Application of SPSS in the Analysis of Comprehensive Results of Specially Selected Public Physical Education Classes -- Take the example of "Taekwondo" Special Selection Class

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Abstract:

In today's highly informative society, educators need to master advanced data analysis methods to analyze data information with breadth, depth, and high accuracy, and to obtain more accurate conclusions to provide a data reference for the development of the field. The SPSS software is a tool for statistical products and services, and its high level of automation and accuracy can greatly reduce the burden of statistical analysis on teachers. In this paper, the author analyzes 346 comprehensive results (before the make-up exams) of the 2021 class of Taekwondo at an institution of higher learning to verify the effectiveness of classroom instruction and to propose reference solutions for the development of the discipline.

Keywords: SPSS software; results analysis; teaching effect; parametric test; data

I INTRODUCTION

Education should follow the development of information technology and make improvements with the times as well as timely improvement of teaching methods and evaluation. In today's practical teaching work, the traditional manual and semi-manual statistical analysis methods obviously can no longer meet the teaching needs. Teachers could only get more objective and accurate evaluation by using professional statistical analysis software for teaching analysis work. SPSS, known as Statistical Product Service Solutions, is the most widely used statistical software, which integrates powerful functions such as data entry, management, analysis, table production and graphic generation, and is popular among statisticians for its unique advantages of easy operation, rigorous reasoning and reliable results. For educators, it is necessary to make timely use of SPSS statistical processing functions to analyze teaching effects and make reasonable teaching evaluation.

II. DATA SOURCES

Taekwondo is a compulsory general education course for students of all majors in this institute, which is a course with strong practicality. Through the Taekwondo course, students could understand the basic characteristics and rules of Taekwondo, master the basic theories, methods and skills of *Taekwondo*, and have the ability to use the means of Taekwondo for physical fitness activities. This study examines the reasonableness of the selected distribution of students' final results by taking a sample of 346 undergraduate students' final comprehensive results of Taekwondo course in an institute of 2021[1]. Given that there are many factors that affect students' final exam results [2], this paper uses SPSS25.0 to conduct basic descriptive analysis, normality test, and correlation test on the sample data to make an evaluation of teachers' teaching quality and teaching methods, and to grasp information from both teachers and students, so as to facilitate reasonable rectification of problems in teaching and to promote high development of teaching quality [3].

III. STATISTICAL ANALYSIS OF DATA

3.1 Frequency analysis

Basic statistical analysis often begins with frequency analysis. To analyze the effect of teaching at the end of the period, the first step should be to test whether the distribution of students' comprehensive results is normal, i.e., a bell pattern with low sides and high middle. Click to open SPSS-File-Data-EXCEL, import the comprehensive results in the form of a pre-organized EXCEL table into SPSS and draw a histogram, resulting in Fig 1.
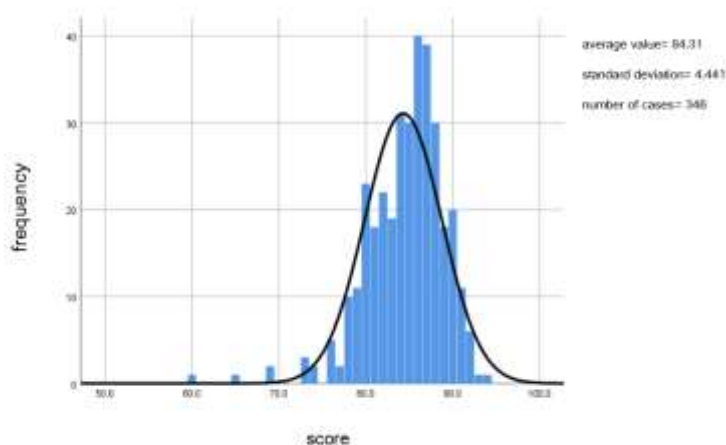

Fig. 1: Histogram

3.2 Basic descriptive analysis
Continue clicking on "Analysis-Descriptive Statistics-Description", resulting in TABLE I.

TABLE I Sample description analysis

Descriptive Statistics

	N Statistics	Min. Statistics	Max. Statistics	Mean Statistics	Standard Deviation Statistics	Skewness Statistics	Skewness Standard Error	Kurtosis Statistics	Kurtosis Standard Error
Comprehensive Results	346	60.0	93.5	84.308	4.4411	-1.162	.131	3.388	.261
Number of effective cases (in columns)	346								

In this case, the main indicators selected are the maximum value, the mean value, the sample deviation, the skewness coefficient and the kurtosis coefficient [3].

