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Validity evidence for the measurement of metamotivational strategies using the Educators' Metamotivational Strategies (EMS) scale

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ABSTRACT

Background: Educator motivation is critical for effective teaching and professional growth in health professions education (HPE), yet little research focuses on the self-regulated strategies educators use to sustain their motivation. This study explores the metamotivational strategies of health professions educators and provides evidence of validity for their measurement.

Methods: An exploratory sequential mixed-methods study (2021–2023, Iran) was conducted in seven steps: literature review, interviews with 15 expert educators (content analyzed), synthesis of literature and interview findings, item development, content validity (CVI/CVR) with 15 experts, cognitive interviews, pilot testing with EFA (n=294), and CFA (n=185) to assess structural validity and reliability.

Results: Interviews identified 326 primary codes, categorized into 16 subcategories and five core metamotivational strategies: regulation of professional identity, regulation of vision, regulation of excellence, regulation of motivational space, and regulation of motivational network. The Educators' Metamotivational Strategies (EMS) scale, comprising 15 items, demonstrated strong psychometric properties (EFA: 65.6% total variance, CFA: RMSEA = 0.07, SRMR = 0.06, CFI = 0.91, Cronbach's alpha = 0.855, composite reliability = 0.86).

Conclusions: This study provides robust validity evidence for the measuring educators' metamotivational strategies. The EMS scale measures five key metamotivational strategies and is recommended for use in HPE academic settings.

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Motivation; metamotivation; motivation regulation

Introduction

Educator motivation, a neglected area of research in Health Professions Education (HPE), explores what drives individuals toward educational practice, professional growth, and engagement in teaching others [1]. Dörnyei and Ushioda define educator motivation as both the motivation to teach and the motivation to remain and grow in the profession [2]. However, educators encounter different challenges in their professional life that hinder their motivation to teach and might have a negative impact on their professional identity [3]. The dynamics that sustain or diminish motivation in health professions educators are complex, shaped by the interplay of teaching, clinical practice, and research. These roles involve unique enablers (e.g. prestige, respect, funding, and a calling to heal) and barriers (e.g. competition, poor outcomes, failed experiments, and dissatisfied students) [4]. Given the complex challenges and rewards faced by health professions educators, Alexander and Hoy argue that they require specific strategies to sustain motivation and counter factors that diminish it [5,6]. Recent literature underscores that educator motivation is not only essential for their professional well-being but also significantly impacts student outcomes. Motivated educators are more likely to employ learner-centered approaches, foster engaging learning environments, and enhance students' academic performance and professional development. Therefore, understanding and promoting educator motivation in HPE is critical for improving teaching and learning quality [7].

Research on educators' motivation in medical education, while emerging, remains limited and

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Practice points

- The EMS scale measures five key educators' metamotivational strategies (regulation of professional identity, vision, excellence, motivational network, and motivational space) in health professions education.
- The newly developed EMS scale demonstrates strong psychometric properties, providing a tool for researchers and educators to assess key educators' metamotivational strategies in health professions.
- Researchers are encouraged to investigate how these strategies influence learner outcomes, faculty performance, and long-term professional development in diverse educational settings.

fragmented. Steinert et al. investigated faculty motivation in continuing professional development, highlighting the role of institutional support and recognition, yet their focus remains on extrinsic motivators [8]. Moreover, Verhees et al. explored contextual factors relate to the teacher motivation of healthcare professionals working in different healthcare contexts [9]. Recent studies, such as Hanson et al. have applied Deci and Ryan's self-determination theory (SDT) [10] to examine health professions educators' motivation to teach in preclinical curricula, identifying intrinsic motivators like enjoyment of teaching and contribution to student education, as well as extrinsic factors like lack of recognition or resources as demotivators [11]. However, Hanson et al. primarily focus on motivational states – such as how autonomy, competence, and relatedness influence teaching engagement. Furthermore, Orsini et al. have explored clinical educators' autonomous motivation, identifying intrinsic factors like purpose, enjoyment of teaching, and professional growth as key drivers [7]. According to the findings of Orsini et al.'s, clinical educators are predominantly driven by autonomous motivation to teach rather than controlled incentives [12]. Based on SDT framework, the factors influencing clinical educators' motivation were categorized as originating from 'above' (interactions with stakeholders and societal expectations), 'within' (personal beliefs and dispositions), and 'below' (perceptions of learners' motivation and engagement). Focusing on factors 'within' educators, key autonomous motivators include a profound sense of purpose toward their institution, patient care, and profession, deriving satisfaction from contributing to learners' development, pure enjoyment of teaching, fostering rapport, and pursuing professional growth and mastery. Less dominant controlled motivations from 'within' involve recruitment opportunities, workload reduction, and gaining status. Orsini et al. suggested that to support clinical educators 'within' motivation, it is crucial to nurture their inherent enjoyment, altruistic purpose, and personal fulfillment from teaching [12].

