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Study and Evaluation of the Assumptions of Statistical Methods in Published Educational Research: Al-Mandumah Database as A Model: Review Study

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Abstract: The aim of this research is to study and evaluate the assumptions of statistical methods in educational research published in the Dar Al-Mandumah Database. The non-probability purposive sample was used in the study, and it consisted of 301 educational research divided into three categories (PhD and Master's theses, educational research in curricula, teaching methods and educational issues, and educational research in statistical subjects). To achieve the goal of the research, the “Preferred Reporting Items for Systematic and Meta-Analysis Protocols (PRISMA-P2015) method” was used, and it consists of two phases. The first phase dealt with the study of the statistical methods used in educational research, and the second phase dealt with the verification of each of the assumptions of the statistical methods used in educational research. Frequencies and percentages were used in both phases. The results of the first phase concluded that descriptive statistical methods and simple inferential statistical methods are the most widely used. While the results of the second phase indicated that educational research lacks the verification of the assumptions of the statistical methods used in it. The research recommends that research should follow a new approach when it comes to statistical methods; especially since recent trends in research refer to the use of advanced research methods, and assumptions must be verified before using statistical methods.

Keywords: Statistical methods, assumptions of statistical methods, educational research, Dar Al-Mandumah Database.

1 Introduction

Statistical processes occupy a prominent place in the design and implementation of many scientific research and graduation requirements to obtain a bachelor's, master's or doctorate degree, and because statistical methods are an integral part of the statistical process, hardly any psychological or educational research is devoid of their use, whether descriptive or inferential. As a result of recent developments in technological means, it has become possible to use many statistical methods in data analysis, after it was difficult to use them.

It has become a requirement for good research to use appropriate statistical methods to collect data and analyze it in order to come up with statistical indications that will help

us accept or reject statistical hypotheses, so that the results reached by the researcher can be generalized. Some describe educational research that does not use statistics as impractical [3]. Therefore, the researcher must have the ability to properly understand the different theories, and have the professional ability to employ them appropriately, and possess logical thinking that helps them in analysis, and the ability to deduce results through interpretation. The skill of analyzing and interpreting information includes arranging information according to its importance in the occurrence of the problem or in its interpretation, and this is done in specific steps [17]. The researcher should choose the statistical method on the basis of studying its theoretical framework, not only based on the terms of use of each statistical method, but also based on its suitability for achieving the research and its assumptions. In order for the researcher to be able to do this, they must rely on a set of

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criteria, namely: the objective of the research and the statistical method that suits it (descriptive statistics, inferential statistics), measurement levels, the nature of the sample and its relationship to society, the nature of the variables, the strength of the statistical test [9].

Educational research is one of the various fields of scientific research, and it can be said that educational research has become one of the most important fields that contribute to the progress of countries. But it has also been noted that educational research is currently in a phase of confusion and instability. This confusion is caused by some mistakes that researchers make; affecting the credibility of educational research, and the results that can be relied on in educational sciences. Therefore, it is necessary to continuously and permanently evaluate educational research in order to identify weaknesses and errors and address them, as well as strengthen the positive aspects [12].

The author in [14], indicated by reading many university theses, educational research, and degree promotion research, that many of them did not use statistical methods accurately, which leads to a loss of ability among some researchers in the educational field to choose the appropriate statistical method for their research, putting them in front of an ethical and scientific responsibility. Among the common statistical errors that researchers make are: errors in statistical test analysis, sampling errors, questionnaire design errors, errors in data collection (including bias error, ease and coincidence), and general methodological errors (are more clear when choosing the approach for comparison purposes).

In [15], the authors drew attention to two aspects about the use of mathematical statistics for educational research purposes. The first is: the adequacy of the application of mathematical statistics in examining the phenomena related to the educational process, for example, the T-Test was used to test hypotheses in educational research. The second aspect is: clarifying how the computer affects the quality of mastering the subjects under study and the developing the student's personality. The most important results of the study showed that the use of the T-Test is not compatible with the educational data that was analyzed, as it did not fulfill the condition of a normal distribution.

The author in [6], addressed in her study the identification of the obstacles in using statistical methods in university theses from the point of view of first-year master students at the Department of Psychology at Mohamed Boudiaf University in Messila, in three areas: (data collection, research procedures, analysis and interpretation of results). She also aimed to: examine the differences in the degree of these obstacles. The study concluded that the degree of obstacles in using statistical methods in university theses from the students' point of view is major in the field of data collection, as well as in the field of research procedures, and the field of analysis and

interpretation of results and that there are no statistically significant differences in the obstacles of using Statistical methods in university theses from the students' point of view due to the specialization variable.

In [9] the authors indicated that the process of choosing the appropriate statistical method has become an urgent necessity for researchers as a result of the need for more objective and accurate results, and the process of violating the conditions for applying any statistical method inevitably leads to false results.

