

**The problem of applying statistical methods in experimental psychological and educational research at Algerian universities**  
**An applied study on a sample of doctoral theses.**

**إشكالية تطبيق الأساليب الإحصائية في البحوث التجريبية النفسية والتربوية بالجامعة الجزائرية**  
**دراسة تطبيقية على عينة من أطروحتات الدكتوراه**

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**Abstract:**

The study aimed to uncover the reality of applying statistical methods in experimental psychological and educational research at Algerian universities.

The study was conducted on a sample of doctoral theses published on the National Thesis Portal (Cerist). These theses used the experimental method and consisted of 35 theses from various universities, defended between 2020 and 2023.

The study reached the following results:

- The inappropriate use of statistical methods exceeded the appropriate use in the study sample, with a large proportion of researchers failing to adhere to the assumptions of applying statistical methods, especially regarding sample size and the normality of data distribution, and a significant proportion of researchers in the study sample also failed to calculate practical significance.

**Keywords:** research; experimental; psychology; education; doctoral theses.

**ملخص:**

هدفت الدراسة إلى الكشف عن واقع تطبيق الأساليب الإحصائية في البحوث التجريبية في علم النفس وعلوم التربية بالجامعة الجزائرية.

تم تطبيق الدراسة على عينة من أطروحتات الدكتوراه المنشورة على مستوى البوابة الوطنية للأطروحتات (Cerist)، والتي استخدمت المنهج التجاري، بلغ عددها 35 أطروحة من بعض الجامعات، نوقشت خلال الفترة الزمنية 2020-2023. توصلت نتائج الدراسة إلى أن: نسبة الاستخدام غير المناسب للأساليب الإحصائية تفوق نسبة الاستخدام المناسب لها في عينة الدراسة، بحيث لم تلتزم نسبة كبيرة من الباحثين بالتحقق من افتراضات تطبيق الأساليب الإحصائية خاصة ما يتعلق بحجم العينة واعتدالية توزيع البيانات، كما لم تلتزم نسبة كبيرة من الباحثين في عينة الدراسة بحساب الدلالة العملية.

**الكلمات المفتاحية:** البحوث؛ التجريبية؛ علم النفس؛ التربية؛ أطروحتات الدكتوراه.

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## 1. INTRODUCTION

The experimental method is considered one of the most effective scientific research approaches for solving problems in a scientific manner. It is a method widely used in the natural sciences, which have made significant scientific advancements as a result. This has prompted many researchers in the fields of humanities and social sciences to adopt this method in their own investigations.

As a result, psychological and educational research has transitioned from focusing solely on descriptive studies that describe and interpret phenomena in their current state, to experimental studies that involve manipulating and controlling one or more independent variables to understand their impact on a dependent variable or multiple dependent variables. Researchers intentionally intervene in order to reshape the observed phenomena by implementing specific procedures or introducing deliberate changes. The results are then carefully observed, analyzed, and interpreted.

Studies conducted by students, professors, and researchers in psychology and educational sciences at Algerian universities, and their development of counseling, training, and therapeutic programs, as well as their assessment of their effectiveness, indicate a growing interest in the use of experimental methods in academic research.

However, conducting experiments in the field of psychology and educational sciences presents various challenges. These challenges include the nature of the variables themselves, which are hypothetical variables inferred from a set of behavioral indicators that can be measured using specific tools. Other challenges involve selecting suitable participants for the experiment (the sample) and considering their characteristics, as well as controlling the general conditions of the experiment to ensure internal and external validity.

Therefore, it is crucial for researchers to carefully choose the appropriate experimental design that aligns with the objectives of their study and implement strict and precise procedures.

According to Alili (2013), experimental design involves the researcher identifying the independent, dependent, and extraneous variables, as well as choosing the sample method and understanding the statistical aspects of the experiment. The primary goal of experimental design is to establish a cause-and-effect relationship between the independent and dependent variables, while the secondary goal is to obtain the maximum amount of data or information with minimal resource utilization.

Therefore, in this study, we aim to explore the practical application of experimental designs in psychological and educational research. We will analyze a selection of doctoral dissertations published on the National Theses Portal, which have now gained recognition as valuable scientific references. These dissertations serve as previous studies and are easily accessible for download by individuals interested in scientific research.