Notably, existing research predominantly examines external factors influencing educator motivation, with scant attention to internal, self-regulated motivational processes, particularly in the complex context of HPE. This gap underscores the need for explaining and measuring educators' metamotivational strategies, particularly in the complex, multifaceted context of HPE. Few researchers have conceptualized factors from 'within' through the lens of self-regulation of motivation or, metamotivation. Metamotivation is defined as the process and knowledge by which individuals regulate their motivational states. It involves two interconnected processes: metamotivational monitoring, which evaluates the intensity and nature of motivation toward a goal, and metamotivational control, which applies this evaluation to select strategies for sustaining or enhancing motivation [13]. In the early 2000s, Wolters identified five self-regulation strategies that one develops and uses to influence their own motivation: mastery self-talk, performance self-talk, interest enhancement, environmental structuring, and self-consequating in students [14]. Later the names of these strategies have been modified, other strategies of regulating learner motivation have been introduced [15–18]; several theoretical models have been proposed [19–22], and measurement instruments have been developed [17,23–26]. Despite the expansion of understanding students' motivation, there remains little on the strategies that educators use to regulate their motivation. While the ability to monitor and control their motivation could enhance their personal and professional growth [27] and possibly improve teaching effectiveness, we know little about educators' motivation regulation ['28–31].

Metamotivational strategies serve distinct purposes for students and educators, reflecting their differing roles and professional contexts. For students, these strategies focus on sustaining academic motivation and enhancing learning within structured educational settings, such as attending lectures, studying for exams, or completing assignments. In contrast, educators require motivational regulation to address the complex demands of their professional roles, which extend beyond academic tasks to include teaching, research, mentorship, and institutional responsibilities. Students' regulation strategies, like those developed in Wolters' study, are tailored to scenarios specific to learners, such as managing motivation for coursework or exams, which do not align with the challenges faced by educators,

particularly health professions educators who navigate clinical duties and interprofessional collaboration [32]. While students' motivation is often tied to short-term academic outcomes, educators must sustain long-term professional engagement, maintain passion for teaching, and pursue scholarly productivity amidst institutional pressures. Additionally, educators' motivation is deeply connected to their professional identity as leaders and mentors, unlike the primarily self-focused motivation of students. Directly applying students' strategies to educators, risks overlooking these unique needs, potentially introducing bias and reducing effectiveness. An educators-specific set of strategies is therefore essential to address the distinct motivational challenges educators face.

Given these differences, in the present study, we aim to develop a questionnaire with appropriate evidence of validity and reliability to measure metamotivational strategies among educators. As we know, based on the modern concept of validity proposed by Kane and Messick, validity is not a property of the instrument itself but rather refers to the degree to which evidence and theoretical rationale support the interpretations and uses of test scores [33,34]. Therefore, in this study, our aim was to gather multiple sources of validity evidence, consistent with modern frameworks of validity. Understanding the factors that influence health professions educators' motivation to teach is critical for ensuring high-quality education and the sustainability of the distributed healthcare education model. This approach serves as a pathway to identify effective strategies that can be further developed and supported by contextual variables, taught, and adopted through professional formation and faculty development. This research therefore was undertaken to explore two main purposes: (A) explaining the metamotivational strategies in the health professions educators; (B) developing Educators' Metamotivational Strategies (EMS) scale.

Method

Setting

This research was conducted as an exploratory sequential mixed-method study during 2021–2023. The target group comprised educators working at HPE universities. The study procedures were meticulously designed following the guidelines outlined in AMEE Guide No. 87 [35] and were structured into seven distinct steps as follows:

1. *Conduct a literature review*

To review the literature and identify studies related to motivational regulation in educators, we conducted comprehensive searches of the PubMed, Scopus, and PsycINFO databases, as well as the Google Scholar search engine. The keywords used included 'motivation,' 'regulation,' 'metamotivation,' 'faculty member,' 'teacher,' 'facilitator,' 'educator,' and 'trainer.'

1. *Conduct interviews*

A conventional content analysis approach was adopted to allow for an inductive exploration of educators' metamotivational strategies, deriving themes directly from educators' experiences without imposing pre-existing frameworks. Hence, this step was conducted in parallel with the literature review (step 1), and the findings from the literature review did not direct interview questions or analysis of its results. Participants were purposively selected for in-depth interviews based on their recognition as outstanding educators at Iran's annual Motahari festival, which evaluates teaching excellence, impact, and contributions to medical education through a standardized, guideline-based process. Selected educators are formally recognized during an official ceremony, ensuring that participants in this study were acknowledged for their exceptional teaching by an institutional body.