In the same context, the author in [13] aimed to identify the statistical methods that were used in higher education research between 1998 and 2017. To collect data, the Educational Resources Information Center (ERIC) and the Current Index to Statistics (CIS) were used, and the key words in the summaries of the studies that are included in ERIC were examined (in terms of: data, dependent variable, response, outcome or performance). The statistical methods used in the studies were classified into seven categories (descriptive statistics, hypothesis tests, simple regression models, multiple regression models, factor analysis, survey analysis and category errors). The results showed that until 2010, the majority of research used a limited number of statistical methods, including: descriptive statistics, basic tests and simple regression. After 2010, more quantitative methods were used, including: factor analysis, multiple regression models, structural equation models, slope analysis, random limits, and survey models. The study also found that most research focuses on statistical relationships between variables rather than generating and testing theory-based methods.

Through the foregoing, this research came to study and evaluate the assumptions of statistical methods in educational research published in the journals included in the educational information database (Edu Search) - which is a sub-base of the Dar Al-Mandumah Database- to know which statistical methods are most used in it, and if these researches have verified the assumptions of the statistical method used. Educational research includes theses and educational research published in the educational information database (Edu Search). This research deals with educational research, whether it is university theses (Master's and PhD), or educational research published from two sides: the first is a review of the statistical methods used in them, and the second is a verification of the assumptions of the statistical methods used in these researches.

The educational research studied in this research are published in high quality educational journals, some of which are included in the global database "Scopus", such as the Journal of Dirasat issued by the University of Jordan. As for university theses (PhD and MA), they are issued by many internationally recognized Arab universities. In the sense that educational research and messages were not limited to an educational journal or an Arab university per se. What distinguishes this study is the diversity in

educational journals and Arab universities that publish research and theses (PhD, MA). This study is distinguished by its focus on studying the statistical methods used in them and verifying their assumptions.

It is known that hardly any research, especially educational research, is devoid of the use of statistical processes and methods, whether they are descriptive or inferential. Therefore, a cursory look at educational research is sufficient to provide clear proof of the extent to which educational research uses appropriate statistical processes and methods. The statistical method has conditions and assumptions that must be verified before starting the process of analyzing and interpreting the results and making generalizations; they include: the nature of the data, the independence of the data, randomness, and the normal distribution of the data. Many researchers ignore the verification of the assumptions of the statistical method used, and face obstacles that are reflected in the use of the statistical method and the carrying out of statistical operations related to the research topic, and this is what the author indicated in [6], He pointed out that graduate students face many obstacles and statistical problems when writing university theses, which results in difficulty in trusting the findings, leading to a clear shortcoming in addressing educational problems. In [16], the author mentioned many factors that contribute to the misuse of statistical processes and methods in research, including: the degree of proficiency in using statistical programs, and the desire to obtain statistical significance, even if it was necessary to falsify the results. This study highlights the verification of the assumptions of the statistical methods used in educational research. Specifically, this study seeks to answer the following question:

Were all assumptions of the statistical method used in research and educational messages verified?

This research acquires its theoretical importance through its findings regarding statistical methods in research and educational messages, in terms of research and educational messages verifying the assumptions of the statistical methods used in them. As for its practical importance, it is manifested in directing the researcher to the scientific steps they must take in the field of research when choosing the statistical method, including: verifying the assumptions of the statistical method and its relevance to the data and the nature of the research.

This research aims to study and evaluate the assumptions of statistical methods in educational research published in the educational information base within Dar Al-Mandumah Database, by identifying the statistical methods in educational research and messages, and ensuring that the assumptions of the statistical methods used in them are verified. This study aims to assist educational researchers in choosing the appropriate statistical methods in their studies and the ways to verify their assumptions.

This research was limited to educational research

published in educational journals and included in the educational information database (**Edu Search**) within the Dar Al-Mandumah Database, in the time period between 2018 and 2020.

The research deals with the following terms:

Dar Al-Mandumah Database: a database specialized in the field of building and developing scientific databases specialized in research and academic fields, namely: the Educational Information Database (**Edu Search**), the Islamic and Legal Sciences Database (**Islamic info**), the Language and Literature Database (Arabase), the Economics and Administration Database (**Eco link**), the Humanities Database (Humanindex), University Theses Database, University Theses Registration Database: Al-Kashf [4].

Educational research (the terminological definition): it is one of the various fields of scientific research, and an organized and directed scientific effort with the aim of reaching solutions to the various educational problems in the educational sciences, which in their entirety constitute a system with inputs, processes and outputs [2].

Educational Research (procedural definition): it is research that is concerned with studying an educational problem or a specific educational field, and it has been published in one of the educational journals located within the educational information database (Edu Search), which is a sub-base of the Dar Al-Mandumah Database.

