

Characteristics of depression prevalence among college students and analysis of depression influencing factors based on BP neural network modeling

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Abstract. Depression is an important influencing factor affecting the mental health of contemporary college students, which has an important impact on the healthy development of college students' physical and mental health and the cultivation of sound personality, and it is of great practical significance to find out the influencing factors affecting college students' depression. This paper adopts a present investigation study, finally selects college students identified as depressed status in 10 universities in S province from January to December 2022 as research subjects, observes their depressive symptoms, analyzes the prevalence characteristics of their depression, and constructs a model of college students' depression influencing factors based on BP neural network to derive the sensitivities of each variable, and evaluates the degree of each factor's influence on college students' depression. The results show that among the 2000 cases of college students who participated in the survey, the number of people who showed depressive state was 134 cases (6.70%), and the incidence of depression among women was slightly higher than that of men in all 134 cases. Gender samples will show significance ($p < 0.05$) for depression status, meaning that different gender samples all show inconsistency and significant differences for depression symptoms. Neural network analysis using spss software showed that the ranking of the importance of the factors affecting the influence of depression among university students was yes: whether there is a family psychiatric disorder > gender > age > whether it is an only child > household registration.

Keywords: college students, depression prevalence characteristics, BP neural network, depression, influencing factors.

1. Introduction

Depression is a common clinical psychological problems, patients after the onset of the disease is often manifested as a depressed state of mind, emotional fall, and some patients even appeared suicidal phenomenon. Widiger TA, Livesley WJ, Clark LA (2009)[1] research pointed out that depression is not a simple phenomenon of presence or absence. According to the data statistics of "2022 National Blue Book of Depression", the number of school college students suffering from depression in China is 47.5 million at present. Li Xueyi, Chen Liting, Yang Aojing (2023)[2] pointed out that contemporary college students, under the multiple pressures of life, academics, and the economy, have become depressed, and because of the lack of a clear understanding of depression, many of the symptoms of depression are aggravated, which ultimately leads to some adverse consequences. Gotlib IH, Joormann J (2010)[3] pointed out that the assessment and identification of depression in college students is not a simple phenomenon, and it is not a simple phenomenon. Most of the studies on the assessment and identification of college students' depressive mood have directly used the critical values of depression-related scales to assess the severity of depressive symptoms. Regarding the research on the factors affecting depression in college students, Beck AT (1991)[4] pointed out that college students are in the transition stage from late adolescence to early adulthood, with immature and borderline psychological development, and are a high prevalence of depression; Barton YA, Barkin SH, Miller L (2017)[5], Rodriguez D, Moss HB, Audrainmcgovern J (2005)[6] explored the characteristics of college students' depressive symptoms using latent profile analysis (LPA) method, and Pang Z, Wang W (2023)[6] pointed out that contemporary college students' depression is mainly due to family of origin factors, living environment factors, academic employment pressure factors, work and rest time factors, interpersonal factors and knowledge

deprivation factors. This paper focuses on analyzing the prevalent characteristics of college students and the factors influencing their significance based on BP neural network model.

2. Data and Methods

2.1. Clinical data

In January-December 2022, 2035 college students from 10 universities in S province were selected by simple random sampling method. The selection criteria were those who had normal cognitive function and could cooperate with the survey independently, and the exclusion criteria were (1) those who were dependent on drugs; (2) those who had expression impairment or hearing impairment; and (3) those who had suicidal tendency or those who had already experienced suicidal behavior. In the survey data, there were 2,000 valid cases, of which, there were a total of 975 males and 1,025 females, aged 18-25 years old, with an average age of (19 ± 2.4) years old. This survey was conducted to respect the privacy of patients and their right to know, and to handle the confidentiality of patients' data.

2.2. Methodological design

The questionnaire designed by the author himself was used, and the basic survey information included: gender, age, stage of schooling, household registration, whether it was an only child, family history of mental illness, etc. The recovery rate of this questionnaire was 100%, and excluding invalid questionnaires, the validity rate was 98.28%.

The scale design about depression assessment was adopted from Hamilton Depression Scale, which was chosen as the 17th version, mainly containing 7 aspects of body mass, somatization, day and night changes, cognitive disorders, sleep disorders, sense of despair and delayed reaction of the survey respondents, etc., with a total score of 54, and ≥ 18 points can be judged as depression.

2.3. Observation indicators

- (1) Observe the incidence and prevalence of depressive symptoms in the college student population;
- (2) analyze the factors affecting depression in the college student population.