Qualitative data were collected using in-depth and semi-structured interviews. These interviews were conducted either in-person or virtually, depending on the participant's preference. The goal of the interviews was to stimulate retrospective reflection on the situations and events experienced in their teaching roles and to describe the strategies they use to maintain their motivation to continue and strive for improvement. Formal, written informed consent was obtained after introducing the purpose of the study and the members of the research team. Participants were assured of the confidentiality of all responses, and the process of recording and analyzing responses was detailed. The interviews began with open-ended questions about the participants' choice to become health professions educators, exploring their motivations for this career choice. Further questions addressed some of the motivational challenges they encountered. Probing questions were employed to delve into the events and circumstances surrounding these challenges and to understand how participants sustained their motivation to continue teaching and pursue the health professions educator path. The interview protocol is provided in Appendix A. After the completion of each interview, the audio recordings were transcribed and entered into MAXQDA 2020 (VERBI Software, 2020) for qualitative content analysis. Memoing was also conducted during both the coding process and the interviews. When coding the interviews, the researchers adhered to two key criteria:

1. The health professions educators must use the strategy consciously and with the intention of influencing their own motivation.

2. The strategy should be used to maintain or promote motivation.

The average duration of the interviews was 90 min, and the interviews were concluded after reaching data sufficiency. Data sufficiency in qualitative HPE research refers to the state where the collected data are deemed adequate to address the research questions or achieve the study's objectives, without necessarily reaching the point of data saturation [36].

To analyze the interviews, the researchers employed the five steps of conventional content analysis proposed by Hsieh and Shannon [37].

1. *Data immersion*: The researchers immersed themselves in the data by reading and rereading the interview transcripts to gain a comprehensive understanding.
2. *Code generation*: Key themes and concepts were highlighted, and initial codes were generated based on these insights.
3. *Preliminary code labeling*: The initial codes were labeled to facilitate organization and further analysis.
4. *Creation of categories and subcategories*: The codes were sorted and grouped into categories and subcategories, reflecting the underlying themes.
5. *Detailed definition of categories*: The categories were developed and defined in detail to ensure clarity and consistency in the analysis.

To ensure the rigor of the study, the criteria provided by Lincoln and Guba [38,39] were considered. The researchers employed bracketing during data collection and analysis to enhance the credibility of their findings. To improve confirmability, all research steps were meticulously recorded. After transcription, the interview texts were returned to the health professions educators for review and modification if necessary. The research team conducted several meetings throughout the study's implementation to maintain consistency and rigor. All interviews were promptly recorded and transcribed. Three researchers independently classified all interviews, and the data analysis was reviewed by experts to validate the process and confirm the final categories. To increase the transferability of the findings, participants were selected with maximum variation in terms of gender and academic ranking.

1. *Synthesize the literature review and interviews*

The similarities and differences between extracted strategies from interviews and the literature review were compared.

1. *Develop items*

To develop the questionnaire items, a panel of 10 experts with extensive experience in medical education and educational psychology was convened. Panel members were selected based on their expertise in motivation research within educational contexts, particularly in HPE, and their experience in scale development and psychometric validation to ensure methodological rigor. This panel aimed to design items for each identified strategy. The response options for the questionnaire items were structured using a five-point Likert scale: 'Always,' 'Usually,' 'Sometimes,' 'Rarely,' and 'Never,' which participants used to indicate the frequency with which they employed each strategy.

1. *Conduct expert validation*

To achieve content validity evidence, the initial draft of the instrument was distributed as an online questionnaire link to 15 experts in the fields of medical education and educational psychology. The content validity index (CVI) and content validity ratio (CVR) were calculated using Lawshe's table and Waltz and Bausell's formula.

1. *Conduct cognitive interviews*

The evidence of response process validity was examined through cognitive interviews. The interviews continued until data sufficiency was reached (three interviews), such that no ambiguities in the interpretation of the items were observed in the last two interviews.

1. *Conduct pilot testing*

The evidence of structural validity was evaluated through both exploratory and confirmatory factor analyses. Initially, for the Exploratory Factor Analysis (EFA), 294 health professions educators (with a minimum of one semester of teaching experience) were recruited using convenience sampling, ensuring at least 10 participants per item to ensure adequacy for achieving robust statistical power [40]. The developed questionnaire, designed on the ePoll platform, was distributed to 294 health professions educators. IBM SPSS Statistics software (Armonk, NY) was used for the analysis of the collected data. The KMO index (>0.70) and Bartlett's test of sphericity ($p < .05$) were employed to assess sample adequacy and data factorability. Principal component analysis was used for data extraction, and Varimax rotation was applied. Subscales were confirmed if they included at least three items with an eigenvalue greater than 1. Additionally, items with a factor loading of less than 0.4 were refined and revised in the study.

