



The Mediating Effects of Learning Motivation on the Association between Perceived Stress and Positive-Deactivating Academic Emotions in Nursing Students Undergoing Skills Training

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Purpose: Nursing students experience a high degree of perceived stress during skills training. The resulting academic sentiment is worthy of research. This study examined the learning motivation as a mediator in the association between perceived stress and positive deactivating academic emotions in nursing students undergoing skills training. **Methods:** A survey was conducted on 386 third-year undergraduate nursing students at a university in Changchun, China, in 2017. The survey included the items on perceived stress, learning motivation during nursing skill training, and general academic emotion. There were 381 valid responses (response rate=98.7%). Based on the results of partial correlation and stepwise multiple regression equations, the study examined the mediation model between perceived stress, learning motivation and positive-deactivating academic emotions using process 2.16 (a plug-in specifically used to test mediation or moderation effect in SPSS). **Results:** There was a significant negative correlation between students' perceived stress and learning motivation during nursing skills training and positive-deactivating academic emotions. Nervousness, loss of control, and interest in developing reputation had significant predictive effects on positive-deactivating academic emotions. The mediating model was well supported. **Conclusion:** Learning motivation during nursing skills training lessened the damage of perceived stress on positive-deactivating academic emotions. Improving students' motivation to learn could reduce their perceived stress and build more positive emotions. Positive emotions during learning played an important role in helping nursing students improve skills and enhance their nursing competence.

Key words: Motivation; Pressure; Emotions; Nursing

INTRODUCTION

To meet the requirements of clinical openings, it is necessary for nursing students not only to receive nursing education but also to rigorously train in nursing skills. Nursing skills include a variety of techniques such as monitoring vital signs, aseptic techniques, administering injections and performing intravenous infusions, specimen collection, rescue of critically ill patients, patient

comfort, and psychological care. These skills are practical skills that every nursing staff member must master. The correct procedure directly affects the quality of treatment, quality of care, medical condition, and health and safety of patients. Therefore, nursing skills training is an indispensable part of nursing student training.

Nursing skill training is usually conducted through practical training courses. The traits and emotions exhibited by students in

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practical training courses are closely related to their academic achievement [1]. Pekrun, a German educational psychologist, conceived of the concept of academic emotion while studying the learning process [2]. According to Pekrun's theory, academic emotion refers to various emotional experiences related to students' academic activities in the teaching and learning process, which can be divided into two major categories: positive academic sentiment and negative academic sentiment. Positive academic emotions can stimulate student enthusiasm. Ma [3] divided the positive academic emotions into five types: interest, enjoyment, hope, pride, and relief. According to the degree of stimulation of various emotions, interest, happiness, and hope were considered positive activating dimensions referred to as positive-activating academic emotions (PAAE). Based on the theory, pride and relief were categorized as positive deactivating dimensions called positive-deactivating academic emotions (PDAE). Previous studies have demonstrated an interaction-promotion relationship between students' academic performance and PAAE and PDAE and a negative correlation with academic burnout [4]. Similar results have been found in studies on nursing students [5,6]. It can be observed that elevating students' PAAE or PDAE in nursing skills training is an effective way to improve their professional competence. Positive-activating academic emotions have received more attention compared with PDAE, with many studies probing into the related mechanism. However, few studies have been conducted on PDAE, which leads to two questions: (1) What the factors influence the PDAE in students in training courses? (2) What is the specific mechanism of action of these factors? These questions have become hot topics in the field of nursing education and are investigated in this study.

The influence of stress on students' mental health and behavior is widely known [7]. Stress arises from threatening stimuli in

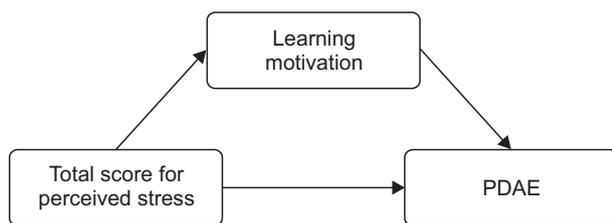
the environment. Individuals use cognitive resources to process and evaluate the threatening stimuli, after which subjective feelings are produced. These feelings are referred to as "perceived stress" [8]. Previous studies have found a significant negative correlation between perceived stress and individual positive emotions [9,10]. Another survey showed that students' perceived stress was negatively correlated with their positive emotions [11,12]. It may be inferred that there are mediating factors between perceived stress and emotional behavior. Individual differences may be revealed by exploring the influence of these factors.