Assumptions of the statistical method (procedural definition): they are characteristics assumed by the parametric statistical methods of the data, and the violation of these assumptions affects the results and their interpretation, so they must be achieved when using the parametric statistical method in order to accurately interpret the results, and reach real, realistic results. Some of the most important assumptions are: normality, randomness, independence and homogeneity of variance.

Statistical methods in educational research:

Statistical methods in educational research include:

Descriptive Statistics

Descriptive statistics in educational research include: mean, median, standard deviation, simple linear correlation, Spearman Rank Correlation, and Simple Linear Regression.

Inferential Statistic: Parametric and Non- Parametric Statistics

Table (1) shows the most important parametric and non-parametric inferential statistical tests alternative to parametric tests in the event that their assumptions are not achieved in educational research.

Assumptions of Parametric Inferential Statistics:

In [10], the author pointed out the most important assumptions of parameter statistics, which are:

- The data should be on a categorical scale at least.
- Data Independence: meaning that choosing any individual at random from the sample does not affect another individual from the same sample.

- Randomize: each member of the study population has the same chance of being selected to be in the study sample.
- Normality: the random data approximate a normal distribution, depending on the type of test being performed.
- Homogeneity of variance: when more than one group is compared, the variance is the same for all groups.

Methods of verifying the assumptions of parameter statistics in educational research:

The verification of the assumptions of parameter statistics in educational research is as follows:

- Data Independence: the Durbin-Waston coefficient is used, the coefficient is (2.5-1.5) so that the data is independent.
- Randomize: to test the hypothesis, the Run Test is used [8].
- Normality: the Kolmogorov-Smirnov Test, the hypotheses to test the normal distribution of the data are:

- H_0 : the data is normally distributed
- H_1 : The data follows a certain distribution that is not a normal one

If the probability value is $\text{sig} < 0.05$, the null hypothesis is not rejected, and therefore the data is normally distributed [7],[8].

- Homogeneity of variance: the homogeneity of variance hypotheses are as follows:

- H_0 : All groups have the same variance (equal in variance)
- H_1 : The variance varies between at least two groups

The most commonly used tests to check homogeneity of variance are:

- Levene's Test, if the value of Levene's Test probability $\text{sig} < 0.05$ the null hypothesis is not rejected and therefore the variance is equal for all groups.
- Bartlett's Test

$$\chi^2 = \frac{N - K \ln S_p^2 - \sum_{i=1}^K n_i - 1 \ln(S_i^2)}{1 + \frac{1}{3k-1} \left(\sum_{i=1}^k \frac{1}{n_i-1} - \frac{1}{N-K} \right)}$$

If the calculated value of $\chi^2 <$ the critical value at degree of freedom $df = k-1$ the groups are homogeneous.

- F-max Test (Hartley's Fmax): this test is used in the context of Anova.

$$F_{max} = \frac{\text{larger variance}}{\text{smaller variance}}$$

It is assumed that the size of the study groups is equal if the value of F-max = 1, which means that the variances are homogeneous, but if it differs from 1, the value of F-max is

compared with the critical value of the F-max tables at the degree of freedom $df = k-1$ and k means the number of groups. To check the homogeneity in the case of regression, Parallelism Tests are used to verify that the slope of the regression line is the same for all levels of the variable [7].

Advanced statistical tests

Advanced statistical methods include: Factor Analysis, Principal Component Analysis, Discriminant Analysis, Ancova Analysis, Survival Analysis, Multiple Regression, Logistic Regression.

Indicators of the power of relation and the effect size, [1]

Indicators of the power of relation and the effect size are used when rejecting the null hypothesis in the T-Test for two independent samples and for tests of variance. The statistical significance is not an appropriate tool to measure the effect of treatment, because it has a relationship with the sample size, the larger the sample size, the greater the possibility of rejecting the null hypothesis from these indicators in educational research Eta square η^2 , omega square ω^2 , effect size (d).

Post Hoc Multiple Comparison [1]and [5]

These tests are used when F is a statistical function, that is, they are used after the results of the analysis of variance have shown the presence of statistical significance, and it is called (Post Hoc Multiple Comparison), which is either Pairwise Comparison like: Tukey Test (HSB), Newman-Keuls Test and Tukey/Kramer (TK) Test or Complex Comparison like: Scheffe Test. One of the pre comparisons tests, regardless of the significance of F, is the Dunnett Test.

2 Materials and Methods

The research follows the descriptive-evaluative approach, which depends on collecting, analyzing and interpreting information and facts to reach realistic, applicable and developmental conclusions. This is due to its relevance to the objectives of the study. The research community consists of educational research published in Arab journals included in the Educational Information Database (**Edu Search**), which is included in the Dar Al-Mandumah Database. The size of the target community in the study is too large to be limited, so the study sample was chosen from the newly published educational research within the database.

