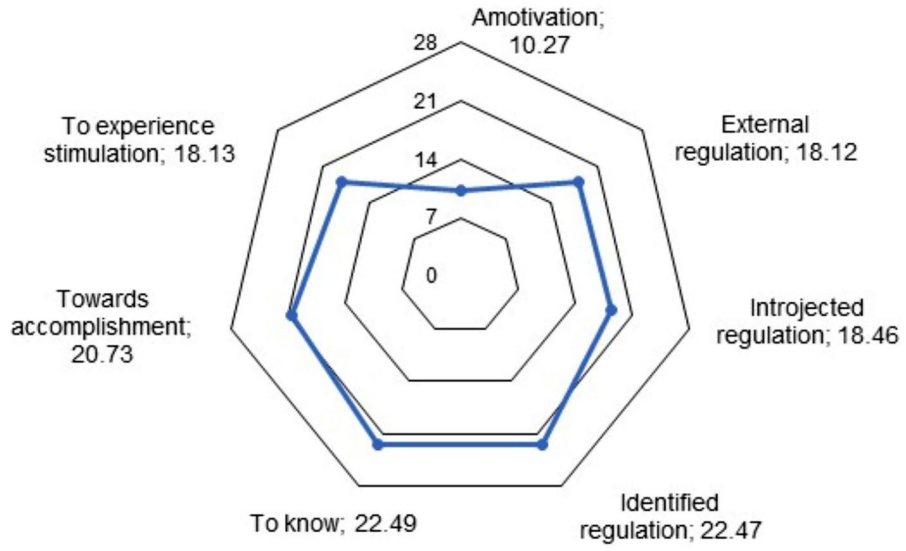

Figure 5. Academic motivation profile of Year 5 medical students.

Table 2. Evolution of academic motivation among medical students.

	Year 1		Year 3		Year 5	
Domain	Mean (SD)	Min-Max	Mean (SD)	Min-Max	Mean (SD)	Min-Max
Amotivation	6.64 (4.14)[a,c]	4–25	8.51 (4.61)[a,b]	4–24	10.27 (5.83)[b,c]	4–27
External regulation	17.77 (5.79)[a]	4–28	18.92 (5.65)[a]	4–28	18.12 (7.39)	0–28
Introjected regulation	18.69 (6.03)	4–28	19.42 (5.61)[b]	4–28	18.46 (5.93)[b]	4–28
Identified regulation	23.37 (3.72)[c]	6–28	23.57 (3.85)[b]	4–28	22.47 (4.50)[b,c]	4–28
To know	24.92 (3.24)[a,c]	5–28	23.97 (3.55)[a,b]	10–28	22.49 (4.65)[b,c]	4–28
Towards accomplishment	21.93 (4.66)[c]	5–28	21.84 (4.79)[b]	4–28	20.73 (5.05)[b,c]	4–28
To experience stimulation	20.18 (4.77)[a,c]	4–28	19.22 (4.96)[a,b]	4–28	18.13 (5.57)[b,c]	4–28

Note: a – Year 1 versus Year 2 pairwise comparison significant at $p<.05$; b – Year 2 versus Year 3 pairwise comparison significant at $p<.05$; c - Year 1 versus Year 3 pairwise comparison significant at $p<.05$.

stable in the clinical years (mean = 18.12). This pattern was supported by significant differences observed in the repeated measures ANOVA. Introjected regulation was moderately high at the beginning (mean = 18.69), remained unchanged after the pre-clinical years (mean = 19.42), and decreased significantly after two years in clinical studies (mean = 18.46). Identified regulation was high at the outset (mean = 23.37), remained stable after the pre-clinical years (mean = 23.57), and decreased significantly after two years in clinical studies (mean = 22.47).

Changes in intrinsic motivation

Intrinsic motivation to know was high initially (mean = 24.92), decreased significantly after the pre-clinical years (mean = 23.97), and further decreased significantly after two years of clinical studies (mean = 22.49), as shown by repeated measures ANOVA and pairwise comparisons. Similarly, intrinsic motivation towards accomplishment was high at the start (mean = 21.93), remained the same after completing the pre-clinical years (mean = 21.84), and decreased significantly after two years of clinical studies (mean = 20.73). Intrinsic motivation to experience stimulation was moderately high at the study's start (mean = 20.18), decreased significantly after the pre-clinical years (mean = 19.22), and further decreased significantly after two years of clinical studies (mean = 18.13).

