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Computer-Aided Design AND APPLICATIONS

Computerized Data Analysis of the Current Situation of Children's Psychological Education Using Big Data

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Abstract. In recent years, more and more students have serious mental health problems in the face of the pressure of learning. In view of this situation, this paper collects big data information, conducts comprehensive analysis of the data, and takes corresponding measures to prevent psychological problems through big data, so as to prevent children's psychological problems and carry out timely one-to-one targeted teaching. The junior middle school students in a middle school were selected as the research objects, and the paper quality scale group of 2018 grade and the automatic scale group of 2019 grade were compared as the teaching comparison data. The enrollment age of the two groups of students is 11 to 14 years old, with an average age of 12.4 ± 0.5 years. In the 2019 grade, there are 312 students in 6 teaching classes, 158 boys and 154 girls. In the 2018 grade, there are 324 students in 6 teaching classes, 163 boys and 161 girls. The bivariate t-check method of SPSS analysis software was used to compare and analyze the data of students in two grades. It was found that $t>10.000$ and $P<0.05$, which was a credible statistic. The following three rules were found in the actual statistics. The actual evaluation value of most students is low, and the students with mental health problems are always among the few students in the class. The change range of individual students' mental health is greater than that of collective mental health. Observe the actual evaluation value data of student cases separately. The range of change is greater than the median range of change. Some time points are above the median and most of the time points are below the median. That is, under the premise that the overall mental health of students is basically unchanged, students with more prominent mental health problems may occur. After using computer aided big data analysis, its important function is highlighted in the actual teaching process, that is, in addition to knowing the SAS evaluation scores and SDS evaluation scores of students at any time, the computer aided psychological state evaluation index and the collective psychological state evaluation index of students are given. Teachers and schools can obtain more detailed data on students' mental health while teaching tests are being conducted, so as to provide more accurate one-to-one psychological education intervention programs.

Keywords: Big data;Children's mental health;Psychological education for children;Data analysis
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1 INTRODUCTION

The mental health of children directly determines their long-term quality of life in the future. In contemporary education, the introduction of new big data in-depth mining technology to obtain children's mental health status should be the core method of children's education, and the core purpose of contemporary education should be to ensure children's mental health.In the actual teaching practice, this paper introduces big data real-time in-depth analysis algorithm to obtain children's mental health status in real time and carry out one-to-one targeted teaching, which has achieved gratifying teaching results. The teaching practice process is reported as follows.

2 OVERVIEW

In recent years, mental health has become a hot topic in society.He Qiang（2021）Children are not mature in mind and have strong self-esteem. We should use scientific education methods to maintain children's mental health and maintain their self-esteem [12].Nanhai, Ji Xuan（2020）As the ideological guides of children, teachers and parents should attach importance to children's mental health education, so that children can grow up healthily and happily [29].Nanhai, Ji Xuan（2019）Due to the earthquake and physical disability, many injured children have mental health, learning and education barriers.The rapid development of the Internet can help earthquake injured children more easily access external information, restore normal interpersonal relationships, and effectively improve learning and education problems [13].Yang Hongli（2021）It is mentioned in the innovative research on the dynamic monitoring system of students' mental health based on big data that big data can timely and accurately understand the evaluation indicators, principles and scope [3].Zhang Xiaoxiao (2021)It was mentioned in the study that the use of big data is an effective way to master students' mental health indicators [7].Wang Tao (2021)It was mentioned in the research on the psychological characteristics of students with difficulties that the use of big data analysis is particularly important for understanding the mental health of students with difficulties [2].Li Wenbo (2020)The research discussed the importance of big data technology in the innovation of students' mental health education.The research also conducted research and analysis on the objectives and content education models of students' mental health education [1].Alexander Leo（2020）This study provides insights, guidance and inspiration for seeking to promote big data personality measurement and practical consideration of researchers. Personality researchers use big data methods to conduct personality measurement, which greatly improves their work efficiency [4].Jiang Lingzhi (2020)The research always put forward that computer big data technology has built a new model for students' mental health education. Let schools and teachers guide students' psychological education in a timely manner [11]. Wang Kai (2020)The research analyzed the process of big data mental health education, and integrated big data into mental education in the education system. This method can effectively improve the quality of learning [10] computerized methods in mental health education is the dynamic monitoring of students' mental health using big data. By collecting and analyzing a vast amount of data, such as evaluation indicators and principles, educators and mental health professionals can gain timely and accurate insights into students' mental health status. This information serves as a foundation for identifying potential issues, providing appropriate interventions, and tailoring education models to meet individual needs.