The sample consisted of educational research published in educational journals within the period 2018-2020. This period was chosen to ensure the up-to-dateness of the published research. These educational research and studies were classified into three categories (PhD and MA theses, educational research in curricula, teaching methods and educational issues, and lastly educational research dealing with issues related to statistical methods). The size of the research sample was (301) educational research and university theses, divided into the three categories: (43) university theses (Master's and PhD), these theses focused

Table 1: Parametric and non-parametric inferential statistical tests in educational research.

Evaluation to be performed	Parametric Test	Non-parametric Test
Compare one set with the default value	One-Sample T-Test	Wilcoxon Signed Rank Test
Compare two independent groups	Independent Sample T-Test.	Mann-Whitney Test
Compare three or more independent groups	One-Way Anova	Kruskal-Wallis Test
Compare two related groups	Dependent T-Test	Wilcoxon Signed Rank Test
Compare three or more related groups	Repeated Measure Design	Friedman Test
Correlation between two variables	Pearson Correlation	Spearman correlation
Predicting a variable from a set of variables	Linear regression	Non-parametric regression/Logistic regression

on the third semester which dealt with the statistical methods used in the research and, the fourth semester, which dealt with the results of applying statistical methods in each thesis. (168) educational research in curricula, teaching methods and educational issues, and (90) educational research related to statistical methods.

After reviewing the educational literature from previous studies related to the topic of the research, and after collecting evidence related to the research objectives, a checklist consisting of several stages according to the eligibility criteria *Preferred Reporting Items for Systematic and Meta-Analysis Protocols (PRISMA-P2015)* was used as a research tool. The protocol or method is a tool for reviewing and evaluating research and studies. It is based on collecting studies and research related to a particular topic. These studies and research are reviewed in stages. After collecting all studies and research related to the subject of the study, their summaries are reviewed, and then the methods used in these studies and research, the data and its nature, the limitations, the recommendations, and the results are all reviewed. These stages could be increased, depending on the type of study. This protocol or method allows us to clarify the most important methods used and the most suitable ones for the research and related studies. It functions as a guide that can be referenced to and reviewed for the most important results so that we can benefit from them in later studies. It also serves as an appropriate base with regard to inclusion criteria and decision-making [11].

This protocol or method was used in the study [13], the aim of which was to review statistical methods in graduate studies. In this research, the protocol or review method for research and studies consists of some of the phases used in the study. The verification of the assumptions of statistical tests was added to it, and the first phase related to the summaries was omitted from it, which is explained as follows:

Phase one: determining the methods of statistical analysis in research and university theses, which are:

1. Descriptive statistics: frequencies, mean, median, variance or standard deviation, correlation, simple regression, histogram.
2. Statistical methods hypothesis testing: T-Tests, Z-Tests, analysis of variance of all kinds, Analysis Anova, chi-square.
3. Simple Regression Models, logistic regression.
4. Multilevel regression.
5. Factorial Analysis, Principal Component Analysis (PCA), Discriminant Analysis.
6. Survival Analysis.
7. Nonparametric methods.
8. Effect size coefficients and statistical significance.
9. Dimensional comparisons if the test result rejects the null hypothesis.

Phase two: Checking the verification of each assumption of the statistical method used, including: sample size, data independence, randomness and homogeneity of variance.

The objective of the two-phase study tool is to identify the statistical methods used in the first phase, and in the second phase to evaluate the verification of the assumptions of the statistical methods.

Statistical methods:

The research used the following statistical methods:

- Percentages
- Statistical frequencies
- Arithmetic means and standard deviations
- Illustrations

3 Results and Discussion

To answer the research question, the data was analyzed in two stages, as follows:

Phase One: The results of the analysis related to statistical methods:

The first phase deals with the frequencies and percentages of PhD and Master's theses and educational research to examine the suitability of the study sample to the objectives of the study. Then it deals with calculating the percentages and frequencies for the parametric and non-parametric statistical methods used in educational research and university theses.

The results of the analysis in Table (2) indicated that the PhD and Master's theses made up about 14.3% of the

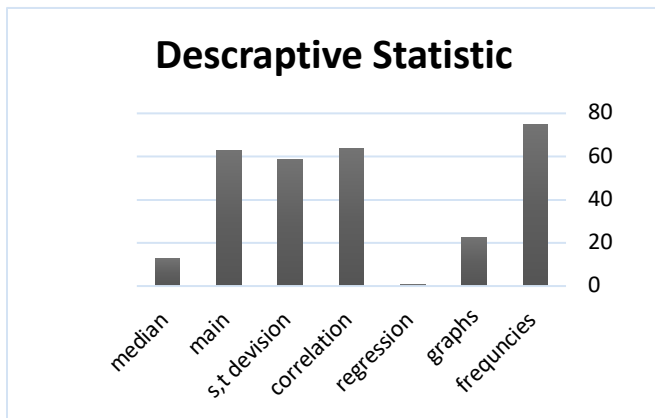


Fig. 1: Descriptive Statistics.

