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Types of Medical Students' Learning Motivation and their Relationship with Learning Engagement and Psychological Well-being: A Latent Profile Analysis

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Abstract

Objective: This study aims to classify the learning motivation of medical students using latent profile analysis and explore the relationship between learning engagement within different latent types of learning motivation and psychological well-being. **Methods:** A total of 635 medical students from a medical university in Guangxi were selected for this study. The Motivated Strategies for Learning Questionnaire, Utrecht Work Engagement Scale-Student, and Psychological Well-being Scale were used to collect data. Latent profile analysis was employed to classify medical students into different types of learning motivation. Regression analysis was conducted to examine the relationship between learning engagement and psychological well-being across different types of learning motivation. One-way analysis of variance was used to investigate the differences in learning engagement and psychological well-being among different types of learning motivation. **Results:** Latent profile analysis identified three types of learning motivation among medical students: medium motivation (23.46%), medium-high motivation (43.31%), and high motivation (33.23%). Different types of learning motivation had a significant positive impact on learning engagement and psychological well-being (β=0.66, 0.59, 0.62, all $p<0.001$). There were significant differences in learning engagement and psychological well-being among different latent profile types. Medical students with high motivation demonstrated the highest levels of learning engagement and psychological well-being, followed by those with medium-high motivation, and those with medium motivation had the lowest levels.

Keywords: Learning Motivation, Learning Engagement, Psychological Well-Being, Medical Students, Latent Profile Analysis

Problem Statement

College students are the backbone of the future of our country and the key force for national rejuvenation and prosperity. Medical students are an important part of college

students, but they face unique challenges due to their strong specialization, extensive curriculum, complex learning content, high difficulty, and long duration of study. Moreover, the strong specialization of medical students leads to limited employment opportunities and high job pressure. This puts higher demands and standards on their theoretical knowledge and professional skills. Medical students frequently encounter challenges such as academic burnout (Greenmyer et al.,2022; Saeed et al.,2021), academic procrastination (Real Delor et al.,2023; Tian et al., 2021), academic anxiety (Almutairi et al., 2024; Moreira et.al., 2018),sleeping disorders Zainab et al (2020) and employment anxiety(Lin et al.,2022). In response to these academic challenges, this study seeks to examine the learning motivation of medical students from a positive psychology perspective, with a focus on their academic engagement and psychological well-being. The aim is to provide theoretical guidance that contributes to the healthier and more sustainable development of medical students.

Psychological well-being is based on the concept of eudaimonia, which emphasizes the realization of self-improvement and self-potential of individuals (Ryff, 1998). It refers to the positive psychological experience that individuals generate when engaging in activities that align with their deep-seated values (Waterman, 1993). The thesis of happiness and well-being is an important topic in positive psychology. Approaching the challenges and difficulties in professional learning from a positive perspective and enhancing the happiness and well-being of medical students not only contributes to their own healthy growth but also contributes to the development of the national medical industry.

Student engagement is an important pathway for self-realization for medical students. Student engagement refers to a persistent, positive psychological state of emotion and cognition related to learning, research, and employment, including vigor, dedication, and absorption (Schaufeli et al., 2002). The sustained happiness theory Lyubomirsky et al (2005), suggests that individual happiness is influenced by three major factors: genetics, circumstances, and intentional activities. These factors account for 50%, 10%, and 40% of the variance in happiness, respectively. The theory integrates the set-point theory (Kammann, 1983), and the dynamic equilibrium theory (Headey and Wearing, 1989), suggesting that the influence of genetics and circumstances on individual happiness is relatively stable, while intentional activities are the key to increasing individual happiness. For highly specialized medical students, learning activities are the most important, meaningful, and valuable intentional activities in their college life. Student engagement is not only an important measure of learning status but also a significant predictor of academic performance and learning outcomes (Effah, 2022). Therefore, it is plausible that student engagement is one of the important factors influencing psychological well-being.

In previous studies, a significant correlation between psychological well-being and learning engagement has been found, and it has been verified that psychological well-being significantly predicts learning engagement (Pan, 2023). However, whether learning engagement can significantly predict psychological well-being remains to be further explored. Yu (2017), and Joo (2017), respectively investigated the relationship between work engagement and psychological well-being among civil servants and employees, confirming that work engagement can significantly predict psychological well-being. Chen Chunxiao (2020) used latent profile analysis and found that there are different relationships between work engagement and psychological well-being among employees with different types of

work motivation. Therefore, this thesis aims to use latent profile analysis to classify medical students' learning motivation and explore the impact of different types of learning motivation on learning engagement and psychological well-being.