First, let's take a closer look at the experimental design used in these studies. According to Al-Thobaiti (no year mentioned), if the research design is not suitable or does not align with the study's

data, the researcher will not achieve precise results, even if they employ advanced statistical analyses.

We will also focus on the most commonly used statistical methods for analyzing the data and assess the assumptions associated with each statistical method. This includes considering the types of variables studied, their measurement levels, distribution normality, and sample size. Furthermore, we will explore how researchers prioritize practical significance and its implications.

Al-Omari (2012) emphasized that the validity and accuracy of the statistical analysis, as well as its compatibility with the chosen design, are crucial factors determining the results of any experimental study.

### **The study questions**

The study questions are:

- What are the types of experimental designs used in psychological and educational research?
- What are the statistical methods used in the analysis of psychological and educational research data, and how valid is their selection?
- To what extent do researchers adhere to verifying the assumptions of the statistical methods used in the analysis of psychological and educational research data?
- To what extent do researchers adhere to understanding the practical significance in interpreting the results?

### **The study objectives:**

The study objectives are:

- Identify the types of experimental designs used in psychological and educational research.
- Identify the statistical methods used in analyzing psychological and educational research data and the validity of their selection.
- Determine the extent to which researchers adhere to verifying assumptions when applying statistical methods in analyzing psychological and educational research data.
- Determine the extent to which researchers are committed to understanding the practical significance of interpreting the results.

### **Importance of the study:**

The significance of this study lies in evaluating the implementation of experimental designs in psychological and educational research, particularly in doctoral dissertations. These research projects are expected to produce highly accurate and reliable results.

It is important for researchers to have a thorough understanding of experimental design procedures, including the proper use of statistical methods based on relevant assumptions. By doing so, researchers can ensure the practical significance of their findings and avoid common errors and misuse of statistical techniques.

## **2. Theoretical Framework:**

### **2.1. Experimental Design and Experimental Control Procedures**

Research design is the structure or plan of the research and its organization, through which answers to research questions and variable control can be achieved.

Experimental design is the verification of hypotheses through experimentation, aiming to test causal relationships until the causes of phenomena are identified. It is a deliberate and controlled alteration of the specified conditions of the phenomenon, and the observation of the outcomes of the changes in the studied phenomenon. (Abbas & all, 2007, p79 )

Experimental design includes a set of procedures related to formulating hypotheses, identifying independent, dependent, and extraneous variables, determining the specifications and sample size, the method of selection, and the characteristics of the population from which it was taken, as well as determining the measurement tools and appropriate statistical analysis methods.

Experimental designs are divided into two categories: quasi-experimental designs or non-real experimental designs, and true experimental designs. The main difference between a true experimental design and a quasi-experimental design is that the latter does not adhere to the random assignment of experimental groups, making control impossible, unlike the true experimental design which is based on random assignment of groups. ( Abou Allam, 2006, p213 )

It should be noted here that although random assignment (in true experimental designs) is of great scientific value compared to non-random assignment (in quasi-experimental designs or what is known as non-true experimental designs), it is difficult to implement in the fields of psychology and education sciences. Placing individuals in experimental groups randomly does not guarantee that these groups have become truly equivalent, or that they will remain equivalent throughout the experiment.

There is also a possibility of participant attrition before the experimental procedures are completed and before the post-test is conducted. Researchers in the field may also face difficulties in selecting research samples and controlling their conditions. Schools may not accept new programs on an experimental basis, and they may not accept mixing classes and redistributing them when a researcher wants to apply random assignment to their samples. The researcher finds themselves here forced to choose quasi-experimental designs in their research.

The researcher believes that the designs applied in the field of psychology and education sciences are quasi-experimental designs, where the researcher tries to control a set of factors that threaten the internal and external validity of the experiment. Some other factors may be beyond the researcher's control, but we have noticed through our study sample that they use the term "experimental design".