• Simple Statistical Methods results

Figure (2) shows the t.test was used more than the z.test test in the researches under study by 40.9%.

educational research targeted in this study. Educational research in curricula, teaching methods and educational issues made up 55.8% of the educational research targeted in this study. While educational research in statistical issues made up 29.9% of the educational research targeted in this study. Thus, the sample is considered a reliable sample that is reliable in analyzing the data and achieving the objective of the study, and so is a good example of the research problem.

• Descriptive statistics results

The study reviewed the statistical methods found in the third and fourth semesters of theses (PhD and MA), the statistical methods used in educational research in curricula, teaching methods and educational issues, and educational research in statistical issues. The results of the analysis in Figure (1) indicated that the frequencies are the most used method in the researches under study by 75%.

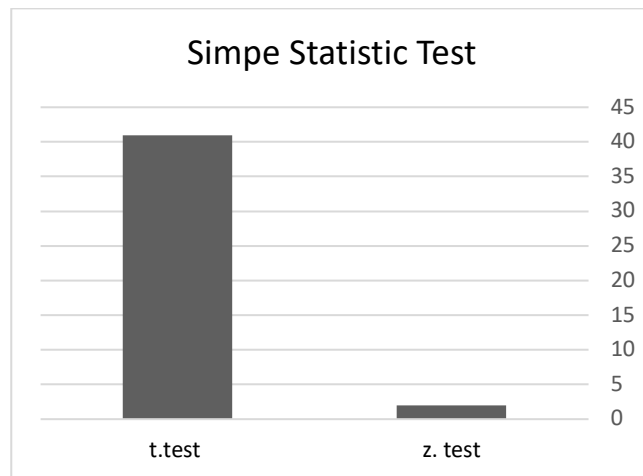


Fig.2: Simple Statistical Methods (T.Test & Z.Test).

Table 2: Frequencies and percentages of PhD and Master's theses, educational research in curricula, teaching methods, educational issues, and educational research in statistical issues.

Type of research	Frequency	Percentage
PhD and Master's theses	43	14.3%
Educational research in curricula, teaching methods, educational issues	168	55.8%
Educational research in statistical issues	90	29.9%
Total	301	100%

Figure (3) shows that the One Way Anova method is the most widely used in the research under study, with a percentage of 16.9%.

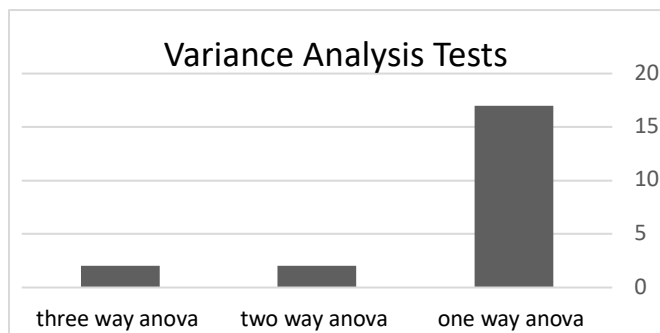


Fig.3: Variance Analysis Tests.

• **Advanced Statistical Methods results**

Figure (4) shows that factor analysis (FA) is the most widely used in educational research under study at 7%, followed by Principal Components Analysis and Logistic Regression at 5%.

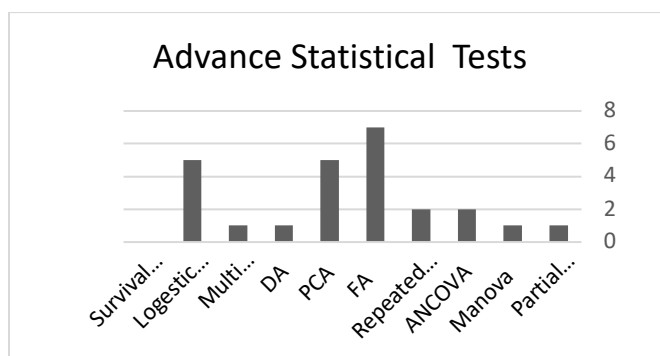


Fig.4: Advanced Statistical Methods.

• **Nonparametric Statistical Methods results**

Figure (5) shows that the chi-square of matching is the most widely used in educational research under study, with a percentage of 9%.