2.4. Statistical analysis

This paper uses spss26.0 software to analyze, respectively, single-factor analysis, multi-factor analysis and important factor ranking analysis, in which the single-factor analysis adopts the t-test for inter-group comparison, and the chi-square test is used for the statistical analysis of data, and the analysis of influencing factors uses the multi-factor logistics analysis, and when the regression coefficient is less than 0.05, it indicates that there is a statistically significant influence, and the influence of the The importance of the factors was analyzed using BP neural network to determine the importance of the influence of the influence factors according to the weight value of each indicator.

3. Results

3.1. Prevalence characterization

Of the 2035 cases of valid data participating in the survey, the number of people with depressive symptoms was 134 cases (6.70%), and the incidence of depression was slightly higher in all 134 cases for females than for males. Gender samples for depression symptoms will show significance ($p < 0.05$), meaning that different gender samples for depression symptoms are inconsistent and have significant differences. This is shown in Table 1 below:

Table 1. Characteristics of depression prevalence among college students

Factor	1. your gender (%)		Total (n=2000)	χ^2	p
	Male (n=975)	Female (n=1025)			
Depression	47(4.82)	97(9.46)	134(6.70)	10.661	<0.05

Data source: spss software processing Statistical analysis of data by chi-square test

3.2. Univariate analysis

Gender, age, stage of study, household registration, whether it is an only child, family psychiatric history and the occurrence of depressive symptoms are closely related to the test shown in Table 2, gender, age, whether it is an only child, family psychiatric history and the occurrence of depressive symptoms are closely related to the occurrence of depressive symptoms will show significance ($p < 0.05$), meaning that these characteristics for depressive symptoms are all inconsistent with significant differences, and have significant differences. These factors can significantly affect the depressive symptoms of college students.

Table 2. Univariate analysis of factors affecting the occurrence of depression in college students

Factors		Depressed group (n=134)	Non-depressed group (n=1866)	Cardinal value	P value
Gender	Female	97(72.39)	928(50.00)	10.041	<0.05
	Male	47(27.61)	928(50.00)		
Age	18-22	56(41.79)	786(42.14)	0.661	<0.05
	23-27	44(32.84)	593(31.79)		
	28-31	21(15.67)	274(14.70)		
	32-35	13(9.70)	213(11.41)		
Stage of study	Undergraduate	84(62.68)	989(53.00)	0.141	>0.05
	Graduate students	50(37.31)	877(47.00)		
Household registration	Rural	45(33.58)	665(35.64)	7.112	<0.05
	Urban	89(66.41)	1201(64.36)		
Only child	Yes	92(68.56)	952(51.02)	10.316	<0.05
	No	42(31.34)	914(48.98)		
Family history of mental illness	Yes	52(38.80)	452(24.22)	14.173	<0.05
	No	82(61.19)	1414(75.78)		

Data source: spss data processing one-factor score collation results

3.3. Multifactorial analysis

The factors associated with influencing the occurrence of depressive symptoms gender, age, stage of enrollment, household registration, whether it is an only child, family psychiatric history of psychiatric history were assigned into Logistic multifactorial analysis, and the results of the study showed that female, age 21-24 years old, average monthly income is low, not in the workforce, and family psychiatric history are the influencing factors affecting the occurrence of depressive symptoms (all < 0.05), as shown in Table 3: Female, age 18-21 years, being an only child, urban domicile, and having a family history of psychiatric illness are several factors that significantly influence depression among college students.

Table 3. Multifactorial analysis of factors affecting the occurrence of depressive symptoms based on logistic modeling

Factor	B value	SE value	Wald chi-square value	ORvalue	Confidence level95%CI	P value
Female	0.537	0.378	5.746	6.28	0.306 ~ 1.374	0.0000
18-21years old	0.514	0.305	7.156	7.28	0.362 ~ 1.546	0.0012
Being an only child	0.134	0.353	6.024	5.86	0.524 ~ 1.615	0.0024
Urban household registration	0.204	0.426	4.284	5.93	0.517 ~ 1.738	0.0084
Family history of mental illness	0.855	0.384	5.342	5.74	0.538 ~ 1.718	0.0046
Constant term	-0.0815	0.437	5.184	5.13	0.572 ~ 1.846	0.0052

