Application of Cluster Analysis in the Management of College Students' Mental Health Education

Yuru Sun

Anhui institute of international business, Anhui Province, Hefei, China

zhangxingyi0712@163.com

Abstract. Through cluster analysis, the mental health of vocational college students is divided, so as to improve the scientific and targeted work.1300 vocational college students were investigated with scl-90 symptom scale and cluster analysis was carried out. According to the mental health level, the group of higher vocational college students can be divided into four categories: the first class has excellent mental health level, the second class has high mental health level, the third class has certain psychological confusion, and the fourth class has poor mental health level.Cluster analysis method can find out different student groups and their characteristics in the huge data, which is helpful to find and solve problems in time.

Keywords: Cluster analysis; Mental health; Educational management

1   Introduction

In today's fiercely competitive social environment, talent competition has become a crucial issue, and education bears the important responsibility of cultivating high-quality talents in the 21st century. As the main training venue for socialist builders and successors, universities have become an important work goal to comprehensively promote quality education. Among them, mental health education is an important foundation and condition for achieving the overall improvement of students' quality. Improving the mental health level of college students plays an important role in ensuring their modernization, integration into the international community, and welcoming the future. Psychological health education plays a crucial role in cultivating healthy psychology, developing psychological potential, enhancing adaptability, and improving personality among college students. Therefore, the strengthening of college mental health education and the improvement of college students' psychological quality are not only crucial to the overall growth and development of students in school, but also of great significance to their future career development and the performance of Role. At the same time, this also helps to improve the overall quality of the country, laying a solid foundation for building a stronger, progressive, and prosperous country. Therefore, universities should actively strive to strengthen mental health education, pay

attention to students' psychological needs, and help them become more healthy, confident, and responsible outstanding talents[1].

2   Application of cluster analysis

The mental health of college students is influenced by many factors, and there is no direct correlation between these factors. Therefore, directly classifying data may not be suitable. In this case, clustering analysis has good adaptability. Through this analysis method, we can objectively and rationally assess the psychological health status of students, and establish a management mechanism with practical reference value on this basis. The advantage of cluster analysis is that it can discover potential mental health patterns and patterns without requiring a predetermined evaluation standard. It can help counselors and student managers better understand students' mental health status, identify existing problems, and provide targeted psychological support and intervention measures. Through this method, we can more flexibly address the complexity and diversity of college students' mental health issues, and promote their comprehensive growth and development. In summary, cluster analysis has important adaptability and practicality in the evaluation research of college students' mental health problems. By subdividing relevant factors, establishing clusters, and analyzing clustering results, we can effectively understand the mental health status of college students, provide them with more personalized and targeted mental health services, and also provide useful references for mental health education and management work in universities, promoting the improvement of students' comprehensive quality and mental health development[2].

2.1   k- means algorithm principle

k-means algorithm is a commonly used partition-based clustering algorithm, which thinks that the closer two objects are, the greater their similarity. In order to achieve global optimization, partition-based clustering requires exhaustive all possible partitions. The main steps of k-means algorithm are described as follows:

(1) randomly selecting k objects from the whole sample n as initial clustering centers m (i= 1,2,..,k)

(2) The distance d(p,m) from each p to k cluster centers is obtained by the following formula, namely:

$$d = (i, j)$$
$$\sqrt{(x_{i1} - y_{j1})^2 + (x_{i2} - y_{j2})^2 + \dots (x_{in} - y_{jn})^2}$$

(1)

(3) Find the minimum distance d(p,m) of each object p, and classify p into the same cluster as m..

(4) After all the objects are traversed, the value of m is recalculated by formula (2) as the new cluster center, namely:

$$mk = \sum_{i=1}^{N} x_i / N$$

(2)

Reassign the objects in the whole data set to the most similar cluster. Perform 2-4 until the following square error E is minimum.

$$E = \sum_{i=1}^{k} p - m_i$$

(3)

First, the first k groups of locations are automatically selected according to some principle, and then the distance between the k locations of each sample data is calculated. EuclideanDistance is usually used to determine the distance between each group and the location of the first group, then divide the sample into k classes according to the distance, and calculate the mean of the new class by avgCount. Taking AVG as the new cluster center and re-clustering with Euclidean distance, the cluster center is accepted if the new cluster center does not change. Otherwise, continue to use avg as the new cluster point and repeat the above process several times [3]. As shown in Figure 1:
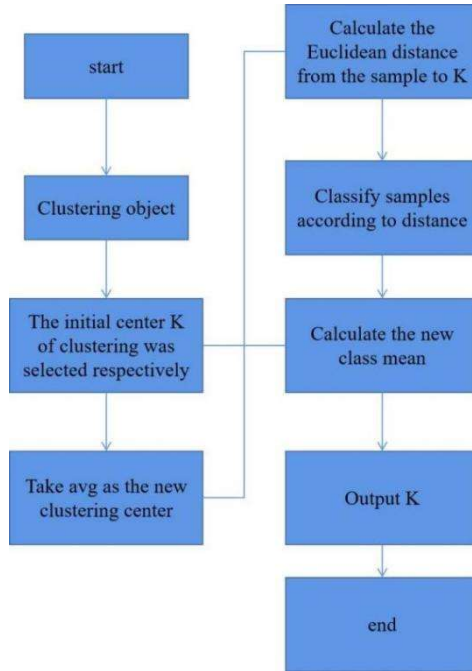

Figure1. Flow chart of k-means clustering analysis algorithm

3 An Empirical Study on the Psychological Health Problems of College Students Based on Cluster Analysis Algorithm

3.1 Data preparation

(1) Data selection. Based on the purpose of this task, the author selected attributes such as number, gender, adaptability and anxiety, introversion and extroversion, emotional and calm alertness, timidity and decisiveness, as well as their standard scores for this data mining.