Two years after the EFA in 2021, during which feedback was collected and three items were refined, Confirmatory Factor Analysis (CFA) was conducted in 2023 with a new sample of 185 educators to analyze the revised scale. Then the questionnaire) was

redistributed using a convenience sampling method (at least 10 participants per items). The analysis was conducted using SmartPLS 4.1.0.9 software. Some of the best goodness-of-fit indices were selected to estimate model fit. RMSEA and SRMR values below 0.08, as well as five indices – GFI, AGFI, NFI, TLI, and CFI – exceeding 0.90, indicate an acceptable fit [41]. Finally, the reliability was examined by calculating Cronbach's alpha coefficient and composite reliability with values above 0.70 considered acceptable [41,42].

Results

Literature review

As outlined in section 'Introduction', the literature review traced the historical evolution of research on metamotivational strategies. These strategies have predominantly been explored within the context of students. However, the literature review conducted in this study identified a significant gap, as no comprehensive research specifically exploring the metamotivational strategies of educators was found. Nevertheless, scattered studies have referenced various 'within' factors that enhance educators' motivation. These factors were systematically categorized by Orsini et al. in their review [12].

Interviews (explaining strategies)

After conducting interviews with 13 health professions educators, no new codes emerged, but we continued to reach 15 interviews to ensure data sufficiency. The characteristics of the participants are shown in Table 1.

Three-hundred and twenty-six primary codes were extracted, which were finally categorized into 16 subcategories and five categories (Figure 1). Therefore, five metamotivational strategies identified in this study consists of: regulation of professional identity, regulation of vision, regulation of excellence, regulation of motivational network, and regulation of motivational space (see Appendix B).

Regulation of professional identity

According to the findings of this study, health professions educators regulate their academic motivation by defining and adhering to their teaching identity. This identity reflects their commitment to students, relatives, institutions, country, and societal well-being, fostering sustained motivation. It should be noted that role models play a key role in regulating professional identity. Educators integrate insights from role modeling, ethical principles, and cognitive-behavioral frameworks to systematically develop

Table 1. Demographic characteristics of the participants in the interviews.

	Gender		Academic rank		
	Female	Male	Assistant professor	Associate professor	Full professor
Number	8	7	4	6	5
Percent	40%	60%	26.6%	40%	33.3%

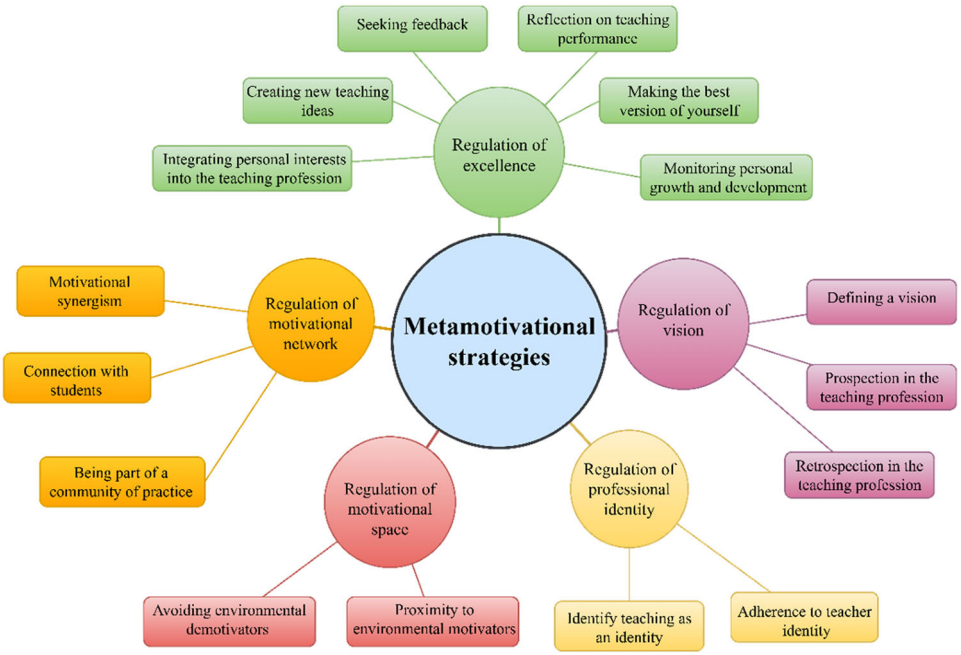

Figure 1. Five metamotivational strategies used by health professions educators and sub-themes.

their professional behavioral frameworks. Through deliberate reflection, this process facilitates the regulation of their professional identity, enabling alignment with institutional norms, ethical values, and competency standards within medical education. Sustained internalization of these constructs promotes pedagogical consistency, intentional practice, and the progressive embodiment of educator roles, thereby reinforcing their own maturation as exemplars within the field.