3.4. Analysis of important influencing factors based on BP neural network

NeuralNetworks algorithm (NeuralNetworks) usually refers to the back-propagation neural network algorithm, also known as BP neural network (Back-Propagation Network). The basic BP algorithm consists of two processes: forward propagation of the signal and backward propagation of the error. That is, the calculation of the error output is performed in the direction from input to output, while the adjustment of weights and thresholds is performed in the direction from output to input. In forward propagation, the input signal acts on the output node through the implicit layer and undergoes a nonlinear transformation to produce the output signal, and if the actual output does not match the desired output, it is transferred to the process of back propagation of the error. Error back-propagation is to back-propagate the output error to the input layer layer by layer through the implicit layer, and apportion the error to all units in each layer, and use the error signal obtained from each layer as the basis for adjusting the weights of each unit. By adjusting the connection strength between the input node and the hidden layer node and the connection strength between the hidden layer node and the output node as well as the threshold value, the error decreases along the gradient direction, and the network parameters (weights and thresholds) corresponding to the minimum error are determined after repeated learning and training.

Age > whether it is an only child > household registration.

Table 4. Importance of influencing factors

	Importance	Importance of standardization
1. your gender	.190	55.0%
2. your age	.176	50.8%
3. Whether you have a family history of mental illness	.346	100.0%
4. Whether you are an only child	.162	46.9%
5. Your household registration	.127	36.6%