Learning motivation not only initiates learning but also maintains and directs learning. Learning motivation is an internal motivation and psychological resource that directly promotes student learning [13]. The direction, progress and effect of student learning are directly affected by the nature and intensity of learning motivation. Empirical data show that there is a significant correlation between stress and learning motivation [14]. Learning motivation has a positive effect on positive learning emotions [15]. From the perspective of resource preservation theory [16], the change in students' perceived stress can cause an imbalance in their psychological resources and then affect their emotions and behaviors [17]. Based on the theories of previous studies, this study explored the perceived stress and learning motivation of students undergoing nursing skills training as factors influencing PDAE and hypothesized that the relationship between perceived stress and PDAE is mediated by learning motivation during nursing skills training (Figure 1).

METHODS

1. Study design

This was a cross-sectional study of nursing students who were undergoing nursing skills training. The study was restricted to individuals who had completed some basic and professional courses and had not yet started their graduation internship. Therefore, this study used a convenient sampling method to recruit undergraduate nursing students who had recently entered their fourth year. The students completed a self-administered questionnaire survey. Nursing students were the research objects of this study, and the sample size was quite large. Therefore, the



PDAE=Positive-deactivating academic emotions.

Figure 1. Hypothesis of the mediation model.

following formula was used to estimate the sample size [18].

$$n \geq \left(\frac{k}{\alpha} \right)^2 \times P \times (1 - P)$$

α = Significant level

k = Quantile

P = Standard deviation (0.5)

According to the formula, 384 students would meet the accuracy requirements using the convenience sampling method at a required reliability of 95% and an error limit of .05.

2. Setting and sample

A total of 386 eligible students were recruited from 6 classes. A total of 386 questionnaires were distributed and collected in this study, of which 381 were valid questionnaires, accounting for 98.7% of the total number of questionnaires, which was close to the required sample size.

3. Ethical considerations

The study was approved by the Institutional Review Board of The Affiliated Hospital to CCUCM (IRB: CCZYFYLL2016-032, Institutional Review Board of The Affiliated Hospital to CCUCM). All students enrolled voluntarily in the study and were guaranteed confidentiality. All of the students were aware of the purpose of the investigation and signed an informed consent form.

4. Measurements

1) Perceived stress scale

Stress perception was assessed with the Chinese Perceived Stress Scale [19,20]. The scale contains the dimensions of "nervousness" and "loss of control" and a total of 14 items. Seven positive items and seven negative items are each rated on a 4-point Likert scale. Item responses range from 4 ("exact match") to 1 ("completely does not match"). The respondents evaluated the extent of approval based on the described problem. Higher scores indicate higher levels of perceived stress. Nervousness and loss of control scores were calculated as the sum of their respective item scores. The total score was calculated by subtracting 14 from the sum of the two dimensions. The reliability test showed that Cronbach's α values for the "nervousness" and "loss of control" dimensions were .74 and .87, respectively,

which were greater than .70 [21] and indicated that the survey results had high reliability.

2) Learning motivation questionnaire on nursing skills training

The questionnaire used in this study was based on the Learning Motivation Questionnaire for University Students developed in 2006 [22]. The questionnaire was revised according to the education and learning characteristics of basic nursing skills training. For example, the item, "I always feel that studying at the university is a pleasant thing," was revised to, "I always feel that study in skills training course at the university is a pleasant thing." The item, "I want to improve my position in class by studying hard," was revised to, "I want to improve my position in class by studying hard to learn nursing skills." A total of 27 of the 34 items in the original questionnaire were revised. The revised questionnaire was distributed to 582 nursing students to measure interest in studying, desire for skills, interest in developing reputation, and tendency toward altruism, which were the same as the original questionnaire. The reliability test showed that the internal consistency coefficient for the entire questionnaire was .91. Then, 40 participants were randomly selected from these samples, and the questionnaire was retaken 1 month later. The test-retest reliability was .89. As with the original questionnaire, the revised questionnaire was measured on a 5-point scale ranging from 1 ("non-conformity") to 5 ("conformity"), with low scores demonstrating poor learning motivation. Each dimension score was calculated as the sum of its item scores. The total score was the sum of all item scores. The internal consistency coefficients for the four dimensions were adequate: .88, .85, .84, and .80. The Cronbach's α of the scale was .95 in this study.