Overall motivation trends

The longitudinal data (analysed with repeated measures ANOVA) revealed several notable trends in medical students' academic motivation across the five-year programme, as illustrated in their academic motivation profiles of the medical students at Years 1, 3, and 5 (Figures 3, 4 and 5). In summary, these

motivational trajectories diverge from the expectations of SDT, which anticipates an increase in autonomous forms of motivation as students internalise their learning goals. Amotivation showed a consistent and significant increase from Year 1 through Year 5, indicating a gradual rise in disengagement as students progressed. Meanwhile, extrinsic motivation remained relatively stable, with external regulation increasing slightly in the pre-clinical phase and plateauing thereafter, and introjected and identified regulation showing only modest changes. These patterns suggest a motivational shift away from internal drivers toward more external or controlled forms of regulation as students advance through medical training. In contrast, intrinsic motivation subdomains (to know, towards accomplishment, and to experience stimulation) exhibited a progressive decline, suggesting reduced enjoyment and personal interest in learning over time.

Discussion

This study assessed the longitudinal changes in academic motivation among medical students at three critical stages of their training: the start of medical school (Year 1), after completing pre-clinical training (Year 3), and following two years of clinical training (Year 5), yielding the following key findings. By the final year, students who had completed both pre-clinical and clinical training demonstrated low amotivation and moderately high to high levels across both extrinsic and intrinsic motivation subscales. Analysis of the AMS revealed several significant trends across these stages. Intrinsic motivation consistently declined over the course of medical training, while amotivation increased significantly. The three subscales of extrinsic motivation exhibit varying trends, where external regulation remained relatively stable while identified and introjected regulation declined by Year 5. The significant and consistent decline in intrinsic motivation and increase in amotivation across all three time points, presents the most unexpected result as it contradicts the SDT, which theorised that through the process of internalisation, students should gradually transform external motives into more autonomous forms of motivation, reflected by higher intrinsic motivation and lower extrinsic motivation and amotivation by the later years of medical education [5].

Amotivation

Throughout the medical students' academic journey, their amotivation exhibited an upward trend but remained well within the low range. Contrary to the expectations of SDT, the findings did not show a decline in amotivation; instead, they demonstrated an increase. The significant increase in amotivation suggest a complex interplay of factors, likely arising from educational, social, and psychological shifts associated with studying medicine [32–34]. Malaysian school science teachers often favour didactic teaching approaches [35]. Consequently, the transition from this structured, directive style in pre-university education to the practical challenges of medical studies may introduce stressors, such as increased academic demands [33,36] and limited supervision from medical educators [37]. Furthermore, entering the workplace setting may cause students to struggle in defining their roles [33], while being exposed to negative workplace cultures [38,39], and negative role models [40]. These stressors may lead students to psychological issues, such as diminished self-confidence [41,42], rising levels of burnout [43,44], and maladaptive coping mechanisms [45]. These challenges encountered in medical education may contribute to the increasing amotivation observed as students advance in their studies.

Extrinsic motivation – external regulation

Students demonstrated moderately high levels of external regulation at the beginning of the study, which increased significantly after completing the pre-clinical years but stabilised after two years in the clinical phase. Contrary to the expectations of SDT, the findings did not show a progressive decline in extrinsic motivation; instead, they demonstrated stabilization throughout medical training. The process of internalisation may have been hindered by exposure to real-world clinical environments characterised by stress, role ambiguity, and insufficient support. These factors may cause students to continue relying on external incentives rather than developing autonomous motivation. This finding

also implies that parental influence [4,46], aspirations for material gains, and the desire to improve living standards [47,48] play a substantial role in motivating students during the early stages of their medical education. Similar to trends seen in the engineering profession, medical students from low social classes in Malaysia may view the medical profession as a means to improve their family's quality of life [49].