Source of figures: obtained by spss software processing

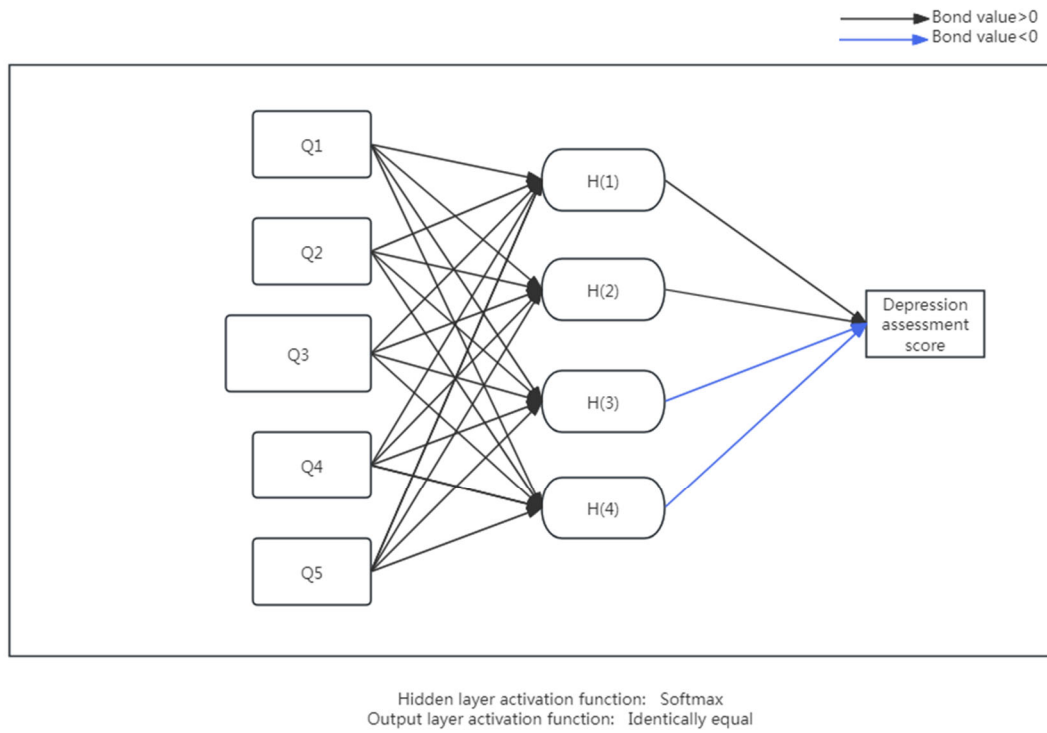


Figure 1. Path diagram between neural network input, hidden and output layers

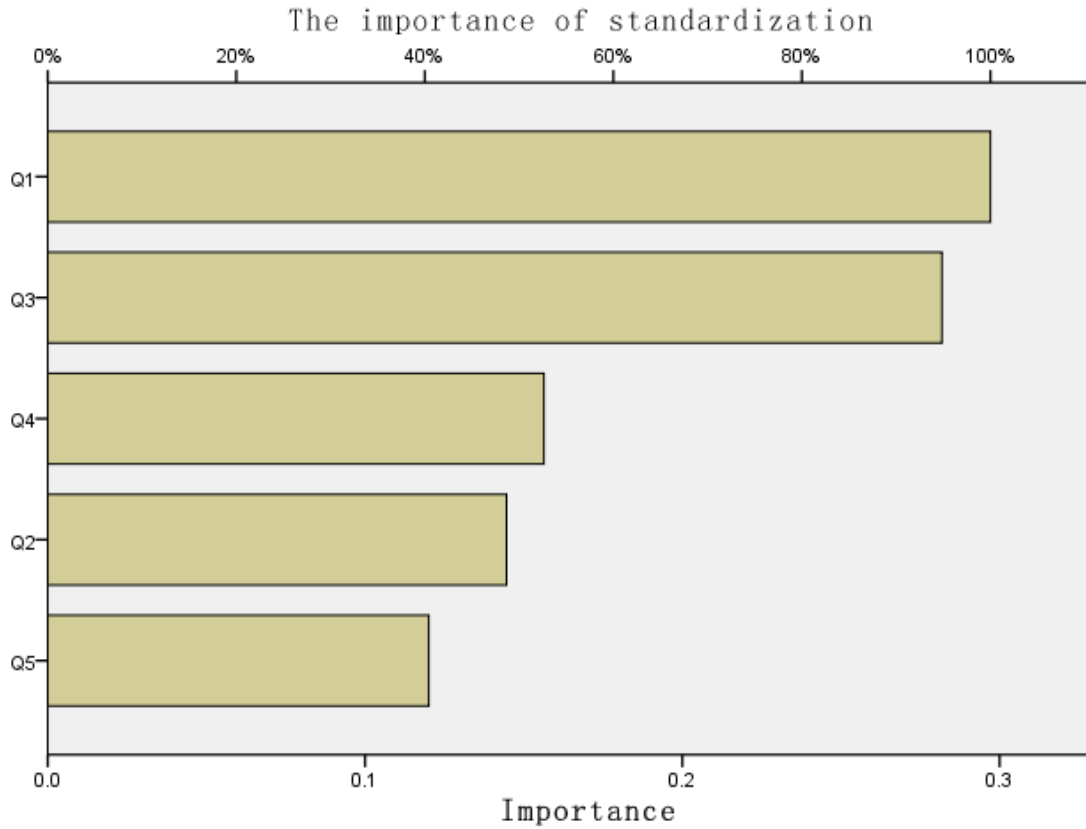


Figure 2. Significance of Positivization of Influencing Factors

4. Conclusion and Recommendations

In recent years, factors such as high-intensity academic burden, examination pressure, and anxiety about future employment may have a negative impact on college students; secondly, factors such as social pressure, interpersonal conflict, and loneliness may also be a cause of depression; next, economic difficulties may lead to increased life pressure and affect mental health; confusion about one's future direction and identity, and the gap between social expectations and individual expectations may also trigger depression; and lack of effective psychological coping mechanisms and adaptability may increase the risk of depression. These factors may be intertwined and affect each college student to varying degrees. Establishing a healthy psychological support system, raising awareness of mental health, and seeking professional help in a timely manner are all important ways to alleviate depression among college students [5].

The results of this study showed that among the 2,000 cases of college students studying at different stages in 10 colleges and universities in Province S, based on the results of Logistic multifactorial analysis, females, age 21-24 years old, household registration of towns and cities, only child, and family history of mental illness were the most important factors affecting the occurrence of depressive symptoms (all <0.05). Among them, the incidence of depression and anxiety symptoms is slightly higher in women than in men (all <0.05). Firstly, genetic factors, genetic factors increase the chances of women suffering from depression, and some studies have found that there are more gene mutations among women [9-10], which contain genes related to the regulation of female hormones. Secondly, women are more prone to stress, women are more likely to complain that they are in such a stressful emotional state, and women are more likely to be in particular situations of extreme stress than men, and thirdly, women's moods are more volatile. The reason why older 21-24 year olds are prone to depression, according to the survey, is because at this age they are facing employment pressures, as well as the economic pressures of entering the community and leaving the comfort zone of the campus, which often leads to nervousness, low mood, poor sleep quality and other problems. Among them, according to the BP neural network's importance ranking of influencing factors, it can be seen that the family psychiatric history is a key factor affecting the depression of college students, family psychiatric history of anxiety disorders, depression disorders, such psychological disorders may also have genetic factors, and the acquired environment and education on the patient's influence is more obvious, acquired imitation and learning is a factor leading to the development of psychological disorders more often.

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