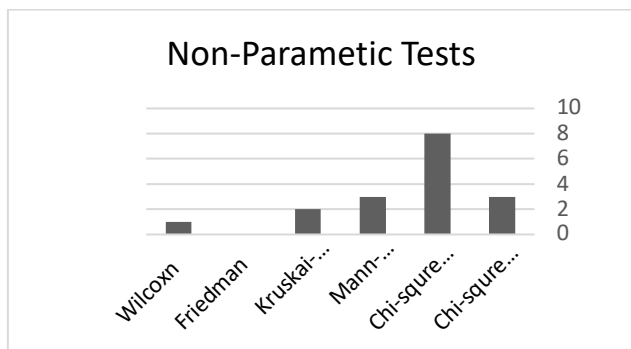


Fig.5: Nonparametric Statistical Methods.

• **Statistical Significance, Power of Relation and Effect Size results**

Figure (6) shows that statistical significance is the most widely used in educational research under study, with a percentage of 60%.

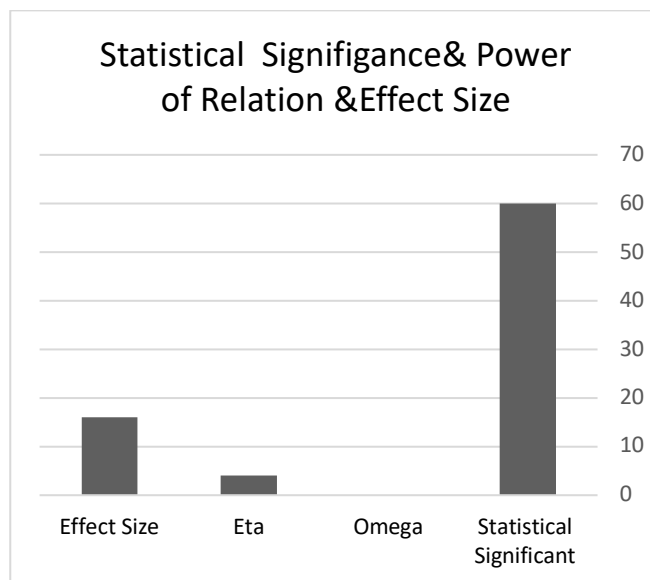


Fig.6: Statistical Significance, Power of Relation and Effect Size.

• **Pre and Post Comparison Tests results**

Figure (7) shows that Scheffe's post-comparison test is the most widely used in the educational research under study with a percentage of 7%, while none of these researches used pre-comparison tests.

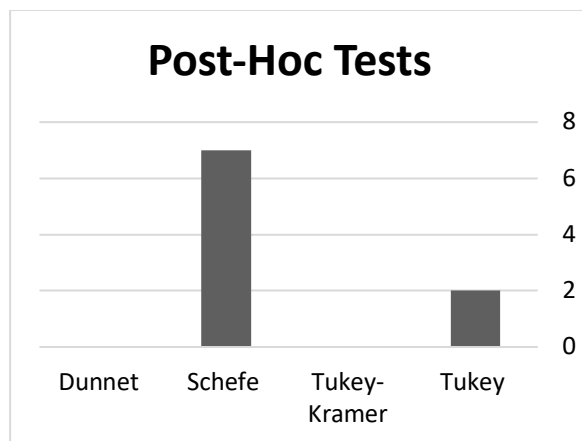


Fig.7: Pre and Post Comparison Tests.

The statistical methods most commonly used in the educational research under study can be summarized as shown in Figure (8), that frequencies are most used, followed by the T-Test, and the least is factorial analysis (FA) Test.

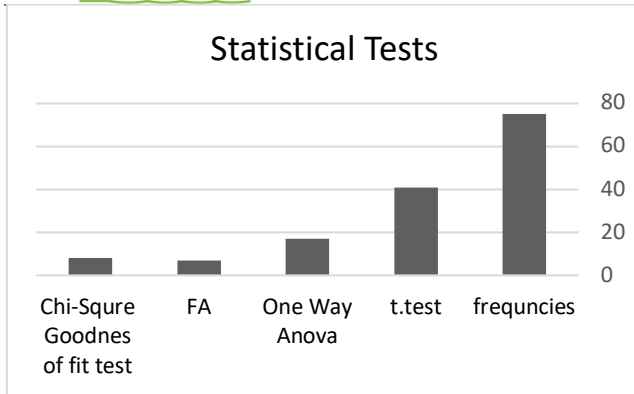


Fig.8: Summary of the most widely used statistical methods in educational research.

The first phase of the research dealt with the statistical methods used in the research under study, most of which have used descriptive statistics methods represented in (frequencies, arithmetic mean, standard deviation and Pearson/Spearman correlation coefficient). The Pearson/Spearman correlation coefficient was used to check the stability of the study's tools and to reveal the correlation between the paragraphs of the study's tool used, or what is called internal consistency. This indicates that the majority of research uses descriptive statistics extensively.