Extrinsic motivation – introjected regulation

The initial moderately high levels of introjected motivation did not change significantly after completing the pre-clinical years but declined significantly during clinical training. This trend partially aligns with SDT, suggesting a gradual internalisation process in which students become less driven by external approval and social expectations as they mature professionally. This decrease may reflect an adjustment of the medical students' ego and reduced dependence on external approval once they enter the clinical years [27]. Senior medical students may become less reliant on social expectations and obligations as they gain a deeper understanding of the complex roles and responsibilities of healthcare professionals workers [40].

Extrinsic motivation – identified regulation

High levels of identified regulation were observed at the beginning of the study and remained consistent after the pre-clinical years; however, a significant reduction occurred during clinical training. Contrary to SDT, which predicts an increase in identified regulation as students internalise the value of their learning, the decline observed suggests that clinical realities may undermine this process. At this stage of medical training, students are exposed enough to recognise and evaluate whether becoming a doctor aligns with their personal goals and values. The significant decrease during Year 5 may reflect growing uncertainty about career prospects in the medical field [50], prompting some to reconsider their professional paths [51]. Furthermore, workplace realities such as heavy administrative burdens and a toxic culture can lead to disillusionment with the profession, subsequently diminishing students' identified regulation.

Intrinsic motivation – to know, towards accomplishment, and to experience stimulation

Intrinsic motivation was initially high but declined significantly after the pre-clinical years, and further during clinical training. Contrary to the expectations of SDT, the findings did not show an increase or maintenance of intrinsic motivation; instead, they demonstrated a significant decline throughout medical training. This aligns with previous findings showing that intrinsic motivation tends to be lower during the clinical stage compared to the pre-clinical stage of medical education [27,52]. The declining trend observed in this study may be attributed to several factors that potentially undermine all aspects of intrinsic motivation as students transition from the early, theory-based phase of medical education to the more demanding, practice-oriented clinical setting.

A reduction in curiosity about knowledge, integral to intrinsic motivation to know, may result from multiple challenges that students must face during clinical training. Cognitive overload [53,54], the rapid expansion of medical knowledge [55,56], and the increasing complexity of clinical learning [32,57] can make learning overwhelming rather than engaging, subsequently reducing their interest to gain knowledge. Motivation towards accomplishment may diminish as students encounter the demanding and often unpredictable nature of clinical scenarios, where success is less clearly defined [58] and useful feedback is less apparent [59,60]. Such obscurity will hinder the students a drive to improve and a sense of achievement, which are essential to fuel their motivation towards accomplishment. Additionally, students may become desensitised towards the novelty of medical training [61,62] as clinical duties become a routine over time, reducing their sense of stimulation. Moreover, limited practices that foster autonomy, an essential condition for the internalisation of motivation [63], may negatively impact students' sense of control over their learning. This, in turn, hinders their ability to experience stimulation from the exploration and novelty associated with clinical practices.

Trends of motivation: Findings, implications, and future directions

The consistent and significant declines in intrinsic motivation, the rise of amotivation and the inconsistent trends across all subtypes of extrinsic motivations were among the most notable findings of this study. Contrary to the expectations of SDT, these trends suggest that the internalisation of motivation may not occur uniformly across the stages of medical training. This divergence between theoretical predictions and real-world outcomes offers important insights into how contextual, educational, and environmental factors shape motivational trajectories. As longitudinal research on medical students' motivation remains limited, this study contributes a valuable perspective on the effectiveness of a medical curricula in sustaining intrinsic motivation throughout an education period. By identifying critical transition points where motivation tends to decline, the findings highlight the need for targeted educational strategies that foster autonomy through autonomy-supportive teaching, enhance student engagement, and address negative elements of the learning and workplace culture that contribute to amotivation. Future research should further explore how institutional practices and clinical learning environments can better support the internalisation process to sustain intrinsic motivation throughout medical education.