3 DATA AND METHODS

3.1 General Information of Students

The junior middle school students of a middle school were selected as the research objects. The 2019 grade students began to use the automated online scale to collect the students' mental health status. Previously, the enrolled students collected the students' mental health status through the paper quality scale distributed in the classroom, and compared the 2018 grade paper quality scale group with the 2019 grade automatic scale group as the teaching comparison data. The enrollment age of the two groups of students is 11 to 14 years old,The average age is 12.4 ± 0.5 years old. In 2019, there are 312 students in 6 teaching classes, 158 boys and 154 girls. In 2018, there are 324 students in 6 teaching classes, 163 boys and 161 girls. The bivariate t-check method of SPSS analysis software was used to compare and analyze the data of students in two grades. It was found that $t>10.000$ and $P<0.05$, with a believable statistical consistency.

3.2 Data Acquisition Method

SAS scale was used to count students' anxiety and SDS scale was used to count students' depression. When the score of equivalent scale exceeded 7, students were considered to have corresponding mental health disorders. When the score exceeded 5, students' mental health needs to be closely watched.The 2019 grade students completed the scale on the mobile Internet platform, and the system automatically summarized it to the database and gave a score evaluation. After the 2018 grade students fill in the class distribution scale manually, the head teacher will recycle it and conduct manual marking and evaluation. Compared with students in Grade 2018 and Grade 2019, the following in-depth data mining based on big data of mental health scale has been added.

3.3 Data Analysis Method

Under the control of data timestamp tags, construct a data multi-dimensional matrix for multiple students' SDS and SAS data, use the minmax algorithm to normalize the data, use the transfinite learning machine to mine the intermediate results of data change rules, integrate the original data and the intermediate result data into the fuzzy neural network and convolve them into the final result. The algorithm mode is shown in Figure 1:

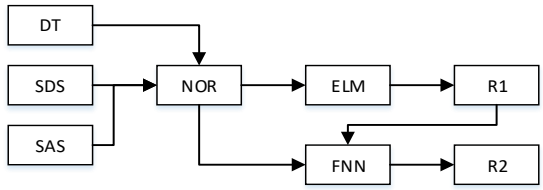

Figure 1: Algorithm System of Big Data Mining.

In Fig 1,

DT: data timestamp label;

SDS: a clinical scale for students' psychological state of depression;

SAS: an on-the-spot scale for students' anxiety;

NOR: a data normalization algorithm based on minmax. The algorithm formula is shown in Formula (1);

ELM: a data depth mining algorithm based on ELM. The algorithm node function is shown in Formula (2);

FNN: a data depth mining algorithm based on FNN. The algorithm node function is shown in Formula (3);

R1: Intermediate result output by ELM;

R2: Final result of FNN output;

$$\mathrm{MinMax}(x) = \frac{\mathrm{Max}(x) - x_i}{\mathrm{Max}(x) - \mathrm{Min}(x)} \tag{1}$$

Among: the ith variable in x_i: sequence x; $\mathrm{Max}(x)$: Maximum value in sequence x; $\mathrm{Min}(x)$: Minimum value in sequence x; $\mathrm{MinMax}(x)$: Function output results;

$$\mathrm{ELM}(x) = \sum_{i=1}^{n} A \cdot \mathrm{Sin}(B \cdot x_i + C) + D \tag{2}$$

Among: x_i: the ith variable in sequence x; Sin(*): Sine function rules in trigonometric functions; A. B, C, D: variables to be regressed;

$$\mathrm{FNN}(x) = \sum_{i=1}^{n} \sum_{j=0}^{5} A_j x_i^j \tag{3}$$

Among: x_i: the ith variable in sequence x; A_j: The variable to be regressed of the jth order polynomial.

In the above algorithm, different original data combination modes can form different output results. The original data combination mode is shown in Figure 2 below:

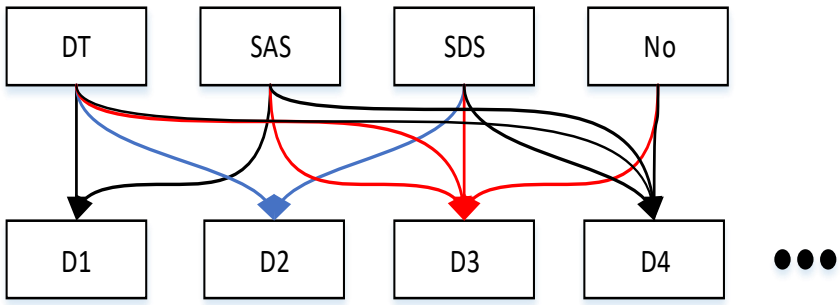

Figure 2: Combination Mode Diagram of Raw Data.