As for the tests related to T-Tests. and Z-Tests., it was concluded that nearly half of the research under study used T-Tests. It was noted by reviewing the statistical methods used that these tests were mostly used for the purpose of verifying the equivalence of the study groups. The study concluded that the T-Test does not fit with the analyzed educational data, as it did not meet the conditions of a normal distribution.

The results of the analysis related to the analysis of variance tests indicated that the one-way analysis of variance is the most widely used in the educational research under study, compared to other analysis of variance tests. As for the advanced statistical methods, the results indicated that the factor analysis (FA) is the most used compared to other methods with a percentage, due to the fact that some educational research in statistical issues dealt with topics related to the analysis of test paragraphs, or topics related to Item Response Theory, which indicates the low use of advanced statistical methods in educational research that dealt with other topics.

As for the nonparametric statistical methods, the most used of these tests in the research under study is the chi-square test for conformity, and the criteria for using this test, or the reasons for using it, were not indicated. The study concluded the low use of non-parametric statistical tests as a whole in the research under study.

The study concluded that the research under study, mostly used statistical significance, and the reason for this

is the use of statistical hypotheses whose acceptance or rejection of the hypothesis depends on the value of the statistical significance, and that the ratio of reference to effect size is weak, and the ratio of reference to the power of the relation represented by the coefficient of Omega and Eta is almost non-existent.

The study concluded that the educational research under study did not use pre-comparisons, which are used to select the most appropriate statistical hypotheses, based on the statistical hypotheses that were used in previous studies. This type of comparison requires a return to previous relevant studies, which requires a comprehensive review of the literature related to the research question and is very useful in study design, instrument selection and statistical tests selection.

Concerning post-comparisons, the study concluded that Schaffer's post-comparisons test is more used than other post-comparisons tests, which are used after rejecting the null hypothesis in order to verify the significance of the differences. However, the use of this test was limited and weak, as many educational researches under study neglected this aspect of the analysis despite its importance in revealing the significance of the differences.

Phase Two: the results related to the verification of the assumptions of the statistical methods

The second phase deals with the results related to the answer to the research question: Were all assumptions of the statistical method used in research and educational messages verified? Which constitutes the second phase of the analysis. The following tables show the frequencies and percentage of each assumption of the statistical methods in research and university theses. The results of the analysis indicated in Table (3) that 9.3% of PhD and Master's theses have verified the assumption of independence, while educational research in curricula, teaching methods and educational issues did not verify this assumption. As for educational research in statistical issues, the percentage of verification of the assumption of independence was 6.7. %.

The results of the analysis in Table (4) showed that a small number of PhD and Master's theses, and educational research in statistical issues were verified by the assumption of randomness at a rate of 2.3% and 1.1%, respectively, while educational research in curricula, teaching methods and educational issues did not verify this assumption.

The results of the analysis in Table (5) showed that a small number of PhD and Master's theses, educational research in curricula, teaching methods and educational issues, and educational research in statistical issues were verified by the assumption of a normal distribution of data at a rate of 2.3%, 0.6%, and 2.2% Respectively.

Table 3: Frequencies and percentages of assuming independence in university theses, educational research in curricula and teaching methods, educational issues, and educational research in statistical issues.

Independence				
Type of research	None	Verified	Not verified	Total
University theses	0	4	39	43
Percentage	0%	9.3%	90.7%	100%
Research in educational issues	13	0	155	168
Percentage	7.8%	0%	92.2%	100%
Research in statistical issues	11	6	73	90
Percentage	12.2%	6.7%	81.1%	100%
Total	24	10	267	301
Percentage	8%	3.3%	88.7%	100%

*None: means research that did not mention any of the statistical methods used in analyzing its data.

Table 4: Frequencies and percentages of assuming independence in university theses, educational research in curricula and teaching methods, educational issues, and educational research in statistical issues.

Randomness				
Type of research	None	Verified	Not verified	Total
University theses	0	1	42	43
Percentage	0%	2.3%	97.7%	100%
Research in educational issues	13	0	155	168
Percentage	7.8%	0%	92.2%	100%
Research in statistical issues	11	1	78	90
Percentage	12.2%	1.1%	86.7%	100%
Total	24	2	275	301
Percentage	8%	0.7%	91.3%	100%

*None: means research that did not mention any of the statistical methods used in analyzing its data.

Table 5: Frequencies and percentages of assuming independence in university theses, educational research in curricula and teaching methods, educational issues, and educational research in statistical issues.

Normal Distribution				
Type of research	None	Verified	Not verified	Total
University theses	0	1	42	43
Percentage	0%	2.3%	97.7%	100%
Research in educational issues	13	1	154	168
Percentage	7.8%	0.6%	91.7%	100%
Research in statistical issues	11	2	77	90
Percentage	12.2%	2.2%	85.6%	100%
Total	24	4	273	301
Percentage	8%	1.3%	90.7%	100%

*None: means research that did not mention any of the statistical methods used in analyzing its data.