3) General academic emotion questionnaire for college students

This study used the PDAE dimension of the general academic emotion questionnaire for college students developed in 2008 [3]. The questionnaire contains measures of pride and relief in the learning process and has a total of 19 items. The questionnaire uses a 5-point Likert scale ranging from "non-conformity" to "conformity." Each dimension score was calculated as the sum of its item scores. The total score was the sum of all item scores.

The Cronbach's α for the PDAE dimension was .89. The internal consistency coefficients of pride and relief were .79 and .82, respectively, which were greater than .70, indicating the results were reliable.

5. Data collection

The study was conducted at a university in Changchun, China from September 22 to 29, 2017. We provided professional training to three teachers who coached the third-year nursing students in their grouped skills training. The three teachers distributed a paper questionnaires to students during a break between grouped nursing skills training sessions. The teachers explained in detail the purpose of the survey and provided instructions for completing the questionnaires. The questionnaires were collected immediately by the three teachers after the students completed the survey anonymously.

6. Data analysis

The data from the survey were coded and analyzed with SPSS version 21.0 (IBM Corp., Armonk, NY, USA). An independent samples t-test was used to compare groups. The correlations among variables were calculated using partial correlation analysis. The variables predicting PDAE were calculated using stepwise multiple regression analysis. The mediating effect was verified using Process 2.16. Process 2.16 is macro for SPSS and SAS-

based that mediates and moderates effect analyses and was developed by Hayes [23]. Nonparametric bootstrap and Sobel tests [24] were used to examine the mediating effects with the plug-in. All statistical tests used gender, family location and age as control variables, except for t-tests.

RESULTS

1. Descriptive statistics

The valid sample included 44 male students and 337 female students, 11.5% and 88.5% of the total, respectively. The mean age of the students was 20.43 years (standard deviation [SD]=1.08). In terms of family location, 38.3% (n=146) of the students came from rural areas, 37.3% (n=142) came from cities and the remaining 24.4% (n=93) came from towns. A mean score for each variable was is presented in Table 1. The average scores for stress perception, learning motivation, and PDAE were 36.78 (SD=6.71), 126.41 (SD=25.56), and 63.60 (SD=10.35), respectively.

2. Differences between groups

The results of the chi-square test showed that there was no gender difference in family location. Independent samples t-tests were used to compare differences between men and women students in terms of the other variables. The results in Table 1 show

Table 1. Stress Perception, Learning Motivation and PDAE among Nursing Students

(N=381)

	Men (n=44)	Women (n=337)	X ²	F	ρ
Rural areas	18	128	.43		.806>.05
Towns	9	84			
Cities	17	125			
Age (yr)	20.27±1.02	20.43±1.08		1.31	.362>.05
Total score for perceived stress	23.55±7.01	22.68±6.68		0.09	.423>.05
Nervousness	18.07±4.44	17.80±4.08		0.89	.680>.05
Loss of control	19.48±3.43	18.89±3.18		0.46	.252>.05
Total score for learning motivation	115.48±31.27	127.84±24.42		6.18	.015<.05
Interest in studying	36.30±10.59	40.95±8.91		2.29	.002<.01
Hankering for capability	31.75±8.15	34.43±5.70		13.34	.040<.05
Interest in developing reputation	21.27±7.94	22.97±7.02		1.85	.138>.05
Tendency toward altruism	26.16±8.64	29.49±6.49		11.31	.017<.05
PDAE	60.43±12.43	64.01±10.00		0.84	.031<.05
Pride	28.66±6.59	30.73±5.07		2.43	.015<.05
Relief	31.77±6.47	33.28±5.83		0.02	.112>.05

PDAE=Positive-deactivating academic emotions.

that there were no significant gender differences in nervousness, loss of control or total perceived stress score ($p>.05$). Women students had greater interest in studying, desire for skills, tendency towards altruism, and learning motivation than men students. Women students also showed higher levels of PDAE ($p<.05$). Except for the lack of significant gender differences in the dimension of relief, women students had higher scores for the pride dimension and the total PDAE scores than men students ($p<.05$).