Learning motivation refers to an intrinsic force that regulates, stimulates, and sustains learning behavior and is directed towards certain academic goals (Bråten, 2005). As the intrinsic driving force behind learning behavior, learning motivation best reflects students' initiative, self-awareness, and purposefulness in learning. Motivation is considered to play an important role in promoting individuals' positive potential development. Self-determination theory (Deci & Ryan, 2000) suggests that motivation is a continuum ranging from amotivation, extrinsic regulation, introjected regulation, identified regulation, to intrinsic motivation. Previous studies have mostly categorized motivation into intrinsic and extrinsic motivation, or controlled motivation and autonomous motivation, to examine their impact on other variables. It has been found that compared to extrinsic motivation, intrinsic motivation has a more significant impact on college students' learning engagement Yan (2016), and compared to controlled motivation, autonomous motivation has a more significant impact on learning engagement (Jiwen, 2015).

Most previous studies that adopt a "variable-centered" approach tend to emphasize the differential effects of a specific type of motivation, while often overlooking the effects of other types of motivation in the context (Howard, 2016). Medical students' learning activities are often influenced by different types of motivation simultaneously, and a "variable-centered" perspective may not adequately consider the effects of other motivations in this process. Latent Profile Analysis (LPA) is a "person-centered" research method that identifies the best-fitting model by fitting indicators, and its classification accuracy and effectiveness are significantly superior to traditional analysis methods (Wang, 2011). The "person-centered" LPA method precisely explores the simultaneous effects of different motivations and provides a new perspective and new ideas for in-depth analysis of the impact of different combinations of learning motivations on other variables. This thesis adopts the latent profile analysis method to identify different groups of learning motivations, explore the relationship between medical students' learning motivation, learning engagement, and psychological well-being, and provide theoretical references for promoting positive education in learning engagement and psychological well-being among medical students.

Research Methods

Participants

Convenience sampling method was used to conduct a questionnaire survey among medical students from a medical college in Guangxi. The principle of anonymity and voluntary participation was followed. The questionnaires were distributed through both online platforms (such as Wenjuanxing) and paper-based forms. A total of 701 questionnaires were collected. Questionnaires with obvious missing data or obvious non-serious responses were excluded. Finally, 635 valid questionnaires were obtained, with an effective rate of 90.58%. Among them, there were 225 male students (35.43%) and 410 female students (64.57%). There were 249 freshmen (39.21%), 157 sophomores (24.72%), 112 juniors (17.64%), and 117 seniors (18.43%). There were 452 students from rural areas (71.18%) and 183 students from urban areas (28.82%). There were 104 only children (16.38%) and 531 non-only children (83.62%).

Research Instruments

Academic Motivation Scale

The Academic Motivation Scale College(AMS-C), developed by Vallerand et al (1992), and translated and revised by Baohua (2007), was used. The scale consists of 28 items, including seven dimensions: intrinsic motivation to know, intrinsic motivation toward accomplishment, intrinsic motivation to experience stimulation, extrinsic motivation identified, extrinsic motivation introjected, extrinsic motivation external regulation, and amotivation. Each dimension has four items. The scale uses a 7-point Likert scale, with 1 indicating "completely disagree" and 7 indicating "completely agree". Higher scores indicate higher levels of motivation in that dimension. In this study, the Cronbach's α coefficient of the scale was 0.93, and the Cronbach's α coefficients of each dimension were 0.89, 0.91, 0.88, 0.88, 0.71, 0.79, and 0.79 respectively.

Learning Engagement Scale

The Utrecht Work Engagement Scale-student (UWES-S), developed by Schaufeli et al. (2002) and translated and revised by Fang et al (2008), was used to measure learning engagement. The scale consists of 17 items, including three dimensions: vigor, dedication, and absorption, with 6, 5, and 6 items respectively. The scale uses a Likert-7 point scoring system, with 1 indicating "never" and 7 indicating "always". Higher scores indicate higher levels of learning engagement. In this study, the Cronbach's α coefficient for the scale was 0.97, and the Cronbach's α coefficients for the three dimensions were 0.90, 0.92, and 0.91, respectively.

