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Adaptation and validation of the Work Extrinsic and Intrinsic Motivation Scale (WEIMS) in pharmacy students based on Self-Determination Theory (SDT)

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Abstract

Background Motivation can significantly impact students' academic decisions and perseverance. Therefore, assessing this construct is an essential step for evaluating the educational environment's support for higher qualities of motivation and implementing targeted educational interventions. In this research, we sought to culturally adapt and validate the Work Extrinsic and Intrinsic Motivation Scale, a tool based on the Self-Determination Theory. The study was carried out within the context of pharmacy education in Iran, during the 2022–2023 academic year.

Methods In the first step, the questionnaire was culturally adapted using the 5-step framework developed by the American Association of Orthopedics Surgeons. The content validity was then evaluated by thirteen experts in the field of motivation. The tool underwent cognitive interviews with pharmacy students for face validity, and the finalized version was distributed online to 165 pharmacy students from the Tehran University of Medical Sciences. The data were analyzed using SPSS 26 and SmartPLS 4 packages to perform exploratory and confirmatory factor analyses. Cronbach's alpha along with composite reliability, were employed to measure the reliability of the adapted tool.

Results The content validity ratio was equal to or greater than 0.54, indicating the retention of all items. However, two items had an item-content validity index within the range of 0.7 to 0.79, suggesting that they be revised. Two additional items were also amended during the cognitive interviews. The confirmatory factor analysis demonstrated good factor loadings exceeding 0.4, with Cronbach's alpha and composite reliability values varying between 0.76 and 0.89, and favorable convergent and discriminant validity.

Conclusion These findings support the good validity evidence and applicability of the adapted Farsi version of the Work Extrinsic and Intrinsic Motivation Scale in the pharmacy educational context.

Keywords Self-Determination Theory, WEIMS, Psychometric, Pharmacy

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Introduction

Motivation is a multifaceted psychological construct that greatly influences students' academic decisions and learning behaviors. Its manifestation in the educational context is through students' selection of academic pursuits, the allocated time and energy devoted to learning a subject, and the extent to which they persevere in the face of educational challenges [1]. There has been a myriad of theories explaining motivation [2–5], with the Self-Determination Theory (SDT) emerging as the most extensively employed theory in the past twenty years [6]. SDT conceptualizes motivation as intrinsic, extrinsic, and amotivation. Intrinsic motivation stems from the inherent joy of activity, extrinsic motivation is driven by external contingencies, and amotivation is characterized by the perceived incapability of performing an activity or viewing it as useless [6]. Extrinsic motivation is then classified into four subcategories — external, introjected, identified, and integrated— and each manifests varying levels of self-determination and agreement with personal identity [7, 8].

In the context of health professions, particularly in pharmacy education, rapid and unforeseeable advances necessitate life-long learning to keep up with accelerating updates and retain the required capabilities in pharmacy practice [9]. To this end, motivation is deemed a fundamental attribute of a life-long learning approach, as individuals are unlikely to use other relevant skills for learning throughout their lifespan without it [10, 11]. An intrinsically motivated disposition gives rise to a lifelong learner who engages deeply in the ever-changing world of learning [11].

Research regarding motivation among pharmacy students has shown varying results throughout their academic years. A research study on first-year pharmacy students, for example, highlighted that enjoying science and a fondness for working in healthcare were key motivators [12]. The inclination toward health-related fields, also known as intrinsic drivers, has been emphasized in other studies. [13, 14]. Moreover, longitudinal research in Australia demonstrated that intrinsic motivation reliably scored higher than extrinsic motivation did over five consecutive years [15]. Wilson et al. noted that both intrinsic and extrinsic factors influence students' motivation, with no meaningful difference in intrinsic motivation between first- and fourth-year pharmacy students [16].

The Garavalia et al. study, on the other hand, highlighted that external motivation among first-year pharmacy students was stronger than their third-year peers [17]. Hastings et al. also assessed the motivation of freshman pharmacy students at the outset and end of their first academic year and reported an unfavorable shift from mastery goal orientation to academic alienation [9]. Observations in another study paralleled these results in a comparable way [18]. As noted in their investigation, the authors observed a transition to a "passing the exams" approach among pharmacy students over their academic years, who were initially highly motivated upon entering the pharmacy program [18].