> To be honest, my first, second, and third job is a teacher, and I consider medicine my fourth job, so I can say that as a professional identity, I first consider myself a teacher and then a doctor. (Interview # 2, Male, Associate professor)

> My teacher identity is independent of my medical profession. I try to be up-to-date and effective in my role as a teacher, this identity is unique and irreplaceable with other positions. This identity motivates me and makes me responsible. (Interview # 8, Female, Assistant professor)

Regulation of vision

The first aspect of this strategy is retrospection in the teaching profession. This means that the educator thinks about their previous experiences and performance, looks for traces of their efforts impact on their students. Have my actions been in line with my vision? Obviously, if the answer to this question is positive, the educator will step toward his vision with a higher motivation. The other aspect is prospection in the teaching profession, for which, educators define the vision of an educator by specifying aims and ideals, and thinking about the results of their work.

> Sometimes I reflect on how my students have grown, and it reminds me why I started teaching. It's deeply fulfilling when I see that the students I helped train have become influential and outstanding figures in society. (Interview # 3, Female, Associate professor)

Regulation of excellence

Health professions educators intentionally regulate their excellence in teaching profession. For example, an educator who consciously monitors their personal growth and improvement by seeking feedback and reflect on their teaching performance, regulate their qualifications in teaching. In this strategy, the educator tries to become the best version of herself/himself as an educator. Therefore, with activities such as creating new ideas and integrating the personal interests in the teaching profession, she/he maintains, monitors, and controls their motivation. Imagine an orthopedic clinician who loves art and paints. She tries to create enjoyable learning for the students by integrating this art in the teaching moments.

> I regularly seek feedback from students. It motivates me when I see that my learners receive positive signals from me. (Interview # 11, Female, Assistant professor)

> I am in contact with the graduates now. When they say that we were able to diagnose the patient's problem from what you taught us … and it was very effective … when I see the results of my efforts, it motivates me a lot. (Interview # 4, Male, professor)

> It is motivator for me to know and integrate one or more other skills apart from my specialized field. For example, painting, poetry, playing an instrument, baking sweets. (Interview # 5, Male, Associate professor)

Regulation of motivational network

The findings of this study indicate that participation in a group of highly motivated individuals enhances individual motivation. This phenomenon has been termed 'motivational synergy.' Interactions and networks with motivated colleagues and students play a significant role in this process. For example, the educator tries to build a team with members who are highly motivated. Being an influencer, self-branding and networking in social networks are the other activities educators use to control their motivation.

> Fortunately, I always make a team of energetic people in the hospital. A series of motivated people who are always together. (Interview # 2, Male, Associate professor)

> My teaching career will never stop. I go to teach in the clinic. I teach in cyberspace, in Telegram groups where thousands of students subscribe. (Interview # 5, Male, Associate professor)

Regulation of motivational space

Health professions educators sustain their motivation by avoiding demotivating environmental factors and engaging with motivating elements in their surroundings. Keep away from disturbing events or people are examples of avoidance of demotivators. On the other hand, engagement in public works and serving in underprivileged areas are among the actions that are close to the environmental enhancers of motivation.

> I closed all the news channels; I stopped checking the website and I didn't look for what is happening in the world. (Interview # 1, Male, professor)

> Every time I go to underprivileged and remote areas and visit children and disabled people, my spirits soar. I feel valued. (Interview # 11, Female, Assistant professor)

> I never argue with such [unmotivated] people because it is useless, I avoid it. I do my own work. (Interview # 11, Female, Assistant professor)

Synthesize the literature review and interviews

The synthesis of the findings of the first two steps indicated that the metamotivational strategies for medical educators are more oriented toward their professional development and efficacy in teaching. Based on the findings of the second step of the study, the educator strategies were more holistic, involving professional identity, long-term vision, and the broader educational ecosystem. This distinction highlights the tailored approaches required to meet the specific motivational needs of educators within the medical education context. Based on this synthesis, a document was developed, defining the five metamotivational strategies for educators and their dimensions to provide experts with a comprehensive understanding of each strategy's components.

Develop items

In the expert panel, the phrase 'To maintain or enhance my academic motivation, I …' was considered as the basic question at the beginning of the questionnaire. In this panel, three items were designed based on the concepts of each strategy and for each subscale. Subsequently, 15 items were developed to measure five metamotivational strategies.