## 2.2. Statistical methods and their assumptions

The choice of statistical method is first linked to the design format. A design of the single group type with pre- and post-measurements requires the application of a paired t-test, which determines whether the difference between the average performance on the pre-measurement and the average performance on the post-measurement is statistically significant. If the assumptions for applying this test are met in the sample data, it falls under parametric or parametric tests, and there is an alternative in nonparametric or nonparametric tests if the conditions for its application are not met.

If the design is of the controlled and experimental groups type with the assumption of equivalence between the groups, it requires the application of an independent samples t-test, which

determines whether the difference between the average performance of the experimental group and the average performance of the control group is statistically significant. If the assumptions for applying this test are met in the sample data, it also falls under parametric or parametric tests, and there is an alternative in nonparametric or nonparametric tests if the conditions for its application are not met.

There are criteria that the researcher must consider when choosing the statistical method, including:

**\* The nature of the distribution of variables in the selected population:**

This assumption requires that the variable scores follow a normal distribution, also known as Gaussian distribution. There are different methods to ensure the normality of the distribution, including:

- Calculating Measures of Central Tendency: In order to have a normal distribution, the average, median, and mode should all be equal.
- Calculating Measures of Skewness and Kurtosis for sample data and comparing them with the Skewness and Kurtosis measures for the normal distribution. In a normal distribution, the skewness is limited to a range of +2 to -2, and the kurtosis is limited to a range of +3 to -3.
- Using Distributional Goodness-of-Fit Tests: Examples of these tests include the Kolmogorov-Smirnov test and the Shapiro-Wilk test, which are provided by the SPSS software. If the test value is statistically significant (less than 0.05), it indicates that the distribution of variable scores differs from the normal distribution. The SPSS software also offers graphical tests such as probability-plots (p-p).
- Graphical Representation of Variable Scores: Comparing the shape of the resulting curve with the shape of a normal distribution curve, which resembles a bell or bell-shaped curve and is symmetrical around its vertical axis. (Filimban, 2016, pp250-251)

If the distribution curve is symmetrical, the researcher in this case chooses one of the teaching methods that is compatible with his data to process it. Allam (2000) states: "The symmetrical distribution and its distinguishing characteristics are considered the backbone of inferential statistics and a major component of the decision-making process."

It should be noted that many statisticians like Abou Hatab (1996), Al-Sharbini (1995), Awadah and Al-Khalili (1988)...see the possibility of disregarding the assumption of normality if the sample size is sufficiently large, i.e., more than 30 individuals, in accordance with the theory of central limit theorem.

However, the same statisticians mentioned earlier believe that it is necessary to conduct tests for normality if the sample size is small, i.e., less than 30 individuals. If it is proven that the frequency distribution of the variable does not follow a normal distribution, nonparametric or distribution-free tests can be used, which do not require any assumptions about the distribution and its shape. (Filimban, 2016, p251)

**\*The quality of the measurement used:**

Stevens refers to measurement as the process by which phenomena and characteristics are expressed using symbols and numbers based on certain rules. Therefore, measurement in psychology and education is the substitution of numbers for phenomena.

Instead of a qualitative description of the phenomenon, it is quantitatively described according to rules and standards that embody the specificity of the studied phenomenon, which is primarily characterized by its interrelatedness, relativity in its measurement, and the hypothetical nature of the indicators that represent it, making the process of measurement complex. (Boussalem, 2014, p32)

There are four levels of measurement:

**The nominal level:** This level is considered the simplest level of measurement, where the role of numbers is limited to classifying individuals or phenomena according to the measured attribute.

This means that an individual cannot belong to more than one category at the same time for a specific attribute. However, they can be classified in multiple attributes, such as being a student in the psychology department and being male and married at the same time. Measurement at this level involves grouping individuals into categories that share a specific characteristic that distinguishes them from other categories.

The resulting categories usually refer to repetitions of individuals who belong to each of these categories. The goal is classification, and therefore we cannot perform any of the four arithmetic operations on numbers at this level. There are many non-parametric statistical methods that can be used in the analysis of nominal data, which are based on the idea of simple counting, such as: Chi-square, Kolmogorov-Smirnov, Phi coefficient...(Saad, 2008, p48)

**The rank level:** This level is based on the ranking of individuals according to a specific characteristic or attribute from largest to smallest, and the resulting numbers indicate the relative position of individuals in this characteristic.