Prior studies have highlighted that internally driven motives significantly increase students' academic achievements, well-being, and persistence, whereas externally focused engagements can lead to deleterious effects in the long term [19–23]. Real-world external rewards, such as the focus on obtaining higher grades in college, can have detrimental effects even on intrinsic motivation over the long term [21]. Hence, balancing both types of motivation is imperative to cultivate well-rounded graduates who maintain strong intrinsic aspirations to pursue their careers in the labor market [24]. Therefore, gauging motivation can be considered a key factor for evaluating the educational environment's support for higher qualities of motivation and implementing targeted educational interventions.

To assess this construct, various SDT–grounded measurement tools have been utilized [22, 25–27]. For example, Ryan and Connell developed a 26-item SDT–based scale to explore students' behavioral incentives [22]. Another tool, the 28-item French scale, which was later translated into English as the Academic Motivation Scale, was designed based on the same theory of motivation [25]. Additionally, the Échelle de Motivation vis-à-vis des Loisirs is a French motivation scale designed for motivation assessment in recreational activities [26]. The Global Motivation Scale is a further 28-item tool utilizing a seven-point Likert scale that is primarily designed to investigate individuals' holistic motivation toward their behavior in life [27]. However, the major limitation of these measurement tools is their inability to measure integrated regulation because of their difficulty distinguishing it from identified motivation [28, 29].

The Work Extrinsic and Intrinsic Motivation Scale (WEIMS), constructed by Tremblay et al., is one of the few established scales featuring the assessment of six SDT constructs, including integrated regulation. The questionnaire features eighteen items with a seven-point Likert scale, originally designed to assess work motivation to predict "optimal functioning" [30]. Their study further examined the scale's factorial structure and psychometric properties, reporting acceptable internal consistency (Cronbach's alpha ranging from 0.64 to 0.83), satisfactory fit indices, and item-to-total correlations above 0.50 [30]. To date, the questionnaire has been applied across various occupational settings worldwide, demonstrating dependable validity and reliability results [31–39].

To the best of our knowledge, no culturally adapted tool has been developed for assessing motivational qualities in Iran's pharmacy education context. Therefore, we aimed to develop and validate such a tool to determine SDT–based motivational qualities for further research. In this study, we adapted the WEIMS with a focus on adjustments for educational settings.

Methods

Participants and settings

This study is part of a project focused on motivation among pharmacy students. The project received ethical approval from Tehran University of Medical Sciences (TUMS) [Ethics Code: IR.TUMS.MEDICINE.REC.1400.1377]. Students were assured that their data would be kept private and anonymous. Participation was not mandatory, and students were permitted to opt out of the study at their preference.

Sample size calculation

The sampling method employed was convenience sampling. In scale development studies, the suggested sample size includes five to ten participants for each item [40]. Therefore, an 18-item questionnaire required a sample size range of 90 to 180 respondents to be considered sufficient. The KMO test was also employed to ensure sample size adequacy [41].

Cultural adaptation and validation

The cross-cultural adaptation and psychometric evaluation of the WEIMS were conducted using the 5-step framework, which is the most frequently used guideline in the literature [41], as detailed in the Beaten et al. study [42] and outlined below:

Step 1 – Initial translation

Two professional English translators, one aware of the context and one unaware of the context, were recruited to translate the items into Farsi. Afterward, a discussion session was held to review the transcripts to pinpoint any discrepancies or nuanced wording and resolve them.

Step 2 – Synthesis

The synthesis of the two transcripts was prepared in a session where the two translators and one of the researchers were present.

Step 3 – Back translation

This step was performed by two translators, with no relevant backgrounds, who were proficient in English.

Step 4 – Expert committee

A joint session was held with the translators and researchers to finalize the translated questionnaire. The original and all translated versions were reviewed to address any ambiguities and make further necessary adjustments. Additionally, content validity was assessed during this process. For this purpose, thirteen scholars with expertise in motivational research in medical education were enlisted. The content validity assessment form, along with the revised draft, was sent to them. Given the essentiality of items, the experts rated each using a three-point Likert scale (1: "necessary", 2: "useful but not necessary", and 3: "unnecessary"), and the Content Validity Ratio (CVR) was computed with the Lawshe formula [43].

Considering the number of panelists and the Lawshe table of CVR minimum value of acceptance [43], items with a CVR < 0.54 were removed from the scale.

Moreover, the panel rated the items in terms of relevance, simplicity, and clarity on a four-point Likert scale (4: very relevant-simple-clear, 3: relevant-simple-clear, 2: somehow relevant-simple-clear, and 1: not relevant-simple-clear), and the Content Validity Index (CVI) was determined at Item-level (I-CVI) using the Waltz and Bausell formula.