Evidence of validity and reliability

The initial 15-item version of the EMS scale was evaluated for content validity evidence, with both CVR and CVI indices calculated, indicating high content validity according to Lawshe's table (average: 0.95). Based on feedback received, three items were revised at this stage. Also following cognitive interviews, only one additional item was modified.

The EFA conducted on the pre-final version of the EMS scale with 294 health professions educators. The KMO index (0.805) and Bartlett's test of sphericity (sig = 0.000) confirmed adequate sample size and factorable data. EFA identified five factors with eigenvalues greater than 1, explaining 65.6% of the total variance. These factors formed the subscales: *regulation of professional identity* (factor 1), *regulation of vision* (factor 2), *regulation of excellence* (factor 3), *regulation of motivational network* (factor 4), and *regulation of motivational space* (factor 5). As shown in Table 2, two items, RoS3 and RoN3, exhibited factor loadings below the 0.4 threshold, indicating weak association with their intended constructs. Additionally, item RoE1 showed substantial cross-loading with multiple subscales. Further examination revealed ambiguities in the wording of these items, leading to inconsistent respondent interpretations. To address this, the problematic items were revised with more precise and contextually appropriate wording to ensure consistent interpretation. At the conclusion of this step, the initial 15-item version was refined, three ambiguous items were revised, and the final version of the EMS scale was established.

The CFA conducted on the final version of EMS demonstrated acceptable fit indices for the measurement model, with RMSEA = 0.07, SRMR = 0.06, GFI = 0.90, AGFI = 0.85, NFI = 0.84, TLI = 0.90, and CFI = 0.91. Factor loadings were all above 0.4 and statistically significant at $p < .05$. For the overall instrument, Cronbach's alpha coefficient was 0.855 and the composite reliability was 0.86. The factor loadings along with Cronbach's alpha coefficients for each subscale are presented in Figure 2. The final version of the EMS scale is presented in Table 3.

Table 2. Exploratory factor analysis of the EMS (pre-final version).

		Factor				
Domain	Item	1	2	3	4	5
Regulation of professional identity (RoI)	RoI1		0.762			
	RoI2		0.797			
	RoI3		0.789			
Regulation of vision (RoV)	RoV1	0.669				
	RoV2	0.761				
	RoV3	0.799				
Regulation of excellence (RoE)	RoE1	0.449	0.448			0.454
	RoE2					0.632
	RoE3					0.515
Regulation of motivational network (RoN)	RoN1				0.843	
	RoN2				0.810	
	RoN3				0.363	
Regulation of motivational space (RoS)	RoS1			0.639		
	RoS2			0.798		
	RoS3	0.345	0.352	0.316		

Table 3. The Educators' Metamotivational Strategies (EMS) Scale (responses use a five-point Likert scale: always, usually, sometimes, rarely, never).

To sustain or enhance my motivation for teaching, I …	
Regulation of professional identity	- Follow the styles of professors I admire as role models. - Uphold the dignity and status of teaching at all times. - Commit myself to the principles and framework of the teaching profession.
Regulation of vision	- Reflect on my impactful role in society through the mission of teaching. - Seek evidence of my influence in my students' successes. - Collect and document the outcomes of my teaching endeavors.
Regulation of excellence	- Present the best version of my teaching persona in the academic community. - Solicit feedback from others about my teaching performance. - Utilize all my skills and passions to elevate the teaching profession.
Regulation of motivational network	- Collaborate with specialized teams in research or education. - Actively participate in communities of practice relevant to my profession. - Join academic groups with high motivation and drive.
Regulation of motivational space	- Avoid negative-minded individuals in educational settings. - Design my educational spaces (e.g. office or classroom) to reflect my preferences. - Incorporate motivational elements (such as photos, gifts, or inspiring objects) into my teaching environment.