In Fig 2,

No: student ID;

D1: Based on the data integration of all students' SAS data on the timeline, the output results reflect the trend of all students' overall mental health on the anxiety index;

D2: Based on the data integration of all students' SDS data on the timeline, the output results reflect the trend of all students' overall mental health on the depression index;

D3: Based on the data integration of SAS data and SDS data of specific students, the output results reflect the mental health characteristics of specific students;

D4: Based on the integration of SAS data and SDS data of specific students in time, the output results reflect the changing trend of mental health characteristics of specific students;

Statistical methods

The measurement data shall be collected by means of the mean value in combination with the relative standard deviation, and summarized in the statistical table in the form of "mean value ± relative standard deviation"; Use the method of occurrence value and sample proportion to make statistics, and summarize the data into the statistical table in the statistical format of "occurrence value (proportion)"; The bivariate "t" check method is used to compare the data differences. When $t<10.000$, it is considered that the data have statistical differences, and the smaller the "t" value, the greater the data differences; The reliability index "p" value is used to determine the statistical value of the data. When $P<0.005$, the result data is considered to be in a credible statistical interval, and when $P<0.001$, the data is considered to have significant statistical significance.

4 RESULTS

4.1 Comparison Between Students' Overall Mental Health Data and Students' Personal Mental Health Data

According to the analysis method in Fig. 2 above, the statistical mean values of the individual SAS scale and the individual SDS scale were calculated, and the maximum, minimum and median values of all students were calculated. A certain statistical rule between individual data and collective data was found, as shown in Figure 3:

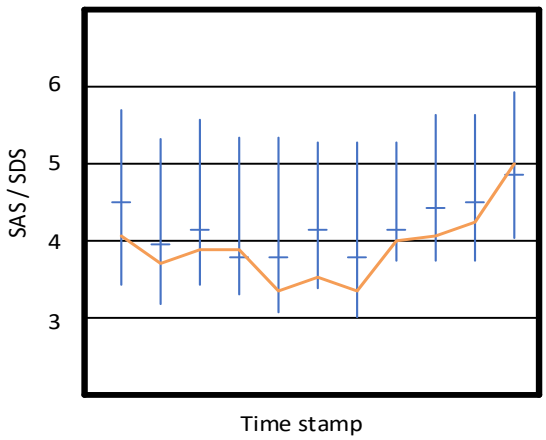

Figure 3: Distribution of Overall Mental Health Data of Students. (The cross star node is the median, and the solid yellow line is the distribution result of the personal data of selected students at random).

In Figure 3, the end of the blue crosshair is the maximum value, the lower end of the blue crosshair is the minimum value, and the center of the blue crosshair is the statistical median. The following three rules are found in actual statistics:

1 The median lies in the middle and lower part of the statistical data, that is, the actual evaluation value of most students is low. It can be inferred that most students are distributed

in the lower evaluation value range, and the students with mental health problems are always among the few students in the class;

2 Observe the maximum evaluation value, minimum evaluation value and median of students. The change range of median data is greater than the upper and lower limit data. The change range of individual students' projection position in collective data is greater than the median data. That is, on the timeline, the change range of individual students' mental health is greater than the change range of collective mental health;

3 Observe the actual evaluation value data of student cases separately. The range of change is greater than the median range of change. Some time points are above the median and most of the time points are below the median. That is, under the premise that the overall mental health of students is basically unchanged, students with more prominent mental health problems may occur;

The change of data is judged by the relative standard deviation rate, and the statistical results are shown in Table 1.

Grouping	*Individual case*	*Mean value*	*Median*	*Maximum*
Grade 2018	*0.482*	*0.375*	*0.519*	*0.202*
Grade 2019	*0.276*	*0.181*	*0.197*	*0.086*
t	*1.263*	*3.057*	*0.867*	*4.199*
P	*0.002*	*0.004*	*0.001*	*0.003*

Table 1: Statistical Chart of Relative Standard Deviation Rate of Data.

In Tab 1, the relative standard deviation rate (RSD) refers to the ratio of the standard deviation to the arithmetic mean of the calculated results. Its calculation function is shown in Formula (4).

$$S = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}}$$

It can be found that among all the four data statistical models involved in the comparison, the median and case data fluctuated most acutely, the mean value fluctuated next, and the median fluctuated least. The data t<10.000 and P<0.01 had significant statistical differences. The data analysis results and the analysis results in Figure 3 above corroborate each other.