3. Partial correlations

Participants' gender, age, and family location were used as control variables. Partial correlations among the main study variables are shown in Table 2. The results showed that the scores for PDAE (including pride, relief, and total score) were significantly negatively correlated with perceived stress and its dimensions. The total scores for learning motivation and its three di-

mensions (interest in studying, desire for skills and tendency towards altruism) were significantly negatively correlated with perceived stress and its dimensions, while the score for the interest in developing reputation dimension was not correlated with perceived stress. At the same time, there was a positive correlation among the scores for learning motivation and PDAE.

4. Stepwise regression analysis

A stepwise regression analysis was conducted after controlling for gender, age, and family location. Six variables were used as independent variables, including perceived stress factors (nervousness, loss of control) and four dimensions from learning motivation (interest in studying, desire for skills, interest in developing reputation, and tendency toward altruism). The dependent variable was PDAE. Table 3 presents the results of the stepwise regressions.

The results showed that the variables of interest in studying,

Table 2. Bivariate Correlations among Variables

(N=381)

	1	2	3	4	5	6	7	8	9	10	11
1- perceived stress	1										
2- nervousness	.94***	1									
3- loss of control	.89***	.67***	1								
4- learning motivation	-.24***	-.24***	-.19***	1							
5- interest in studying	-.38***	-.39***	-.30***	.89***	1						
6- hankering for capability	-.28***	-.30***	-.20***	.85***	.73***	1					
7- interest in developing reputation	.01	.02	-.00	.82***	.56***	.55***	1				
8- tendency toward altruism	-.15**	-.14**	-.13*	.92***	.74***	.70***	.76***	1			
9- PDAE	-.49***	-.48***	-.41***	.54***	.61***	.48***	.33***	.43***	1		
10- pride	-.39***	-.39***	-.32***	.57***	.59***	.51***	.39***	.48***	.91***	1	
11- relief	-.51***	-.49***	-.43***	.43***	.53***	.38***	.23***	.32***	.93***	.70***	1

PDAE=Positive-deactivating academic emotions.

* $p<.05$; ** $p<.01$; *** $p<.001$.

Table 3. Summary of Stepwise Regression Analysis ($<.001$)

Independent Variable	R	R ²	ΔR ²	ΔF	B	β	Tolerance	VIF	CI
Gender	.11	.01	.01	4.71*	.72	.02	.97	1.03	7.50
Interest in studying	.61	.38	.36	219.86***	.69	.42	.51	1.96	10.86
Nervousness	.67	.44	.07	46.82***	-.72	-.23	.48	2.08	16.67
Loss of control	.67	.45	.01	5.76*	-.41	-.13	.54	1.84	22.29
Interest in developing reputation	.68	.46	.01	4.27*	.14	.10	.62	1.62	29.57

VIF=Variance inflation factor; CI=Conditional index.

* $p<.05$; ** $p<.01$; *** $p<.001$.

nervousness, loss of control and interest in developing reputation were significant predictors of PDAE ($p < .001$), accounting for 45.9% of the total variance. Interest in studying ($p < .001$) accounted for the most variance, namely, 36.3% of the total variance. Desire for skills and tendency toward altruism were not significant predictors ($p < .05$).

The multicollinearity between variables was examined to ensure the validity of the predictors in the regression analysis variables. Multicollinearity problems are common issues in statistics. Multicollinearity between the predictor variables and the criterion variables can occur because they were derived from the same data source, and were based on the assessment measures and the characteristics of the study [25]. This study conducted an exploratory factor analysis on the dimensions of perceived stress, learning motivation and PDAE using Harman's single-factor test to detect these deviations [26]. The various dimensions of perceived stress and learning motivation were included as predictive variables in the PDAE regression analysis, and their tolerance, variance inflation factor (VIF), and condition indicators (CI) were calculated. The results showed that three factors co-loaded in the factor analysis. Among these factors, the factor with the highest contribution to variance provided an explanatory power of 37.4%, which was less than 40.0%. The bias in this project was not significant. The tolerance of each predictor in the regression analysis was between .48 and .97 (all greater than .10), the VIF was between 1.03 and 2.08 (all less than 10), and the CI were between 7.50 and 29.57 (all less than 30). These results indicated that there was no multicollinearity issue among the

predictors (See Table 3).