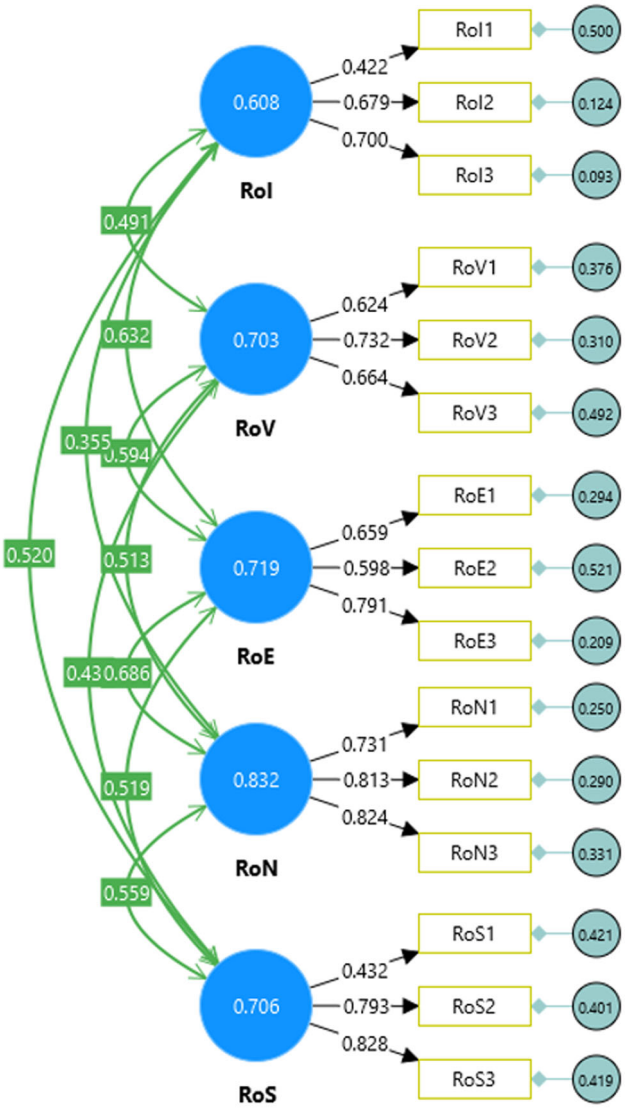

Figure 2. Confirmatory factor analysis of the final version of the EMS, Cronbach's alpha coefficients, and standardized factor loadings. RoI: regulation of professional identity; RoV: regulation of vision; RoE: regulation of excellence; RoN: regulation of motivational network; RoS: regulation of motivational space.

Discussion

This study aimed to explore metamotivational strategies used by health professions educators and to develop the EMS scale as an assessment tool. Five strategies were emerged in our study: *regulation of professional identity*, *regulation of vision*, *regulation of excellence*, *regulation of motivational space*, and *regulation of motivational network*. The results obtained

from the EFA supported this structure, and further examinations in CFA demonstrated that the final version of the instrument possesses strong evidence of validity and reliability. The findings of the present study particularly the emphasis on regulation of professional identity, vision, and excellence are in line with those of Orsini et al. [12].

One of the strategies clarified in this study was *regulation of professional identity*. The educator's identity is described as an individual framework of beliefs, values, and attitudes that provides a context for evaluating and developing the educator's educational activity [43]. Teacher identity refers to how educators perceive themselves, how they are seen by others, and how they choose to behave [44]. Cantillon et al. believe that (based on individualist perspectives) health professions educators have investment in building their identity and consider the clinical work environment as a static context for the process of identity formation [45]. Orsini et al. in their study identified a *sense of purpose towards the institution, patient care and community, and the profession* as strong motivators for clinical educators [12]. The *sense of purpose* is defined through behaviors such as the importance of maintaining teaching standards and loyalty to educational institutions, commitment to patient safety, and upholding healthcare standards. For instance, 17 primary studies reported that educators had a desire to *pay it forward* and *give back* to their profession. As previously mentioned, we also highlighted in our study the commitment of educators to students, relatives, the country, and humanity and humanity in definition of regulation of professional identity.

Another strategy identified in this study was the *regulation of vision*. It seems that health professions educators think about their vision, ultimate goals and aims to regulate their motivation. Health professions educators may find greater value in focusing on their vision to train medical students who enhance healthcare and reduce suffering, rather than competing for higher evaluation scores. Based on Orsini et al.'s study, *contributing to learners' development and integration into the community of practice* is a key motivator for clinical educators [12]. This involves supporting learners' professional and personal growth into competent clinicians, demonstrating proper clinical practices, sharing expertise, providing clinical context, and acting as a role model, which fosters a sense of achievement for educators. This factor closely aligns with the regulation of vision strategy, as both emphasize reflecting on past experiences, evaluating the impact of teaching efforts on students, and setting clear aims and ideals.

In the present study, the use of personal interests to regulate academic motivation was included under the strategy of *regulation of excellence*. Because we found that if health professions educators try to make the learning experience interesting, enjoyable, and fun, all such activities are ultimately aimed at achieving excellence in teaching and providing the best version of themselves for teaching students. However, from Wolters and Benzon's point of view, interest enhancement is a separate strategy and refers to the student's effort to make academic tasks enjoyable and relate the educational material to personal interests [17]. Orsini et al.'s identified *professional growth and mastery* as a key motivator for clinical educators [12]. According to this systematic review, *mastery of teaching competence* was cited in five primary studies, *preservation of clinical competence* in 16 studies, and *challenge and intellectual stimulation* in 11 studies as 'within' factors driving autonomous motivation. Additionally, *desire/enjoyment of teaching*, reported in 22 primary studies, aligns with *integrating personal interests into the teaching profession*, a subcategory of the *regulation of excellence* strategy, which emphasizes fostering intrinsic motivation through meaningful engagement in teaching.