Through the comprehensive analysis of Figure 1 and Table 1, it can be concluded that the total number of students in this final test is 346, with 346 valid scores, of which the lowest score is 60, the highest score is 93.5, and the average score is 84.31, which indicates that the overall performance of students is generally good, and the teacher of the class has an overall excellent grasp of the syllabus and the teaching content is moderately difficult. The marked deviation is 4.44, which indicates that the gap between students' results is not large and the overall level of students is moderate to high. The skewness value is -1.16, which indicates that the overall part of the data sample is asymmetrical, and it is mostly on the right end, and the data is more discrete on the right side. The kurtosis value is 3.39, which is positive, indicating that the distribution of this data sample is steeper than the normal distribution.

3.3 Parameter Detection

Open SPSS and import the final comprehensive results that have been entered. Click on "Analysis - Non-parametric test - Old dialog box - Single sample K-3", and transfer the column where the grade is located to the "List of test variables". Then click "Options", check "Description" in the pop-up dialog box, and then click "Continue" and "OK ", resulting in TABLE II:

TABLE II Results of the single-sample Kolmogorov-Smirnov test

Single-sample Kolmogorov-Smirnov Test

		V2
Number of Cases		346
Normal Parameters[a,b]	Mean value	84.308
	Standard deviation	4.4411
Most Extreme Difference	Absolute	.086

	Positive	.045
	Negative	-.086
Test Statistics		.086
Asymptotic Significance (two-tailed)		.000[c]

a. The test distribution is normal.
b. Calculation based on data.
c. Riley's significance correction.

TABLE II describes the mean value, standard deviation, and extreme deviation of the variable "results". From the diagram, it is easy to see that the mean value of the sample is 84.31 and the standard deviation is 4.44. From the table, it can be seen that the asymptotic significance p-value is 0.00, which is obviously less than the significance level of 0.05, so the original hypothesis is not valid, and it is also judged that the data of the final comprehensive results do not obey normal distribution.

3.4 P-P diagram

To create a P-P diagram of the sample data, first click on "Analysis - Descriptive Statistics - P-P diagram analysis", add "Results" to the "Variables" column, and then click "OK", resulting in Figure 2 and Figure 3.
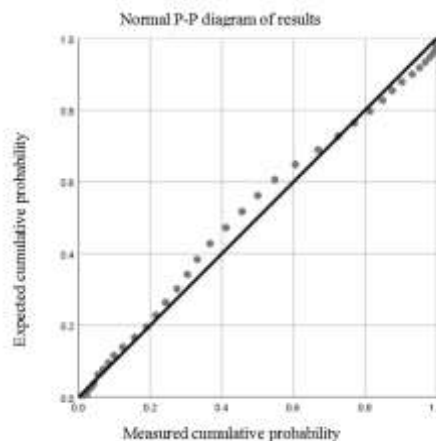

Fig. 2: P-P diagram

P-P diagram is used to verify that the cumulative proportion of the data remains essentially the same as the cumulative proportion of the normal distribution. If the data show normality, then the scatter plot should look approximately like a diagonal straight line. If the scatter plot does not appear to be a straight line, then the data are probably not normal. From Figure 2, it can be seen that the distribution of the sample data and the diagonal line clearly do not coincide and are in a scattered state, which leads to the conclusion that the sample data is not normally distributed.
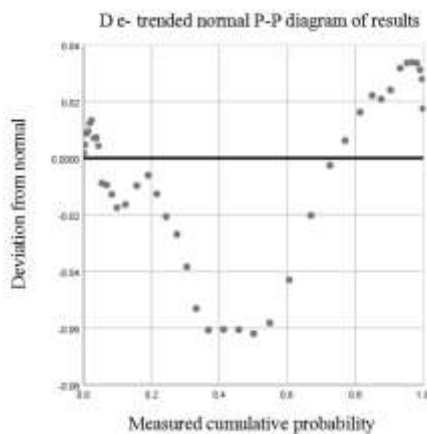
Fig. 3: Residual plot

Figure 3 shows the residuals plot of the actual and theoretical values calculated from the normal distribution. When the sample data is normally distributed, then the origin of the sample data representation should be uniformly distributed on the horizontal axis of Y=0. From Figure 3, it can be seen that there is a significant distance between the origin of the sample data representation and the Y-axis, and it can be decided that this sample data is not normally distributed.