The results of the analysis in Table (6) showed that 7% of PhD and Master's theses were verified by the assumption of homogeneity of variance, using the Bartlett's Test at 2.3%, and Levene's Test at 4.7%, while a few educational research in curricula, teaching methods and educational issues verified the results using Levene's Test at a rate of 1.8%, As for the educational research in statistical issues, they verified the assumption at a rate of 7.8% using the F-max Test at 1.1%, Bartlett's Test at 5.6%, and Levene's Test at 1.1%.

We can summarize and say that the educational research under study focused on verifying the homogeneity of variance more than the rest of the other assumptions, as shown in Figure (9).

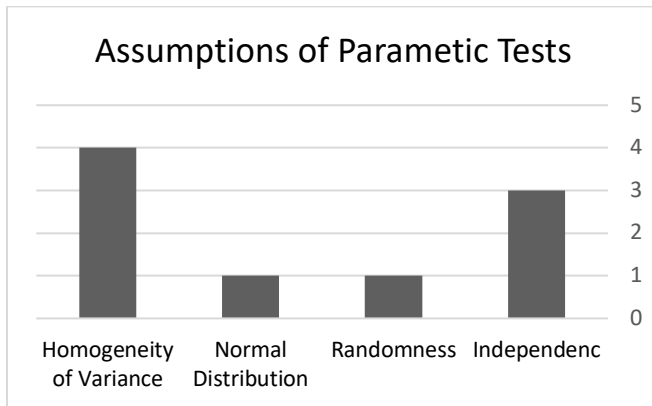


Fig. 9: Assumptions of statistical methods.

Regarding the second phase of the analysis, which dealt with verifying the assumptions of the statistical methods used in the educational research under study, the study concluded that the verification of the assumptions of the statistical methods in the educational research under study was weak. In addition, the assumption that was further verified in the educational research under study is the assumption of homogeneity of variance, as these researches used statistical methods, especially inferential ones, without verifying the assumptions of these methods, which guarantee the impermissibility of using these methods, so as to ensure the credibility and realism of the findings. The educational research under study that verified the assumptions of statistical methods, are the ones in which the topic of research revolved around the Item Response Theory whose use requires verification of assumptions, including the assumption of independence. Weak verification of the assumptions of statistical methods leads to a breach of the conditions for applying any statistical method, which results in false results, and so negative effects.

Based on the conclusions of the study regarding the study and evaluation of statistical methods in educational research published in Dar Al-Mandumah Database as a model, the study recommends the following:

1. Research must take a new direction in statistical methods, especially since recent trends in research refer to the use of advanced research methods and not only simple statistical methods and descriptive statistics.

Table 6: Frequencies and percentages of assuming independence in university theses, educational research in curricula and teaching methods, educational issues, and educational research in statistical issues.

Homogeneity of Variance						
Type of research	None	Verified			Not verified	Total
		Levene's Test	Bartlette's Test	F-max Test		
University theses	0	2	1	0	40	43
Percentage	0%	4.7%	2.3%	0%	93%	100%
Research in educational issues	13	3	0	0	152	168
Percentage	7.7%	1.8%	0%	0%	90.5%	100%
Research in statistical issues	11	1	5	1	72	90
Percentage	12.2%	1.1%	5.6%	1.1%	80%	100%
Total	24	6	6	1	264	301
Percentage	8%	2%	2%	0.3%	87.7%	100%

*None: means research that did not mention any of the statistical methods used in analyzing its data.

2. When using nonparametric statistical methods, justifications for their use must be included, as they are no less important than parametric statistical methods. They are an important outlet for many researchers when the assumptions of parametric statistical methods, especially the normal distribution, are verified, in addition to the sample size and type, and the nature of the data.
3. The necessity of using pre-comparisons before embarking on studies and research, which makes the study or research intended to be conducted strong and solid. In addition, it's necessary to focus on post-comparisons in the statistical methods that require them, in order to reveal the significance of the differences, which achieves the desired benefit of the research.
4. The lack of verification of the assumptions of statistical methods is an indication of the weakness of educational research and the unreality of the results reached. Therefore, it is necessary to verify the assumptions before using statistical methods, so that the results are realistic and can be used in the educational decision-making process.
5. Researchers must have deep knowledge of the statistical methods to be used in their research, so universities and research institutes must take new actions and measures that enable the researcher to master the use of statistical methods in their research.

This study came to complement the educational research that dealt with the use of statistical methods in educational research, so the study recommends re-conducting this study in scientific fields other than educational fields.

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Competing interests

The author declares that she has no competing interests.

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