Limitations

This longitudinal study was conducted at a single institution, which limits its generalisability. However, the institution's characteristics, such as its public status and integrated curriculum are described to allow comparisons with similar institutions. Future research should involve multiple institutions, encompassing both public and private sectors and a variety of curricular structures. This would enhance generalisability and provide a more comprehensive understanding of medical student motivation across Malaysia. Then, it would be valuable to compare Malaysian medical students' career motivations with those of their global counterparts. A more in-depth literature review incorporating international studies would have allowed for stronger contextualisation and may have enhanced the significance of the findings. Future studies should aim to include comparative perspectives to better situate Malaysian medical student motivation within a global context.

Although this study offers potential explanations for changes in student motivation, these remain speculative without empirical validation. As the discussion on motivational trends in this study primarily focused on the educational aspects of motivation, this is attributed to the adoption of SDT as the theoretical framework, which is widely applied in educational psychology. Nevertheless, other theories, such as the Social Cognitive Career Theory (SCCT) [64], may offer an alternative perspective to interpret and address the decline in intrinsic motivation, as students may recalibrate their goals and expectations in response to the realities of medical training and professional practice. Future research employing qualitative methods is needed to explore the underlying factors contributing to declines in intrinsic motivation such as personal challenges, perceptions of the curriculum, and external pressures to strategies that can sustain student motivation.

Additionally, while this study focused on academic motivation within the medical programme, it did not specifically address other factors that can impact motivation to study medicine, such as initial motivation to enrol in medical school. These distinct aspects of motivation may warrant separate investigation to fully understand the trajectory of students' motivational development. Students aged 19–24 are experiencing life changes, including relationships, financial pressures, family circumstances, and evolving career perspectives. These developmental trajectories might also influence students' motivations.

As this study relied primarily on quantitative measures, it may not have fully captured the complex, context-specific reasons behind students' motivational shifts. A mixed-methods design incorporating qualitative data, such as student interviews or open-ended survey responses, could have provided richer insights and enhanced the applicability of findings for educational improvement. This study also relied on self-reported data, which may be subject to social desirability and recall biases. Additionally, the voluntary nature of participation may introduce response bias, as students with strong opinions about their motivation may have been more likely to respond. External factors such as personal life events or concurrent academic pressures, which could influence motivation, were not controlled for and may have affected the results.

The observed shifts in motivation underscore the need for targeted interventions and support mechanisms to address students evolving psychological needs throughout their medical training. A deeper understanding of these influences would inform the development of targeted interventions to support and sustain motivation throughout medical training. This study was limited by its inability to track how institutional policies, support systems, or interventions may have influenced students' motivation over time. Consequently, while declines in intrinsic motivation were observed, the impact of existing support mechanisms or targeted interventions remains unclear. Future research should include an examination of these institutional factors to better understand their role in shaping and sustaining medical student motivation.

Conclusions

The motivational trends observed across all stages of medical training in this study highlight a growing concern about the state of motivation experienced by medical students. The rise of amotivation and the decline in intrinsic motivation may have long-term implications on students' learning engagement, psychological well-being, and professional development. This calls for deeper evaluations from multiple perspectives to understand both the direct and indirect factors influencing these trends. As motivational patterns are likely influenced by a combination of educational, personal, and societal factors, pinpointing these influences will be crucial for developing effective and targeted interventions that address students' academic and psychological needs. While factors directly related to the medical programme such as limited autonomy, inadequate feedback, and role ambiguity are important, less tangible influences should not be overlooked. These may include evolving societal expectations, generational attitudes toward work-life balance, and the personal life stressors that may vary between individual students. By recognizing both explicit and subtle contributors to motivational decline, future research can be more focused, and interventions can be better tailored to support medical students. Such efforts are necessary to help align students' motivation more closely with intrinsic regulation, as envisioned by SDT.

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Ethics statement

All procedures involving human participants were performed in accordance with the ethical standards of the Declaration of Helsinki and approved by the University of Malaya's Research Ethics Committee (UMREC) (UM.TNC2/RC/H&E/UMREC-128 and UM.TNC2/UMREC-2499). Electronic written informed consent was obtained from all individual participants included in the study.

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Data availability statement

Data will be available upon reasonable request from the corresponding author of the manuscript.

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