3.5 Correlation analysis

The final results consist of 30% of the regular grade, 30% of the midterm grade, and 40% of the final grade. Among them, the regular grade includes classroom performance (10 points), attendance (10 points), theory examination (10 points); the midterm grade includes radio exercise (10 points), physical quality (20 points); the final grade is special technology (40 points). Open the SPSS software, click "Analysis" - "Correlation" - "Bivariate", and repeat this step to analyze the correlation coefficients of regular grades and comprehensive results, midterm grades and comprehensive results, and final grades and comprehensive results respectively, and click "OK" to get the following statistical results report.

TABLE III Report of statistical results 1

Descriptive statistics

	Mean Value	Standard Deviation	Number of cases
Comprehensive Results	84.308	4.4411	346
Regular Grade	27.8801	1.78340	346

TABLE IV Report of statistical results 2

Correlation

		Comprehensive Results	Regular Grade
Comprehensive Results	Pearson correlation	1	.596[**]
	Sig. Sig.(two-tailed)		.000
	Number of cases	346	346
Regular Grade	Pearson correlation	.596[**]	1
	Sig. Sig.(two-tailed)	.000	
	Number of cases	346	346

**. At the 0.01 level (two-tailed), the correlation is significant.

TABLE V Report of statistical results 3

Descriptive statistics

	Mean Value	Standard Deviation	Number of cases
Midterm Grade	19.3844	2.88920	346
Comprehensive Results	84.308	4.4411	346

TABLE VI Report of statistical results 4

Correlation

		Midterm Gradet	Comprehensive Results
Midterm Grade	Pearson correlation	1	.782[**]
	Sig. Sig.(two-tailed)		.000
	Number of cases	346	346
Comprehensive Results	Pearson correlation	.782[**]	1
	Sig. Sig.(two-tailed)	.000	
	Number of cases	346	346

**. At the 0.01 level (two-tailed), the correlation is significant.

TABLE VII Report of statistical results 5

Descriptive statistics

	Mean Value	Standard Deviation	Number of cases
Comprehensive Results	84.308	4.4411	346
Final Grade	39.0405	26.57859	346

TABLE VIII Report of statistical results 6

Correlation

		Comprehensive Results	Final Grade
Comprehensive Results	Pearson correlation	1	.096
	Sig. Sig.(two-tailed)		.074
	Number of cases	346	346
Final Grade	Pearson correlation	.096	1
	Sig. Sig.(two-tailed)	.074	
	Number of cases	346	346

From TABLES III, V, and VII, it can be concluded that the mean value of regular grades is 27.88 ± 1.78, the mean value of midterm grades is 19.38 ± 2.89, and the mean value of final grades is 39.04 ± 26.58, and the mean value of comprehensive results is 84.31 ± 4.44, along with its case number of 346. Figures 4, 6, and 8 show the correlation between the regular grade, midterm grade, and final grade with comprehensive results. As seen in Figure 4, the correlation coefficient between the regular grade and the comprehensive results is 0.596, i.e. |r|=0.596. The coefficients are marked with two fortunately and "**" in the lower left corner indicates that the correlation is significant when it is greater than 0.01, which means that the correlation between "regular grades" and " comprehensive results" is significant. Figure 6 shows that the correlation coefficient between midterm grades and comprehensive results is 0.782, with two asterisks next to the coefficient and a note "**" in the lower left corner indicating that the correlation is significant when it is greater than 0.01. This means that the correlation between "midterm grades" and "comprehensive results" is significant. Similarly, according to Figure 8, the correlation between "final grades" and "overall grades" is not significant.

IV. CONCLUSION

The use of advanced data analysis software to make a reasonable and scientific analysis of the final comprehensive results of teaching can provide an objective and fair reference for course teaching and reform. In this paper, after using SPSS25.0 to analyze the comprehensive results of *Taekwondo* course as a data sample, it was concluded that: the distribution of this comprehensive results was negatively

skewed; there was a positive correlation between the regular grades, midterm grades and comprehensive results; and the differences in comprehensive results among students were small. It shows that only students who usually actively participate in motor skill practice, have serious learning attitudes, and actively learn sports-related theoretical knowledge can have correspondingly excellent final comprehensive results. During the usual teaching and final test, teachers should tailor their teaching to different types of students and set different goals so that they can get the same magnitude of athletic ability improvement through course teaching and after-school practice.

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