Items scoring an I-CVI ≥ 0.78 were remained, and those < 0.7 were eliminated. However, items with 0.7 < I-CVI < 0.79 were kept but with further modifications [44].

Step 5 – Pretesting

In this step, the revised questionnaire version underwent cognitive interviews with Doctor of Pharmacy (Pharm.D) students to refine and determine its face validity. During the process, the participants were required to articulate the items aloud and verbalize the questions in their own words. Their interpretations, suggestions, and any ambiguities they identified were thoroughly probed and documented. The items were revised accordingly, and the modified questionnaire was further adopted in subsequent cognitive interviews insofar as data saturation was achieved. The adapted WEIMS questionnaire was then administered in the pre-testing phase, collecting data to assess construct validity and reliability.

Data collection and analysis

The finalized version of the adapted WEIMS, comprising 18 items covering all six subscales of motivation, was administered online to Pharm.D students at TUMS during the 2022–2023 academic year. The questionnaire was created using Google Forms, and the survey link was shared via student messaging platforms. To ensure an

adequate response rate, weekly reminder messages were sent, and in-person requests were made to encourage participation.

The collected data were analyzed through SPSS 26 and SmartPLS 4 package to perform Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) tests [45] for construct validity assessment. In the EFA, the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity were conducted to ascertain data suitability and factorability. Principal Component Analysis (PCA) with varimax rotation was employed for component extraction, keeping items with factor loadings exceeding 0.4 [46, 47]. Finally, the CFA was performed via PLS software.

The Average Variance Extracted (AVE) for each subscale was used to examine convergent validity, and AVE values equal to or above 0.5 were considered acceptable [48]. Discriminant validity was assessed based on cross-loadings and the Fornell-Larcker criterion. In the cross-loading approach, an item should have lower factor loadings with other constructs but the highest with its parent construct [49]. According to the Fornell-Larcker criterion, the values on the primary diagonal of the matrix need to be greater than those of the non-diagonal elements in the respective columns and rows [50].

Cronbach's alpha and Composite Reliability (CR) were employed to determine the reliability of each subscale and the overall tool. Cronbach's alpha values spanning from 0.6 to 0.8, and CR values greater than 0.7 were considered acceptable [51, 52].

Results

The translation and cultural adaptation process led to modifications in seven items, following expert committee discussions and cognitive interviews with students. These revisions are summarized in Supplementary 1.

Supplementary files 2 and 3 illustrate the original and adapted versions of the WEIMS, respectively, each with eighteen items measured on a five-point Likert scale. The scoring system for this questionnaire employs a single scoring index, termed the Work Self-Determination Index (W-SDI), which is calculated as follows [30][1], [2], [3], [4], [5], [6]:

$$\text{W-SDI} = (3\times \text{I.M}^1)+(2\times \text{INT.M}^2)+(1\times \text{ID.M}^3)+(-1\times \text{IJ.M}^4)+(-2\times \text{EX.M}^5)+(-3\times \text{AMO.M}^6)$$

The possible score range for the 5-point WEIMS is ± 24. Positive scores indicate self-determined types of motivation, whereas negative scores reflect non-self-determined qualities.

In the pretesting phase, four students participated in cognitive interviews. For the main validation study, 165 Pharm.D students from TUMS completed the adapted WEIMS online. The gender distribution was 63.03% women and 36.97% men, with the highest participation from 3rd-year students and the lowest from their final-year peers.

Psychometric evaluation

Content validity

Supplementary 4 presents the results obtained from the content validity indices, generated from the experts' assessments of the adapted questionnaire. The CVR values were equal to or greater than 0.54 for all eighteen items, indicating the necessity of retaining them in the tool. Nevertheless, the I-CVI for two items (INT.M_1, IJ.M_2) exhibited values between 0.7 and 0.79, which further proceeded under revision.

Face validity

The revised version was used to establish face validity. During the cognitive interviews, two interpreted items were found to lack comprehensibility and thus were further modified and justified for better understandability and retained thereafter. For instance, the phrase "زیرا می‌توانم با استفاده از حرفه داروسازی به اهداف باارزش و مفیدی دست‌یابم" was refined to "زیرا می‌توانم با استفاده از رشته داروسازی به اهداف شغلی خود در آینده دست‌یابم" and "زیرا داروساز شدن به من کمک می‌کند" was revised to "زیرا داروساز شدن به من کمک می‌کند به اهداف خاص و مهم شخصی‌ام دست‌یابم" (see Supplementary 1).