Psychological Well-being Scale

The Psychological Well-being Scale, developed by Ryff (1989), was used in this study. The scale has four versions: a long version with 84 items, a medium-long version with 54 and 42 items, and a short version with 18 items. The 42-item version was selected for this study, as previous research has demonstrated its good reliability and validity (Morozink et al., 2010; McDowel, 2022). The scale includes six dimensions: autonomy, environmental mastery, personal growth, purpose in life, positive relationship with others, and self-acceptance, with 7 items for each dimension. The scale uses a Likert-6 point scoring system, with 1 indicating "strongly disagree" and 6 indicating "strongly agree". Higher scores indicate higher levels of psychological well-being. In this study, the Cronbach's α coefficient for the scale was 0.92, and the Cronbach's α coefficients for the six dimensions were 0.72, 0.75, 0.72, 0.79, 0.81, and 0.73, respectively.

Demographic Variables

Demographic variables, including gender, grade, hometown, and whether the participant is an only child, were collected through a questionnaire.

Data Analysis

Latent Profile Analysis (LPA) was conducted using Mplus 8.3 software to identify different types of learning motivation among medical students. Starting from a one-class initial model, the number of classes in the model was gradually increased, and the fit indices were comprehensively compared to find the model with the best fit. The determination of the best fit model was mainly based on information criteria (AIC, BIC, aBIC), classification indices (Entropy), and likelihood ratio tests (LMRT, BLRT) to evaluate the classification performance (Nylund, 2007). The specific criteria for judging are as follows: 1) Smaller values of AIC, BICa,

and BIC in the information criteria indicate better model fit; 2) The entropy value in the classification indices is used to evaluate the accuracy of the model's classification. An entropy value above 0.8 indicates high classification accuracy, and a value closer to 1 indicates higher classification reliability. 3) The LMRT and BLRT values in the likelihood ratio tests are used to compare the fit differences between the current K-class model and the K-1 class model. If the p-value is significant, it indicates that the K-class model is better than the K-1 class model.

Statistical analysis was performed using SPSS 26.0 software. Pearson correlation analysis was conducted to explore the relationship between variables. Regression analysis was used to investigate the impact of different latent types of medical students' learning engagement on psychological well-being. One-way analysis of variance (ANOVA) was used to compare the mean scores of learning engagement and psychological well-being among different latent types of learning motivation in medical students.

Results

Common Method Bias Test

Since this thesis collected data through self-report measures, there may be common method bias. Therefore, Harman's single-factor factor analysis was conducted to test for potential common method bias. The results of the unrotated principal component analysis showed that there were 12 common factors with eigenvalues greater than 1, and the cumulative explanation rate was 66.28%. Among them, the first common factor had an explanation rate of 32.31%, which did not exceed the critical threshold of 40%. Therefore, there was no significant common method bias in this study.

Descriptive Statistics Analysis

The results of the correlation analysis are shown in Table 1. It was found that amotivation was significantly negatively correlated with all dimensions of learning motivation (except for the intrinsic-integrated dimension), as well as learning engagement and psychological well-being. The other variables showed significant positive correlations with each other.

Table 1
Descriptive Statistical Analysis of Variables and Related Analysis

variable	M±SD	1	2	3	4	5	6	7	8	9
1. Intrinsic Motivation to Know	5.33±1.17	1								
2. Intrinsic Motivation Towards Accomplishment	5.15±1.22	0.89**	1							
3 Intrinsic Motivation to Experience Stimulation	5.15±1.17	0.86**	0.87**	1						
4Extrinsic Motivation Identified Regulation	5.70±1.07	0.83**	0.76**	0.75**	1					
5 Extrinsic Motivation Introjected Regulation	4.69±1.13	0.60**	0.67**	0.63**	0.59**	1				
6 Extrinsic Motivation External Regulation	5.61±1.11	0.43**	0.38**	0.40**	0.61**	0.56**	1			
7 Amotivation	2.91±1.30	-0.30**	-0.27**	-0.19**	-0.31**	0.43	-0.05	1		
8 Learning engagement	4.74±1.09	0.62**	0.63**	0.61**	0.51**	0.37**	0.11**	-0.19**	1	
9 Psychological well-being	4.62±0.76	0.51**	0.52**	0.46**	0.47**	0.25**	0.11**	-0.38**	0.61**	1

