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Latent Profile Analysis and Influencing Factors of Positive Mental Health Among Undergraduate Nursing Students

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Abstract: ***Objective:*** *To explore the latent profile characteristics of positive mental health among undergraduate nursing students and its influencing factors, aiming to provide a scientific basis for mental health education in universities.* ***Methods:*** *A convenience sampling method was used to survey 655 undergraduate nursing students from a university in Zhengzhou between October and December 2022. A general information questionnaire and the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) were used for data collection. Latent Profile Analysis (LPA) was employed to identify the latent categories of positive mental health, and multivariate logistic regression analysis was conducted to examine the influencing factors.* ***Results:*** *The positive psychological health of undergraduate nursing students can be categorized into three latent profiles: low-level positive (45.80%), moderate-level positive (43.21%), and high-level positive (10.99%), indicating significant group heterogeneity. Multivariate logistic regression analysis revealed that household registration (hukou) and chronic constipation were significant influencing factors for different categories of positive psychological health among these students ($P < 0.05$).* ***Conclusion:*** *The overall level of positive psychological health among undergraduate nursing students exhibits heterogeneity. Relevant universities should design stratified psychological intervention programs based on the diverse psychological characteristics of these students, in order to comprehensively improve their mental health and future professional competency.*

Keywords: Undergraduate nursing students, Positive mental health, Latent Profile Analysis, Influencing factors.

1. Introduction

With the rapid development of society and the increasing pressure of competition, mental health issues have become a significant topic of global concern. Particularly in higher education environments, university students face multiple challenges such as academic pressure, emotional distress, and career planning, leading to an increasing trend of mental health problems [1]. As a unique student population, undergraduate nursing students not only experience common academic pressures but also face psychological burdens during clinical internships, emotional stress in patient care, and uncertainties in their own professional development [2]. Therefore, exploring the mental health status of undergraduate nursing students, especially the characteristics of their positive mental health, is of great significance for enhancing their comprehensive quality and future professional performance.

Positive mental health is not merely the absence of mental illness; rather, it represents an individual's capacity to exhibit resilience, optimism, and self-actualization when facing life's challenges [3]. Positive mental health contributes to an individual's emotional regulation, stress coping, and enhanced life satisfaction [4]. Studies have shown that good mental health levels have a profound impact on nurses' work efficiency, patient care quality, and individual professional development [5]. However, existing research has primarily focused on academic stress, anxiety, and other negative emotions among nursing students, with less attention paid to the multidimensional manifestations and influencing factors of positive mental health [6]. Latent Profile Analysis (LPA) is a statistical method based on individual response patterns that can identify different latent categories within data and reveal the characteristics and related factors of each category [7-8]. Within the undergraduate nursing student population, positive mental health may exhibit heterogeneity. This study aims to use latent profile analysis to conduct an in-depth analysis of positive mental health among undergraduate nursing students, explore their potential mental health categories, analyze the influencing factors of different categories, and provide targeted evidence for schools and related institutions to develop tailored mental health intervention strategies.

2. Methods

2.1 Participants

This study utilized a convenience sampling method to recruit undergraduate nursing students from a university in Zhengzhou as research participants between October and December 2022. All participants provided informed consent and participated voluntarily. The inclusion criteria are as follows: 1) Enrolled as an undergraduate student majoring in nursing; 2) Having completed clinical observation but not yet started clinical internships. The exclusion criteria were: Having a history of or current mental illness. A total of 655 undergraduate nursing students were included in the final sample.

2.2 Methods

2.2.1 Instruments

The research instruments included a general information questionnaire and the Chinese version of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS).

General Information Questionnaire: This questionnaire was designed by the researchers and included items on gender, age, ethnicity, family origin, whether the participant held a position on the class committee, type of household registration, father's education level, mother's education level, and smoking status.

WEMWBS Chinese Version: This scale was developed by Tennant et al. in 2007 and translated and revised by Liu Yongchuang et al. in 2016 [9]. The Chinese version of the WEMWBS consists of 14 items, each rated on a 5-point Likert scale (1-5 representing "never," "rarely," "sometimes," "often," and "always," respectively). The total score ranges from 14 to 70, with higher scores indicating a higher level of positive mental health. The Chinese version of the WEMWBS has been used to assess the positive mental health status of the elderly and middle school students, and its reliability and validity are greater than 0.8.

2.2.2 Date collection

This survey was conducted through the Questionnaire Star platform. Researchers distributed questionnaires to eligible participants in a classroom setting at the university. The researchers used standardized instructions to explain the study's purpose, significance, privacy protection measures, and completion requirements. Questionnaires were collected immediately after completion.