Construct validity

The KMO value in the EFA was 0.83, and Bartlett's test of sphericity was statistically significant (p-value < 0.05). This confirms that the sampling adequacy is high and the data are suitable for factor analysis. The total variance explained table revealed that six factors accounted for 76% of the variance, with eigenvalues greater than one. The results obtained from the rotated component matrix demonstrate that the items, consistent with the predefined structure of the questionnaire, measure six subscales of motivational qualities. (Table 1).

The factor loading values from the CFA measurement for all the constructs were greater than 0.4 (Fig. 1).

[1] Intrinsic motivation
[2] Integrated regulation
[3] Identified regulation
[4] Introjected regulation
[5] External regulation
[6] Amotivation

Table 1 Rotated component matrix of the adapted WEIMS questionnaire

	Components[a]					
	1	**2**	**3**	**4**	**5**	**6**
Q1[b]					0.72	
Q2					0.77	
Q3					0.77	
Q4			0.83			
Q5			0.72			
Q6			0.79			
Q7	0.82					
Q8	0.75					
Q9	0.67					
Q10				0.84		
Q11				0.88		
Q12				0.71		
Q13						0.56
Q14						0.81
Q15						0.84
Q16		0.84				
Q17		0.82				
Q18		0.82				

[a] Components: identified regulation (1)—amotivation (2)—integrated regulation (3)—introjected regulation (4) -intrinsic motivation (5)—external regulation (6)

[b] Question

According to Table 2, all six constructs had AVE values above 0.5, demonstrating the convergent validity of the adapted questionnaire. Additionally, the results illustrated in Supplementary 5 show the fulfillment of discriminant validity requirements. The items presented no significant cross-loadings on other adjacent constructs, and the AVEs of each construct were greater than those of the remaining ones.

Reliability

The Cronbach's alpha values were between 0.76 and 0.88, and the CR values varied from 0.76 to 0.89, both falling within the acceptable range for reliability (Table 2).

Discussion

The objective of the current study was to develop a culturally adapted tool based on SDT for assessing motivation among pharmacy students. Given the importance of motivational quality for educational pursuits among university students [9, 53], developing a tailored scale to assess this construct is indispensable. Thus far, no culturally adapted tool rooted in SDT has been developed for pharmacy students. Therefore, we selected the WEIMS, originally designed by Tremblay et al. [30] to measure work motivation, and customized it for educational purposes. The questionnaire is a shorter version of the Blais Inventory of Work Motivation, a 31-item French version that measures work motivation based on SDT [54]. The WEIMS, however, requires less time for participants to complete and yet covers all six constructs of motivational qualities postulated by SDT [30].

In line with the original questionnaire, the adapted version measures six subscales of motivational qualities, as identified by EFA and confirmed through CFA. This result mirrors the CFA findings from data collected using the adapted Polish version among Polish employees [38]. In contrast, the study by Kotera et al. found a different outcome. The data from the Japanese version of the WEIMS suggested a three-factor structure [37]. The authors assumed that this might be due to cultural differences, as the individualistic culture of Canadians in the study by Tremblay et al. might have helped participants distinguish between different motivational types, while the collectivistic culture of the Japanese may not [30, 37].

For the assessment of content validity, the Item-Level Content Validity Index (I-CVI) was calculated, with values of 0.78 or higher representing a high level of agreement among reviewers [55]. CVI calculation is frequently used in the literature and is determined at two levels: Item-Level (I-CVI) and Scale-Level (S-CVI), with I-CVI being more commonly employed than S-CVI [55]. In most research studies, either I-CVI or S-CVI is reported for content validity assessment, as using both can be perplexing and lead to different conclusions [55]. Given