(2) Data organization. Firstly, clean up non-standard, ambiguous, and incomplete data, and then convert variables. For example, convert the gender of the student to 11 (10), and finally calculate the variables to uniformly calculate X1~X4 values.

(3) Establish a comprehensive psychological testing database and tables. Establish a comprehensive psychological testing database and corresponding data tables through data selection and organization.

3.2 Analysis process of college students' mental health

The implementation process of college students' mental health analysis first involves collecting data from college students' mental health tests using a 16PF table. Then, after selecting and clearing data attributes, useful data is established into a comprehensive psychological testing database. Next, clustering algorithms are used to analyze the database and generate clustering results. Finally, prediction analysis and scientific evaluation of college students' mental health factors are conducted to provide objective and scientific guidance for mental health counseling Reliable data protection.

3.3 Example analysis

3.3.1 Data preprocessing.

In order to determine the validity of the focus group, the following procedure should be applied to the original data.

(1) Ensure data accuracy. Verify that the collected data is relevant to the research content, and avoid losing relevant data and compromising the integrity of the data.

(2) Removal of noise data. Delete some invalid data or "hard" data.

(3) Information Sharing. Quantification of data to facilitate performance of clustering algorithms.

In the previous process, this document only organizes the original data using data filtering, transformation, protocols and other methods. The experimental data were obtained from the psychological data of 100 second-year students of the Urban Engineering Department of the New Institute of Urban Engineering College, and the transformation of the data rate code is shown in Table 1 [4].

Table 1. Attribute Transformation

gender	character trait	family income	single parent family	only child	academic achievement	check on work attendance
male	Introverted, rational type	tall middle bottom	Yes no	Yes no	excellent good medium poor	good medium poor
female	Introverted, emotional Introverted, volitional Extraversion, rational type Extraversion, emotional type Extroversion, will type					

For example, the characteristic data, characteristic values, and student numbers are shown in Table 2. From the characteristic code change table, the data set for the model this is {21,31,42,51. ,61,71,82}, which makes the data fast. Student management is managed by department and level, so each level is managed by a full-time advisor. Because similar students have similar academic and administrative backgrounds, it is beneficial for counselors and colleges to provide useful information for manage students by identifying specific activities related to students in the same department and grade level. Therefore, it is necessary and representative to extract the student information that is managed by the group of consultants.

Table 2. Attribute code table of a student

attribute	gender	character trait	family income	single parent family	only child	achievement	check on work attendance
Attribute value	male	Introverted, rational type	medium	yes	yes	good	qualified
code	22	30	41	50	60	70	80

3.3.2 k-means clustering results.

After preliminary data, the SPSS software group numbers were determined by psychologists based on the distribution of the SCL-90 Symptom Diagnostic 90 and UPI self-test forms for college students. In this paper, k = 3 is set, and its first group is automatically generated by the system. It will be modified to include seven indicators,

including gender, personality characteristics, family income, single-parent family, child only, grade point average, and attendance, up to a maximum of 10, and showing aggregated data for each case. Cluster analysis [5].

4   Result analysis

The clustering results show that the characteristics of the three groups are:

(1) There are 22 people in the first category, which is 22 of the total number of people. The different results of significance for the last group show that these students are flexible and stubborn, most of them come from low-income families, some have no children at all, and some come from single-parent families. Compared to other students, being a little different in everything makes them inferior, and they face emotional problems such as lack of self-confidence and silence. Moreover, they refuse to interact with teachers and other students, which makes it difficult to detect their emotional problems at an early stage. Although these students are studying at an advanced level, they do not interact with their teachers and classmates, their learning methods are wrong, and they cannot study well, so it is heartbreaking that their studies are insufficient. Due to the long-term support of many negative mental health conditions, such students may behave excessively if they are faced with serious or unexpected problems. Therefore, such students should be mentors and teachers in the classroom. In addition, there are many male children with different behavior in terms of price and collection design (the collection model is city building), which makes it difficult for girls to find someone to talk to if they have emotional problems. Therefore, girls should pay attention to such students [6-7].

(2) There are 26 students in the second category, which is 26 of all students. Such students are open, sincere, usually have good families and good education. Most of them are working class, military class and students. We need to use these good students and spread their goodness, goodness and happiness to all the students in the class. This group is an important group that sends positive energy to the classroom, and teachers and classroom teachers should strengthen their guidance [8].

(3) There are 55 students in the third category, which is 55 of all students. Such students are the main group of the school, but they are divided into two types that have different characteristics and specific transmission patterns. The first are extroverted students who rarely communicate with others about their inner workings. The second type is taught, but there are students who start looking for someone to talk to, which shows that these students have self-control. This group is still stable, but it is necessary to establish a monitoring system to know their heart regularly [9-10].

5   Conclusion

This is a useful discussion on the use of group therapy techniques in the assessment of mental health problems in college students. Research shows that the prevalence of mental health problems among college students can be found through data mining and grouping of mental health records. In mental health management, focusing on the

problem of poor prevention and the concept of early warning of the health of some college students, the review group is used to evaluate the mental health of students and achieve accurate and stable classification results. Not only does this type help school counselors and student leaders provide more and better mental health services to students, but it also provides some useful for health teachers in colleges and universities.

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