Health professions educators try to regulate their motivations by forming a *motivational network* and creating a motivational synergy. Norouzi et al. and Umemoto emphasized the role of communication with other people in the self-regulation of motivation [15,26]. This strategy aligns closely with the findings of Orsini et al. who identified the *desire to establish rapport and connectedness with learners* as a powerful motivator for teaching. This factor, highlighted in eight primary studies, fosters self-reflection and fresh perspectives on both clinical practice and teaching [12].

The next strategy is the *regulation of motivational space*. Wolters believes that this strategy involves managing the learning environment to avoid distractions or facilitate focus on academic tasks [17]. Norouzi et al. highlight that medical students employ two distinct categories of strategies to regulate their learning environment: those that foster physical readiness and those that promote mental readiness within the learning context [15,23]. Based on the findings of Orsini et al.'s study, certain factors are capable of influencing the controlled motivation of clinical educators [12]. If we consider *status and pride* and *recruitment opportunities for specialty and as partners* as aligned with *proximity to environmental motivators*, and *reduce own workload* as aligned with *avoiding environmental demotivators*, it can be stated that these factors demonstrate a high degree of alignment with the *regulation of motivational*

space. Given the intrinsic orientation identified in this cohort, it remains valuable to explore how these strategies operate across different cultural and institutional settings where controlled motivators may play a larger role.

Limitations and recommendations

While this study provides valuable insights, several limitations warrant consideration. A key limitation of this study is the use of convenience sampling, which may restrict the generalizability of the findings. Future research should consider probabilistic sampling methods to enhance external evidence of validity. Additionally, one potential limitation is self-report bias, which is common in studies of this nature. Participants' responses might have been influenced by personal perceptions or social desirability. This research was limited to health professions educators in Iran, which may restrict the generalizability of the findings to other cultural or institutional contexts. Additionally, the identified strategies require further exploration to establish their impact on teaching performance and faculty development outcomes. Future studies should aim to replicate this research across diverse cultural and institutional contexts and identify contextual variations in metamotivational strategies. Moreover, exploring the long-term impact of these strategies on educators' well-being, job satisfaction, and teaching effectiveness would provide a deeper understanding of their practical significance. While we endeavored in this study to gather robust evidence of validity and reliability through various methods, certain evidence, such as predictive validity and cross-cultural validity, remains unexplored. Future research should investigate these dimensions to further substantiate the scale's applicability across diverse educational contexts. We also would like to mention that we conceptualized excellence of education in this study in a rather narrow sense, concentrating on self-perceived relationships with students instead of proven efficiency and effectiveness.

The findings of this study have several practical and theoretical implications. Establishing peer support networks, structured mentoring programs, and reflective learning communities can further sustain educators' motivation by promoting collaboration and shared experiences. Faculty development programs can leverage the EMS scale to design targeted programs that enhance metamotivational skills, strengthen professional identity, and foster academic networks. From an institutional perspective, strategies to foster motivational synergy should be prioritized. To further elucidate the implications of this study, at the individual level, educators' awareness of their metamotivational strategies can empower them to make informed choices about employing more effective strategies to address motivational challenges. Given the active role attributed to individuals in regulating their motivation, this heightened awareness is expected to facilitate the enhancement of educators' metamotivational knowledge, enabling them to utilize these strategies more effectively in their professional trajectories. Understanding faculty metamotivation also holds significant relevance for educational leadership and policy, as it supports sustainable academic workforce development by fostering a motivated and resilient educator community.

Conclusions

This study aimed to explore the metamotivational strategies employed by health professions educators and to develop a tool, the EMS scale, for assessing these strategies. Five key metamotivational strategies were identified: regulation of professional identity, regulation of vision, regulation of excellence, regulation of motivational network, and regulation of motivational space. The EMS scale demonstrated robust psychometric properties, offering evidence of validity and reliability for further research in this domain.

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Author contributions

All authors contributed in the analysis and interpretation of data for writing the manuscript. All authors read and approved the final manuscript.

Ethical approval

This manuscript is extracted from the results of two projects which were registered with the codes of ethics (IR.TUMS.MEDICINE.REC.1402.032 and IR.TUMS.MEDICINE.REC.1401.315) in Tehran University of Medical Sciences. The researchers were committed to complying with ethical principles throughout the research period. In all the steps, the rights of the participants were respected by providing sufficient information about the objectives of the research and maintaining the confidentiality of the data.

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Data availability statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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