2.2.3 Statistical Methods

This study used Mplus 8.3 software to conduct latent profile analysis of positive mental health and death anxiety among undergraduate nursing students. Model fit was assessed using the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and adjusted Bayesian Information Criterion (aBIC), with lower values indicating better fit. Classification accuracy was evaluated using entropy, with values closer to 1 indicating higher accuracy. To compare the fit differences between different class models, the likelihood ratio test (LMRT) and bootstrap likelihood ratio test (BLRT) were used. A p-value of less than 0.05 indicated that a model with more classes provided a better fit than a model with fewer classes. Data entry and statistical analysis were performed using SPSS 25.0 software. Categorical data were described using frequencies and percentages. For continuous data that followed a normal distribution, data were represented as mean ± standard deviation ($x \pm s$). Descriptive analysis included t-tests, analysis of variance (ANOVA), and correlation analyses. Variables with a p-value less than 0.1 in the univariate analysis were included in the multivariate logistic regression analysis. A p-value of less than 0.05 was considered statistically significant for the final regression results.

3. Results

3.1 General Information of Undergraduate Nursing Students

This study included 655 undergraduate nursing students, among whom 98 were male (14.96%) and 557 were female (85.04%); 643 were Han Chinese (98.17%) and 12 were from minority ethnic groups (1.83%); 266 had urban household registration (40.61%) and 389 had rural household registration (59.39%); 52 had served as student cadres (7.94%) and 603 had not (92.06%); 47 came from single-parent families (7.18%) and 608 from non-single-parent families (92.82%); 98 consumed alcohol (14.96%) and 557 did not (85.04%); 21 smoked (3.21%) and 634 did not (96.79%); 55 had chronic constipation (8.40%) and 600 did not (91.60%); 530 had mothers with a high school education or below (80.92%), 74 with a junior college education (11.30%), and 51 with a bachelor's degree or above (7.78%); 516 had fathers with a high school education or below (78.78%), 70 with a junior college education (10.69%), and 69 with a bachelor's degree or above (10.53%). The mean score on the Warwick-Edinburgh Mental Well-being Scale was (48.69 ± 8.70).

3.2 Latent Profile Fitting Results of Positive Mental Health in Undergraduate Nursing Students

Based on the established latent class model, and using the 14 items of the Warwick-Edinburgh Mental Well-being Scale as manifest variables, we selected 1 to 5 classes for analysis and fitted a total of 5 latent profile models. By comprehensively comparing the fit indices of each model (Table 1), Model 3 was ultimately determined to be the best-fitting model.

3.3 Naming of the Latent Types of Positive Mental Health in Undergraduate Nursing Students

Based on the determined latent class model, the scores on the 14 items of the Warwick-Edinburgh Mental Well-being Scale for 3 categories were obtained. There were significant differences in the total scores of positive mental health among the three latent classes of undergraduate nursing students, with mean scores of 41.32, 52.22, and 65.57, respectively. These were sequentially named "Low-Level Positive Type" (300 people, 45.8%), "Medium-Level Positive Type" (283 people, 43.2%), and "High-Level Positive Type" (72 people, 11.0%), as Figure 1 shows.

Table 1: Model Fit Indices for Latent Profile Analysis of Positive Mental Health in Undergraduate Nursing Students

Model	AIC	BIC	aBIC	Entropy	P		Category Probability
					LMRT	BLRT	
1	22734.474	22860.086	22771.186				
2	19357.871	19550.776	19414.250	0.933	<0.001	<0.001	0.602/ 0.398
3	18111.527	18371.724	18187.574	0.937	<0.001	<0.001	0.458/0.426/ 0.116
4	17596.369	17923.859	17692.083	0.932	0.014	<0.001	0.364/0.456/0.079/ 0.101
5	17347.294	17742.076	17462.675	0.892	0.107	<0.001	0.056/0.352/0.263/ 0.239/ 0.091