4.2 Comparison of Mental Health Status Between Two Groups of Students

After the introduction of computer aided big data analysis in 2019, an important function has been added to the actual teaching process psychological scale test link, that is, in addition to knowing students' SAS evaluation scores and SDS evaluation scores at any time, students' computer aided psychological state evaluation index and students' collective psychological state evaluation index are given.Teachers and schools can obtain more detailed data on students' mental health while teaching tests are being conducted, so as to provide more accurate one-to-one psychological education intervention programs. Table 2 shows the actual performance of 2018 and 2019 students.

Grouping	*SAS>7*	*SDS>7*	*Entrance rate*
Grade 2018	*4.32±0.39*	*4.27±0.37*	*55.28*
Grade 2019	*2.87±0.25*	*2.76±0.23*	*62.73*
t	*1.964*	*2.083*	*7.665*

P	*0.008*	*0.006*	*0.012*

Table 2: Comparison Table of Statistical Results of Teaching Quality (%).

In Tab 2, The statistical results of SAS>7 and SDS>7 refer to the proportion of students with SAS evaluation results or SDS evaluation results greater than 7 points in the total number of students. The entrance rate refers to the proportion of students who have passed the secondary school entrance examination to ordinary high schools in the total number of students. The data in the table shows that the SDS and SAS evaluation results of 2019 grade students based on big data computer-aided analysis are significantly lower than those of 2018 grade students. The data $t<10.000$ and $P<0.01$ have significant statistical differences. In the data of enrollment rate, the students of 2020 grade are 13.48% higher than those of 2019 grade students. The data $t<10.000$ and $P<0.05$ have credible statistical differences.

Use the mean value of SDS evaluation results and SAS evaluation results to analyze the mental health of the two groups of students, and compare the students' academic achievements, as shown in Figure 4:

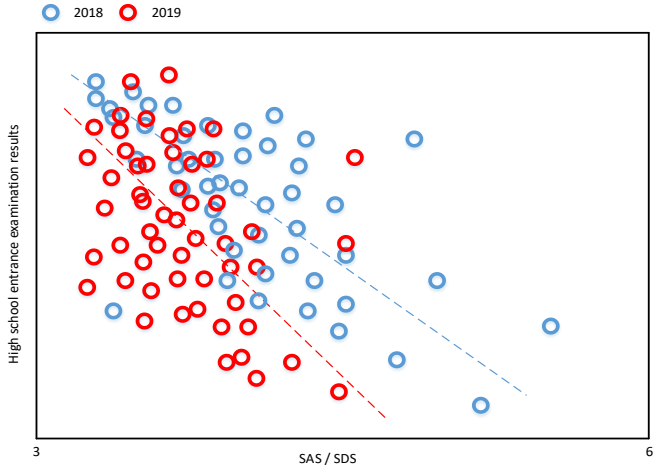

Figure 4: Correspondence Between Students' Mental Health Status and Their Scores in the Senior High School Entrance Examination.

In Fig 4, Students in Grade 2018 focus more on obtaining higher scores under a heavier mental sub-health state, while students in Grade 2019 obtain lower scores under the same psychological pressure conditions, but their overall psychological pressure is lower and their overall scores are higher. It can be seen from the distribution of the mean line that the mean line of Grade 2019 is steeper and lower than that of Grade 2018. It can be considered that the 2019 grade students have made good achievements in mental health management, but the students' learning enthusiasm education under the same psychological pressure needs to be improved.

5 DISCUSSION

The data underlying the results presented in After the reduction of students' psychological pressure, the enrollment rate of students in Grade 2019 has significantly improved compared with that of

students in Grade 2018. But there is also a phenomenon that students' enthusiasm for learning declines. After using computer aided big data analysis, its important function is highlighted in the actual teaching process, that is, in addition to knowing students' SAS evaluation scores and SDS evaluation scores at any time, students' computer aided psychological state evaluation index and students' collective psychological state evaluation index are given. Teachers and schools can obtain more detailed data on students' mental health while teaching tests are being conducted, so as to provide more accurate one-to-one psychological education intervention programs.

Bowden Nicholas (2020) used the comprehensive data infrastructure to identify and analyze the mental health and related problems of children and adolescents [7]. Calhoun Vince (2021) collected knowledge from big data and made progress in neuroimaging technology, which provided new insights into brain work and had a positive impact on mental health [14]. Julie Morton (2019) needs to redefine moral considerations when using big data. It shows that the continuous differences in services and research should also be considered when investigating the use of big data [15].

To sum up, it can be considered that after big data analysis, students' mental health management can provide accurate data analysis and evaluation. In teaching, teachers and parents can know the students' psychological conditions in real time, so that they can make relatively accurate one-to-one psychological education programs in time.

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