5. The mediation model

This study assumed that learning motivation during nursing skills training can be used as a direct mediator between perceived stress and PDAE. Nonparametric bootstrap and Sobel tests were applied using Process 2.16. The findings showed that the total score for perceived stress was a significant predictor ($p < .001$) of learning motivation. The regression of learning motivation score on PDAE was also significant ($p < .001$). The study used the effect as a measure of the extent of mediating effects [27,28]. The direct effect between the perceived stress score and PDAE was $-.59$, and 0 was not included in the confidence interval (-0.71 to -0.47). The indirect effect of the mediating variable on the dependent variable can be calculated by multiplying the effect of the independent variable on the mediating variable and the effect of the mediating variable on the dependent variable [29]. The indirect effect of perceived stress on PDAE through learning motivation in this study was $-.17$, and 0 was not in the confidence interval (-0.26 to -0.10). The results above indicated that learning motivation was a partial mediator of perceived stress and PDAE. The indirect effect ratio was 28.8% (See Table 4 and Table 5).

DISCUSSION

Stress had a negative impact on the mental health of college students, and negative emotions changed with the fluctuation in

Table 4. Mediator Model Test of Learning Motivation

($N=381$)

Independent Variable	Dependent Variable	β	t	p	LLCI	ULCI
1 Total score for perceived stress	Learning motivation	-.91	-4.82	<.001	-1.28	-0.54
2 Learning motivation	PDAE	.18	11.17	<.001	0.15	0.21
3 Total score for perceived stress	PDAE	-.59	-9.53	<.001	-0.71	-0.47

LLCI=Lower level of confidence interval; ULCI=Upper level of confidence interval; PDAE=Positive-deactivating academic emotions.

Table 5. Direct and Indirect Effect (Learning Motivation as Mediation Factor)

($N=381$)

	Effect	SE/Boot SE	LLCI/BootLLCI	ULCI/BootULCI
Direct effect	-.59	.06	-0.71	-0.47
Indirect effect	-.17	.04	-0.26	-0.10

Number of bootstrap samples for bias corrected bootstrap confidence intervals is 5000. And the level of confidence for all confidence intervals in output is 95.00.

SE=Standard error; LLCI=Lower level of confidence interval; ULCI=Upper level of confidence interval.

stress. This view was supported by many studies [30,31]. Owing to the influence of positive psychology, the perspective of researchers gradually shifted from negative emotions to positive emotions. Extensive research has been conducted on the mechanisms between stress and positive emotions [32]. Based on practical education of basic nursing skills, this study mainly discussed the mediating effect of learning motivation on perceived stress and PDAE. There were some significant findings for medical and nursing training courses. In the correlation analysis between perceived stress and academic emotion, there was a significant negative correlation among various factors, indicating that perceived stress can reduce positive emotions during the learning process. This result was consistent with those of a study by Shi et al. on stress, emotion, and mental resilience among college students [33]. Nervousness, a factor of perceived stress, had a significant predictive effect on PDAE. This result further showed that the more stress and nervousness an individual felt, the lower their enthusiasm for learning, and the less likely they were to show positive emotions, such as pride and relief, in their studies. The sense of loss of control, another dimension of perceived stress, also predicted PDAE. The mechanism of this result needs more study, and it was speculated that the mechanism was related to students' passive learning habits.

In this study, learning motivation was positively correlated with PDAE and predicted it in the model. This result was consistent with that of a study by Zhang et al. [15], and was based on the basic principles of motivation theory. The more students are motivated to learn, the more effort they make in learning, which leads to higher academic achievement and more positive academic emotions [34]. Furthermore, individuals with high levels of learning motivation are willing to seek more active and effective coping methods, thereby reducing negative emotions [35].