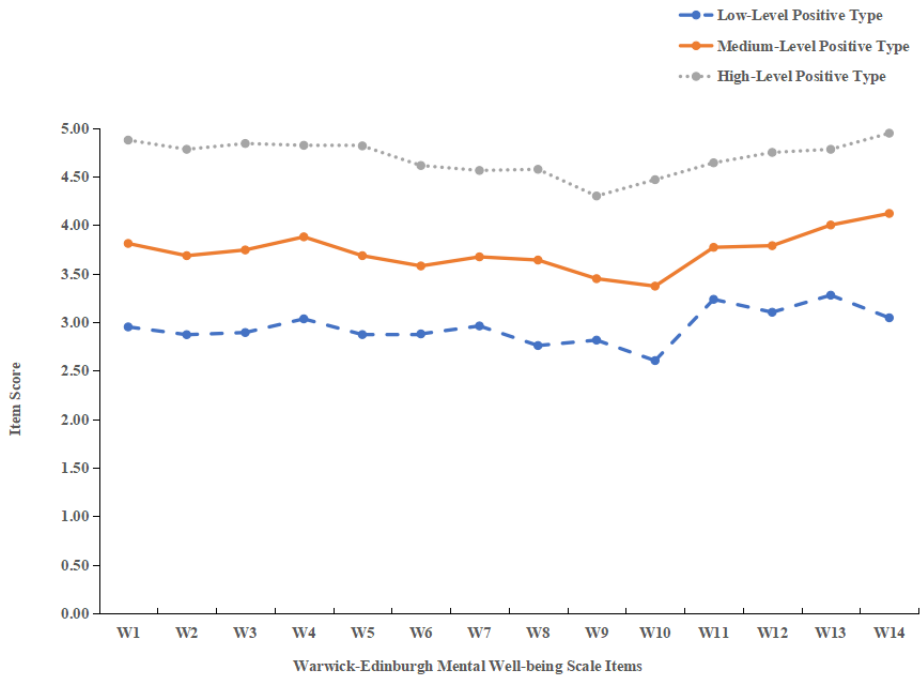

Figure 1: Characteristic Distribution of Latent Profiles of Positive Mental Health in Undergraduate Nursing Students

Table 2: Univariate Analysis of Latent Types of Positive Mental Health in Undergraduate Nursing Students

Item	Category	Low-Level Positive Type	Medium-Level Positive Type	High-Level Positive Type	Statistic (F/χ^2)	P
		n=300	n=283	n=72		
Gender	Male	36 (12.0)	46 (16.3)	16 (22.2)	5.423	0.066
	Female	264 (88.0)	237 (83.7)	56 (77.8)		
Ethnicity	Han	296 (98.7)	277 (97.9)	70 (97.2)	0.904	0.637
	Ethnic Minority	4 (1.3)	6 (2.1)	2 (2.8)		
Family place	Urban	116 (38.7)	107 (37.8)	43 (59.7)	12.295	0.002
	Rural	184 (61.3)	176 (62.2)	29 (40.3)		
Classres	Yes	20 (6.7)	22 (7.8)	10 (13.9)	4.163	0.125
	No	280 (93.3)	261 (92.2)	62 (86.1)		
Single family	Yes	26 (8.7)	18 (6.4)	3 (4.2)	2.262	0.323
	No	274 (91.3)	265 (93.6)	69 (95.8)		
Drinking	Yes	52 (17.3)	36 (12.7)	10 (13.9)	2.508	0.285
	No	248 (82.7)	247 (87.3)	62 (86.1)		
Smoking	Yes	8 (2.7)	7 (2.5)	6 (8.3)	6.870	0.032
	No	292 (97.3)	276 (97.5)	66 (91.7)		
Chronicconstipation	Yes	35 (11.7)	19 (6.7)	1 (1.4)	9.809	0.007
	No	265 (88.3)	264 (93.3)	71 (98.6)		
Mother edu	High School or Below	244 (81.3)	234 (82.7)	52 (72.2)		
	Associate Degree	29 (9.7)	35 (12.4)	10 (13.9)	9.151	0.057
	Bachelor's Degree or Abo	27 (9.0)	14 (4.9)	10 (13.9)		
Father edu	High School or Below	248 (82.7)	220 (77.7)	48 (66.7)		
	Associate Degree	27 (9.0)	31 (11.0)	12 (16.7)	9.292	0.054
	Bachelor's Degree or Abo	25 (8.3)	32 (11.3)	12 (16.7)		
Age		20.43 (1.35)	20.24 (1.45)	20.38 (1.52)	1.348	0.262
BMI		21.02 (3.49)	20.55 (3.06)	20.87 (3.76)	1.506	0.237

3.4 Univariate Analysis of Latent Types of Positive Mental Health in Undergraduate Nursing Students

Univariate analysis showed that household registration location, smoking status, chronic constipation status, and parental education level were correlated with the scale scores ($P < 0.1$). The specific results are shown in Table 2.

3.5 Multivariate Analysis of Latent Classes of Positive Mental Health among Nursing Undergraduates

Using the latent profiles of positive psychological health among undergraduate nursing students as the dependent variable (with 'low-level positive' as the reference category), and factors with $P < 0.1$ in the univariate analysis as independent variables (variable coding is detailed in Table 3), an unordered multinomial logistic regression model was constructed for multivariate analysis. The results showed that household registration (hukou) and the presence of chronic constipation were significant influencing factors for the latent profiles of positive psychological health in undergraduate nursing students ($P < 0.05$). Results are presented in Table 4.