Note： * Table denotes P<0.05, ** Table denotes P<0.01, *** Table denotes P<0.001, the same below

Latent Profile Analysis of Learning Motivation in Medical Students

To explore the latent types of learning motivation among medical students, a latent profile model was established with the seven dimensions of the Motivation for Learning Scale as manifest variables. Starting with a baseline model with one profile, additional profiles were added sequentially for model fitting and estimation. The results (see Table 2) showed that as the number of profiles increased from 1 to 5, the information criteria AIC, BIC, and aBIC decreased, while the classification index entropy increased, ranging from 0.91 to 0.93. The likelihood ratio test indices BLRT and LMR were both significant (P<0.001). However, in the 6-profile model, although the AIC, BIC, and aBIC values were lower than those of the 5-profile model, the LMR was not significant (P>0.05), indicating that the 6-profile model was not superior to the 5-profile model. In both the 5-profile and 4-profile models, one profile had a very low probability of only 3%, making it unsuitable as a separate profile. Considering the fit indices of each model, the 3-profile model had the best fit and ensured model parsimony and accuracy.

Table 2
Fit Indicators for Potential Cross-Sectional Models of Medical Students' Learning Motivation

Profile	AIC	BIC	aBIC	Entropy	LMR (P)	BLRT (P)	Category probability
1	14013.92	14076.27	14031.82				
2	12093.05	12191.03	12121.18	0.92	<0.001	<0.001	0.54/0.46
3	11401.13	11534.74	11439.49	0.91	<0.001	<0.001	0.24/0.43/0.33
4	11052.85	11222.09	11101.44	0.92	0.030	<0.001	0.03/0.4/0.25/0.31
5	10706.75	10911.62	10765.57	0.92	0.045	<0.001	0.31/0.21/0.03/0.21/0.23
6	10577.52	10818.02	10646.57	0.93	0.330	<0.001	0.19/0.03/0.31/0.24/0.02/0.21

As shown in Figure 1, among the three profiles of learning motivation, the first profile consisted of 149 medical students, accounting for 23.46% of the total sample. The first profile of medical students had significantly higher scores in amotivation compared to the other two profiles. However, their scores on external regulation, introjection, identification, intrinsic motivation to stimulation, intrinsic motivation toward accomplishments and intrinsic motivation to know were lower and significantly lower than the other two profiles. Nevertheless, the scores across all dimensions ranged from 3 to 4, indicating a moderate level of learning motivation. Therefore, this profile can be labeled as "Moderate Motivation." The second profile comprised 275 medical students, accounting for 43.31% of the total sample. Compared to the first and third profiles, this profile had higher scores in all dimensions of motivation, placing it at an above-average level. Hence, this profile can be labeled as "Moderately High Motivation." The third profile consisted of 211 medical students, making up 33.23% of the total sample. This profile had the lowest scores in amotivation and higher scores in all other dimensions compared to the first and second profiles, indicating a high level of motivation. Therefore, this profile can be labeled as "High Motivation."