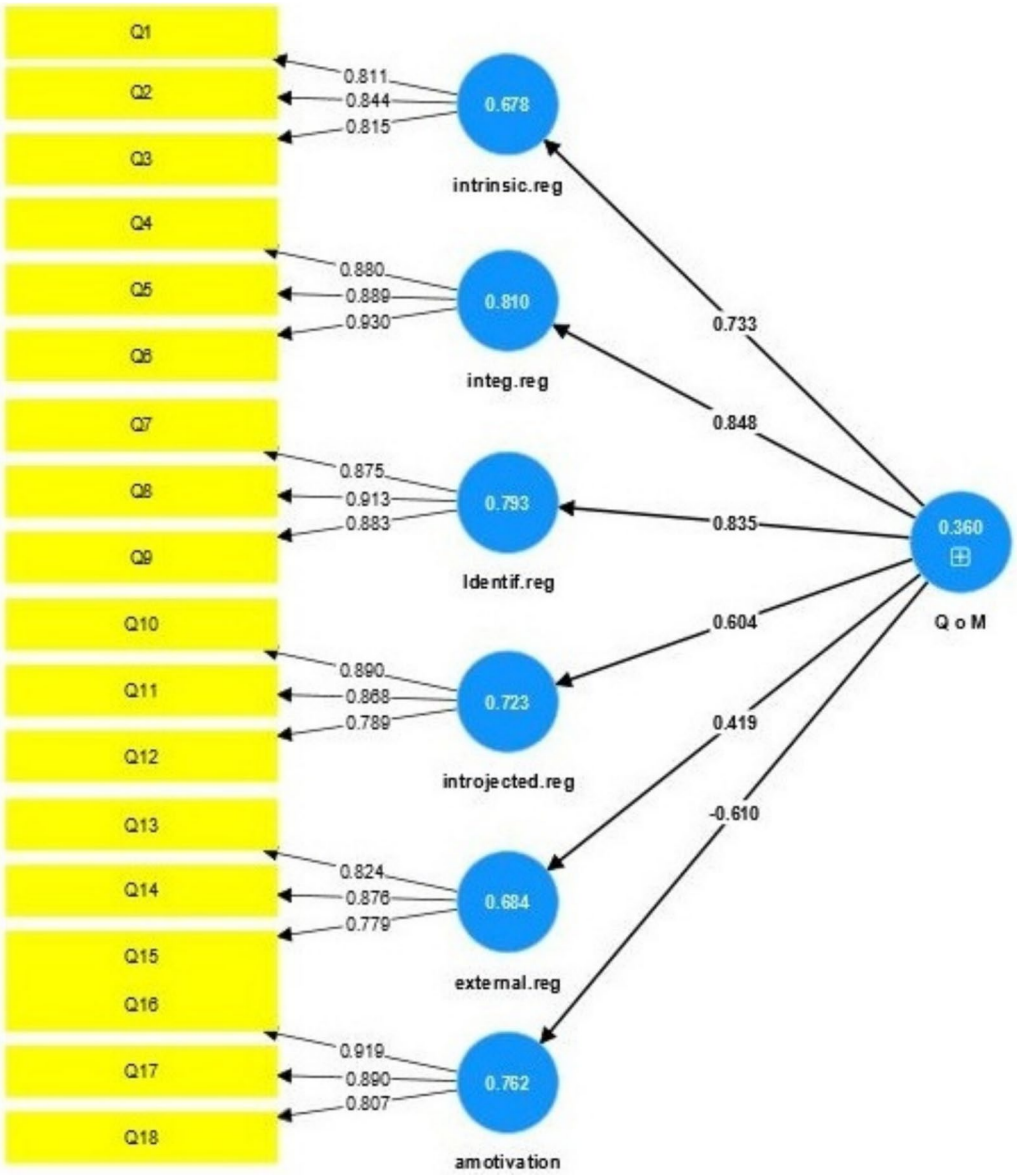

Fig. 1 Factor loadings, AVEs, and path coefficients of the adapted WEIMS questionnaire

the aforementioned reasons, the I-CVI method was employed to determine the content validity.

Although the majority of items in the adapted tool exhibited high levels of I-CVI, two items scored in the 0.7–0.79 range (INT.M_1, IJ.M_2). These two items were subsequently improved, and experts' feedback on three other items (I.M_2, EX.M_1, EX.M_3) was also incorporated to enhance clarity. Their feedback focused on avoiding biased wording usage and ensuring a smoother flow of sentences for better comprehension.

In the next step, the revised questionnaire underwent face validity assessment through cognitive sessions with pharmacy students to evaluate their understanding of each item. These interviews sought to analyze students' comprehension and interpretation of each item and incorporate revisions accordingly [56]. Since there is no optimal number of interviews recommended to ascertain face validity, the iterative approach of performing interviews and revising the tool was employed until data saturation was reached and no further constructive feedback was provided [57]. In this respect, a total of four interviews were facilitated, and two items (ID.M_2, ID.M_3) were identified as lacking clarity and using ambiguous wording, which was subsequently amended.