The data from this study confirmed the partial mediation of learning motivation in the relationship between perceived stress and PDAE. The results clarified the logical relationships among these concepts. In fact, the three concepts themselves have reflected this logical relationship to some extent. As mentioned earlier, the results of this study showed that perceived stress was negatively correlated with positive academic emotions, which had been confirmed by previous studies [36]. As a kind of mental resource characterized by coping, learning motivation had a very

close relationship with perceived stress. When the perceived level of stress was too high, the resources were consumed, the assessment and transformation of stress was changed, and the balance between cognition and behavior was lost, thereby reducing positive emotions. Previous studies showed that highly motivated individuals tend to view life events and stress from a positive perspective [37] and tend to maintain positive emotions and a positive mentality. Individuals with higher motivation were better at adopting positive and optimistic attitudes and treatments in the face of high-stress situations and at gaining more social support, thus reducing their sense of nervousness and loss of control. These skills were beneficial to the generation and maintenance of positive academic emotions. These findings provide evidence for the logical relationships derived from this study. Advances had been made by previous researchers in understanding PDAE. This study focused on PDAE and explored the influential factors and pathological relationships of the deactivating dimensions of academic emotions rather than the activating dimensions. The results obtained further enrich the theoretical system of academic emotions and provide reference for subsequent related research.

Results of the correlation analysis indicated that some dimensions of learning motivation have an excessive correlation (>70). Such data appears in the correlation between hankering for capability and interest of learning, and also between tendency of altruism and all other dimensions of learning motivation (see Table 3). Although the VIF of these dimensions in the regression test do not exceed the standard (<10), due to the high correlation with other dimensions, there may still be collinearity. However, the stepwise regression results show that hankering for capability and tendency of altruism have no predictive effect on the dependent variable. To further avoid the problem of collinearity, the ridge regression method was adopted to test the data. Ridge regression is an improved least squares estimation method that can be used for collinear data analysis [38]. The results indicated that the influence of interest in developing reputation and tendency of altruism on the dependent variable was not stable. The remaining curves were relatively stable, indicating that they had the significant interpretation or predictive effect on the dependent variable. This conclusion was calculated by ridge regression and the problem of collinearity was overcome. The stepwise multiple regres-

sion equation used in this study is also a commonly used method to eliminate multicollinearity and to select the “optimal” regression equation. The results of the ridge regression were the same as those obtained by the stepwise multiple regression, indicating that this conclusion was valid and overcame the collinearity problem.

Moreover, the results in this study provide inspiration for the training of nurses in teaching institutions. Because nursing students have a heavy burden with regard to the necessary skills to learn, they have to devote the majority of their time to training. These students often face critical situations and choices between life and death in the process of learning. The tremendous mental pressure brought about by these conditions has led nursing students to have a lower level of positive academic emotions, which influences their learning. The results of this study suggest that improving students’ learning motivation may alleviate their learning pressure and promote positive emotions, such as pride and relief, in basic practical skills training in medical colleges. The establishment of learning motivation requires long-term cultivation and is influenced by many aspects, such as school education, social environment, family background, and self-awareness [39]. Therefore, schools, families, and medical institutions should pay more attention to learning motivation during nursing students’ skills training. In specific educational practices, researchers and educators should formulate reasonable plans to alleviate the perceived pressure, such as nursing students’ nervousness and loss of control, and avoid suppressing positive academic emotions. Furthermore, because interest in studying is the most important predictor of PDAE, it is suggested that educators start from this factor, pay attention to improving students’ interest in nursing skills training, and thus enhance their PDAE, which may improve their academic performance and nursing competency.

There are several confounding factors in this study because it was based on self-report questionnaires. It was only possible to explain the correlation between factors and not to prove causality. Future research should adopt more objective methods in future research to improve the credibility of the data. In addition, the number of male and female nursing students participating in the questionnaire was not balanced, and the data obtained may not be generalizable. These issues need to be addressed through follow-up studies. The paths found in this study include incomplete

mediation, which means that there may be other mediating or moderating variables between nursing students’ perceived stress and PDAE that require further investigation.

CONCLUSION

The results of this study demonstrate that students’ perceived stress was significantly negatively correlated with learning motivation and PDAE during nursing skills training. The significant predictors of PDAE were perceived stress and learning motivation. The study also showed that learning motivation in nursing skills training was an important mediating factor, providing nursing students with a bridge between perceived stress and PDAE, and buffering the damage of perceived stress on PDAE. Strategically improving students’ motivation to learn could reduce their perceived stress and build more positive emotions. Positive emotions in learning played an important role in helping nursing students enhance their skills and improve their nursing competence.

CONFLICTS OF INTEREST

The authors declared no conflict of interest.

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