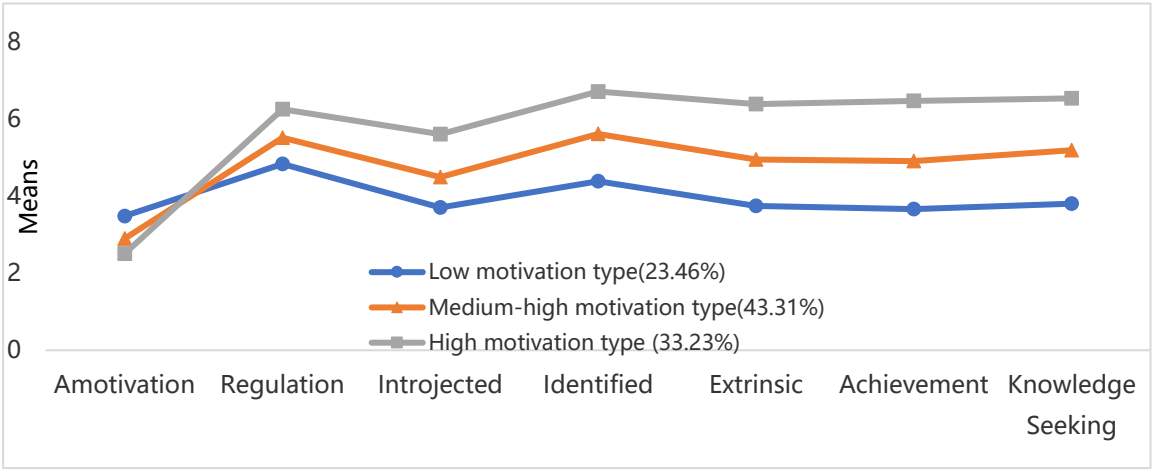

Figure 1: Latent Profile Plot of Learning Motivation Types among Medical Students

The Relationship between Learning Engagement and Psychological Well-being among Medical Students with Different Learning Motivation Types

After using latent profile analysis to divide the sample into three categories, controlling for gender, grade, hometown, and only-child status, we examined the predictive role of learning engagement on psychological well-being. The regression results are presented in

Table 3

Table 3 Results of a Regression Analysis of Medical Students' Academic Investment in Psychological Well-Being with Different Types of Thesis Motivations

variable	Mid-motor model (n=149)			Medium to high motive models (n=275)			High motive models (n=211)		
	β	S.E.	t	β	S.E.	t	β	S.E.	t
Gender	-0.05	0.13	-0.78	0.02	0.07	0.44	0.75	0.09	1.34
Grade (freshman)	0.35	0.84	0.39	0.16	0.07	3.10	1.07**	0.65	2.69
Grade (sophomore)	-0.04	0.59	-0.10	0.02**	0.33	0.39	0.99**	0.65	2.47
Grade (junior year)	-0.05	0.59	-0.13	0.03	0.14	0.56			
Hometown	-0.03	0.12	-0.41	-0.12**	0.08	-2.19	0.22	0.10	0.37
Are you an only child	0.07	0.16	0.10	-0.02	0.10	-0.42	0.37	0.13	0.61
Learning engagement	0.66***	0.05	10.35	0.59***	0.03	12.00	0.62***	0.38	11.16

Note: Demographic variables are virtualized

Multiple Regression Analysis on the Relationship between Learning Engagement and Psychological Well-being among Medical Students with Different Learning Motivation Types

Using learning engagement as the independent variable and psychological well-being as the dependent variable, a multiple regression analysis was conducted. The results revealed that in the Moderate Motivation profile, learning engagement had a significant positive effect on psychological well-being (β=0.66, p<0.001). In the Moderately High Motivation profile, learning engagement had a significant positive effect on psychological well-being (β=0.59, p<0.001). In the High Motivation profile, learning engagement also had a positive effect on psychological well-being (β=0.62, p<0.001).

Differences in Learning Engagement and Psychological Well-being among Medical Students with Different Learning Motivation Types

Using different learning motivation types as the independent variable and learning engagement and psychological well-being as the dependent variables, a one-way analysis of variance (ANOVA) was conducted. The results (see Table 4) showed significant differences in learning engagement and psychological well-being scores among different learning motivation types (p<0.001). Further post-hoc tests revealed that medical students in the High Motivation profile (Type 3) had significantly higher levels of learning engagement and psychological well-being compared to those in the Moderately High Motivation profile (Type 2) and the Moderate Motivation profile (Type 1) (p<0.001). Medical students in the Moderately High Motivation profile (Type 2) also had significantly higher levels of learning

engagement and psychological well-being compared to those in the Moderate Motivation profile (Type 1) ($p<0.001$).