Table 2 AVE, Cronbach's alpha, and CR of the adapted WEIMS subscales

Subscales[a]	AVE[b]	Cronbach's alpha	CR[c]
I.M	0.68	0.76	0.76
INT.M	0.81	0.88	0.89
ID.M	0.79	0.87	0.87
IJ.M	0.72	0.81	0.82
EX.M	0.68	0.77	0.77
AMO.M	0.76	0.84	0.86

[a] Subscales: intrinsic motivation (I.M)—integrated regulation (INT.M)—identified regulation (ID.M)—introjected regulation (IJ.M)—external regulation (EX.M)—amotivation (AMO.M)

[b] Average Variance Extracted

[c] Composite Reliability

In verifying construct validity, the KMO score fell within the range of 0.7 to 0.8, reflecting a "good" level of sampling adequacy [58]. The significance response of Bartlett's test of sphericity suggests appropriate correlations among the items, as indicated by the correlation matrix [59].

The discriminant validity results illustrated evident distinctions among the six constructs of motivation assessed by the adapted questionnaire, with no significant overlap observed. Moreover, the AVE values demonstrated satisfactory correlations among items within each construct [60].

All six constructs exhibited dependable internal consistency for the tool's reliability. The Cronbach's alpha values retrieved in this study (0.76–0.88) were comparable to those reported in the original WEIMS validation study by Tremblay et al., where the minimum and maximum values were 0.64 and 0.83, respectively [30], as well as to those observed in a report on motivation among Greek nurses (0.59–0.73). Similarly, another research documented Cronbach's alpha scores ranging from 0.803 to 0.945. corroborating a sufficient level of internal consistency [61].

Conclusion

The current study represents the first effort to culturally adapt and validate a tool for assessing motivation through SDT within the context of pharmacy education. The adapted Farsi version of the WEIMS proved to be structurally valid and reliable, demonstrating strong psychometric properties. This tool can be effectively employed for further investigations into the field of motivation within educational contexts.

Limitations and recommendations

The WEIMS was originally designed to assess workplace motivation. Its 18-item structure, which evaluates all six motivation constructs, makes it a unique tool by requiring less time and encouraging higher participation rates. More importantly, SDT the underlying motivation theory of the WEIMS, is the most frequently used framework in the recent motivation literature.

One of the limitations of our study was its exclusive focus on pharmacy students from TUMS, which restricted our ability to reach students from other universities. Therefore, it is essential to conduct further studies to include pharmacy students from diverse educational settings to ensure more comprehensive and adequate representation.

Despite the promising results obtained in this study, the tool must be psychometrically assessed in other educational contexts (such as medicine, nursing, etc.) in Iran. Therefore, this version of the WEIMS cannot be considered applicable in other domains without undergoing validation processes.

Abbreviations

SDT	Self-Determination Theory
WEIMS	Work Extrinsic and Intrinsic Motivation Scale
TUMS	Tehran University of Medical Sciences
CVR	Content Validity Ratio
CVI	Content Validity Index
I-CVI	Item-level Content Validity Index
S-CVI	Scale-level Content Validity Index
Pharm.D	Doctor of Pharmacy
EFA	Exploratory Factor Analysis
CFA	Confirmatory Factor Analysis
KMO	Kaiser–Meyer–Olkin
PCA	Principal Component Analysis
AVE	Average Variance Extracted
CR	Composite Reliability
W-SDI	Work Self-Determination Index
I.M	Intrinsic Motivation
INT.M	Integrated regulation Motivation
ID.M	Identified regulation Motivation
IJ.M	Introjected regulation Motivation
EX.M	External regulation Motivation
AMO.M	Amotivation

Supplementary Information

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Supplementary Material 1.

Supplementary Material 2.

Supplementary Material 3.

Supplementary Material 4.

Supplementary Material 5.

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Declaration of generative AI in scientific writing
We declare that we applied ChatGPT on several occasions in the writing process to improve the readability and language without altering the originality of the sentences.

Clinical Trial Number
Not applicable.

Authors' contributions
The study was designed by MA and AN. All three authors were actively involved in the cultural adaptation and validation process of the scale. HA and AN contributed to the data collection and statistical analysis. AN was mainly involved in data refinement and statistical reports. The manuscript was drafted by HA and interpreted by MA, AN, and HA. All authors read and approved the final manuscript.

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Data availability
The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
The current study complies with the principles outlined in the Declaration of Helsinki. The project received approval from Tehran University of Medical Sciences (TUMS) [Ethics Code: IR.TUMS.MEDICINE.REC.1400.1377]. Students completed informed consent forms prior to their participation.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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