Table 3: Assignment of Independent Variables

Variable Name	Assignment Method
Familyplace	Urban = 0, Rural = 1
Smoking	No = 0, Yes = 1
Chronicconstipation	No = 0, Yes = 1

Table 4: Multivariate Logistic Regression Analysis of Latent Classes of Positive Mental Health among Nursing Undergraduates

Class	Variable		B	SE	Wald χ^2	*P*	*OR*	95% CI Lower	95% CI Upper
Medium-Level Positive Type①	Intercept		3.198	1.368	5.465	0.019	-	-	-
	Familyplace	Rural vs. Urban (Ref)	-0.117	0.184	0.404	0.524	0.889	0.62	1.276
	Smoking	Yes vs. No (Ref)	-0.074	0.547	0.018	0.892	0.929	0.318	2.714
	Chronicconstipation	Yes vs. No (Ref)	-0.533	0.304	3.074	0.08	0.587	0.323	1.065
High-Level Positive Type①	Intercept		0.216	2.166	0.01	0.92	-	-	-
	Familyplace	Rural vs. Urban (Ref)	0.667	0.289	5.327	0.021	1.948	1.105	3.435
	Smoking	Yes vs. No (Ref)	0.981	0.634	2.394	0.122	2.668	0.769	9.251
	Chronicconstipation	Yes vs. No (Ref)	-2.328	1.029	5.118	0.024	0.097	0.013	0.732

①Using the low-level positive type as the reference.

4. Discussion

4.1 Heterogeneity in the Positive Mental Health of Nursing Undergraduates

The mean score for positive mental health among nursing undergraduates was (48.69±8.70), indicating an overall upper-middle level of positive mental health [10]. This finding aligns with similar international research. Further latent profile analysis revealed significant heterogeneity in the positive mental health of nursing undergraduates [11], identifying three distinct latent profiles: a low-level group (41.32±4.12, 45.80%), a medium-level group (52.22±3.31, 43.21%), and a high-level group (65.57±3.81, 10.99%). Importantly, approximately half of the students fell into the low-level positive mental health category. This highlights that despite a generally positive overall score, a substantial proportion of students exhibit suboptimal positive mental health, underscoring the need for targeted and stratified interventions and support for these distinct groups.

Possible reasons may include the multiple challenges faced by nursing undergraduates, such as heavy academic workloads, demanding practical tasks, and significant pressure during clinical placements. Particularly in the early stages of internships, increased anxiety about unfamiliar environments and role transitions can easily lead to psychological fluctuations [12]. Furthermore, students with rural household registration are more likely to develop positive psychological health. This may be attributed to rural students' proximity to nature, strong community support, simpler interpersonal relationships, and the development of greater resilience and independence through physical labor. These factors collectively contribute to the improvement of their positive psychological health levels. Therefore, when developing psychological support strategies, students' growth backgrounds should be fully considered. Specifically, urban students could benefit from increased outdoor experiences and resilience training, while a more supportive internship and practice environment should be created for all students to enhance their overall psychological capital [13-14].

4.2 Influence of Familyplace and Chronicconstipation on Positive Mental Health in Nursing Undergraduates

The study found that undergraduate nursing students with rural household registration (hukou) were more likely to achieve high levels of positive psychological health. This may stem from the advantage of psychological resilience cultivated in a rural upbringing: on one hand, navigating practical life challenges has fostered stronger resilience and problem-solving skills, making them better equipped to adapt to the high-pressure environments of nursing studies and clinical practice; on the other hand, close kinship and neighborhood relationships provide a more robust social support network, offering a crucial buffer against stress. However, it is important to note that this correlation does not imply a causal relationship, as rural students also face unique challenges such as resource scarcity. It is recommended that educators draw upon these advantages and design counseling activities that incorporate resilience training for all students [15-16]. This finding is consistent with the results of Chen Yang's research [17].

The study also revealed that nursing undergraduates without chronic constipation were more likely to attain high-level positive mental health. This suggests that physical health status influences students' psychological well-being to some extent [19]. Chronic constipation not only causes physical discomfort but may also trigger negative emotions such as depression and anxiety, thereby affecting psychological vitality and life satisfaction [20-21]. It is recommended that universities adopt an integrated mind-body approach, focusing on students' lifestyles and physical symptoms, disseminating knowledge about scientific nutrition and health management, and enhancing the synergistic development of their physical and mental well-being.

5. Conclusions

This study found significant group heterogeneity in the positive mental health of nursing undergraduates, which can be categorized into three types: low-level positive, medium-level positive, and high-level positive. Among the factors influencing their mental health levels are household registration location and chronic constipation. It is recommended that higher education institutions design layered and categorized psychological interventions based on the different psychological characteristics of nursing undergraduates, while also emphasizing the management of students' physical health, to holistically enhance their mental health levels and future professional competence.

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