Table 4
Differences in Learning Engagement and Psychological Well-Being among Different Types of Learning Motivations

variable	Profile			F value	Post-mortem comparison
	type 1 (n=149)	type 2 (n=275)	type 3 (n=211)		
Learning engagement	3.83±0.82	4.62±0.77	5.53±1.06	165.09***	3>2>1
psychological well-being	4.06±0.43	4.57±0.62	5.09±0.76	108.37***	3>2>1

Discussion

Potential Categories of Medical Students' Learning Motivation

This study used an individual-centered latent profile analysis to explore the status of medical students' learning motivation. The results revealed three potential categories of learning motivation among medical students: moderate motivation type (23.47%), moderate-high motivation type (40.30%), and high motivation type (33.22%). Compared to previous studies, the categories of learning motivation among medical students have certain professional specificity. Gillet et al (2017), conducted a thesis on first-year students in France and classified learning motivation into six categories, including "moderate no motivation, high no motivation, controlled regulation, autonomous regulation, introjected regulation, and identified regulation." It can be seen that medical students have a higher level of motivation and exhibit more autonomous learning motivation, which is closely related to the requirements of the medical profession. Medical students have relatively high entrance exam scores, indicating that the quality of students' source is well selected. However, it is also observed that among the different latent profiles, the dimension of extrinsic motivation-identification (5.70±1.07) has a relatively high score, followed by extrinsic motivation-regulation (5.61±1.11), and then intrinsic motivation-knowledge (5.33±1.17). This suggests that medical students' learning motivation is primarily driven by external regulation, and students' learning behavior relies more on external rewards and control.

From the three potential categories, it can be inferred that both intrinsic and extrinsic motivation influence the maintenance and stimulation of students' learning activities. Medical students in the high motivation type exhibit high levels of both intrinsic and extrinsic motivation. Medical professional learning is a long-term and complex learning process, which requires both intrinsic interest in the medical profession and learning behavior driven by external control and rewards. The latent profile analysis method can clearly reveal the motivation levels of students in each category across various dimensions.

Relationship between Learning Engagement and Psychological Well-being among Medical Students in Different Potential Categories of Learning Motivation

This study found that learning engagement among medical students in different potential categories of learning motivation significantly predicts psychological well-being ($\beta=0.66, 0.59, 0.62$, all $P<0.001$). This result confirms the proposition of the sustainable happiness theory that intentional activities play an important role in promoting the

enhancement of well-being (Lyubomirsky et al., 2005). However, previous studies have mainly focused on the impact of students' well-being on learning engagement, but not every individual naturally possesses the ability to experience well-being. As General Secretary Xi Jinping once said, "Happiness comes from hard work." Therefore, when students are engaged in learning, their psychological well-being is also satisfied.

Differences in Medical Students' Learning Engagement and Psychological Well-being among Different Categories of Learning Motivation

This study confirmed that the learning engagement and psychological well-being of medical students in different categories of learning motivation have significant positive predictive effects. However, it was also found that there were significant differences in the scores of learning engagement and psychological well-being among medical students in different categories of learning motivation ($P<0.001$). Among the three motivation categories, the scores of learning engagement and psychological well-being were highest for the high motivation category, followed by the medium-high motivation category, and lowest for the medium motivation category. Medical students in the high motivation category demonstrated higher levels of learning engagement and obtained higher levels of psychological well-being. A higher level of motivation indicates that students are more willing to invest in learning for a specific reason or to achieve a certain goal. When individuals have learning motivation, they show a more positive and proactive state, have higher and better pursuits in life, and experience an increasing level of psychological well-being throughout the process from motivation to practical actions.

Research Limitations and Prospects

This study explored the situation of medical students' learning motivation in a certain medical school and found heterogeneity among the students in terms of learning motivation. This has important implications for accurately focusing on students' learning motivation and promoting learning engagement and psychological well-being. However, this thesis still has limitations: firstly, it was a cross-sectional survey, which may lack sufficient objectivity or make it difficult to establish causal relationships. Future research could adopt longitudinal tracking methods for verification and analysis. Secondly, the sample of this thesis was limited to one medical school and may not represent medical students as a whole, which may affect the representativeness of the results. In future research, increasing the sample size and expanding the scope of selection will make the research results more representative.

Conclusions

(1) Learning motivation among medical students can be classified into three latent categories: medium motivation type (23.47%), medium-high motivation type (43.30%), and high motivation type (33.22%). Among them, the medium-high motivation type (43.30%) had the highest proportion.

(2) Learning engagement among medical students in the three categories of learning motivation had a significant positive predictive effect on psychological well-being.

(3) There were significant differences in learning engagement and psychological well-being among medical students in different latent profile types. Medical students in the high motivation type had the highest level of learning engagement and psychological well-being, followed by the medium-high motivation type, and the medium motivation type had the lowest level.

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