Therefore, the rank numbers do not indicate the magnitude of the characteristic for each individual. This learner is ranked first in Arabic language among students in his group, and this is his second rank, and so on... In this level, it is not assumed that the differences between ranks are equal to the differences between the grades of the measured characteristic. Therefore, we cannot perform any of the four arithmetic operations.

Most psychological and educational measures can be classified at this level, and the statistical methods used in this type of measures are nonparametric methods, including the rank correlation coefficient and the Kruskal-Wallis analysis.(Allam, 2000, p20)

**The interval level, or the level of equal distances:** is considered more accurate than the previous two levels. It is characterized by equal measurement units, meaning that distances on a scale of a certain characteristic or property are equal. This allows for determining whether one thing equals another. Most tests used to measure intelligence, academic achievement, or aptitude rely on this level.

When comparing intelligence ratios of 100 and 120, it can be said that the same difference exists between 120 and 140 under specific conditions that govern intelligence measurement or academic achievement.

One crucial factor is the accuracy level of the measuring tool. However, at this level, we cannot claim that an intelligence ratio of 160 is twice as high as an intelligence ratio of 80 because there is no absolute or real "0" present. This means that no individual's intelligence or academic achievement is zero.

It is reasonable to assume that everyone possesses some level of intelligence or academic achievement, even if it is minimal. However, obtaining a score of zero indicates an inability to answer all questions correctly, but the individual still possesses some knowledge that was not assessed by the test. At this level, the obtained scores can undergo all arithmetic operations except division, which requires a genuine zero. Parametric and non-parametric statistical methods can also be employed, assuming that the measurement scale is equitable.

At this level, the obtained numbers can be subjected to all arithmetic operations except division, which requires a non-zero real number. Parametric and nonparametric statistical methods can also be used, assuming that the measurement scale is equal. (Saad, 2008, p49)

**Relative level:** This is the most accurate level of measurement as it encompasses three essential properties: magnitude, equal intervals, and absolute zero. The absolute zero represents the complete absence of the measured attribute or characteristic.

Therefore, at this level, all four arithmetic operations can be performed on the numbers resulting from the measurement. However, this level is rarely utilized in psychological and educational measurement due to the absence of a true zero that corresponds to the complete absence of the phenomenon or measured characteristic. (Boussalem, 2014, p32)

Therefore, the measurement level for psychological and educational attributes and characteristics is typically at the level of equal intervals or ordinal level.

#### \*The design of the research in terms of sample size and volume:

The sample size has an impact on determining the appropriate statistical method for analyzing research data. If the sample is small, it has statistical methods that are proportional to its size, namely non-parametric methods. The small sample size affects the normality of the distribution. On the other hand, if the sample is large and other conditions are met, parametric statistical methods are suitable for it.

Mourad (2000) believes that many statisticians have agreed, based on theoretical grounds for distributions, that a sample of 30 individuals or more is sufficient to say that the sample is large. However, from his perspective, a small sample is one with fewer than 25 individuals, while a large sample is one with more than 100 individuals. Random samples with sizes ranging from 30 to 100 are considered medium-sized samples and can be used in social science research and generalization to the community. The larger the sample size, the more stable and accurate the generalization to the community, in addition to increasing the power of the statistical test used.

### 2.3. Practical Significance:

The practical significance of the results, according to Nassar (2017), refers to exploring the strength of the relationship between the variables under study using statistical methods. Therefore, there are many institutions responsible for publishing psychological and educational research that do not accept studies' results that do not indicate practical significance.

Effect size is considered one of the most popular methods used to examine practical significance. It is a quantitative statistical method that measures the importance of treatment by examining the differences between means regardless of the statistical significance of those differences. In other words, the results may be statistically significant but may not be practically significant.

There are several methods for using effect size, including the corrected effect size. There are also methods that rely on comparing means, such as Cohen's "d" equation, and methods that use the variance ratio, which explains the independent variable from the variance of the dependent variable, such as eta squared.

The main goal of all these methods is to answer the following question: Did the treatment make a practical difference between the experimental and control groups? And what is the magnitude of the difference achieved? Effect size is useful because it focuses on reporting the practical significance of the results, going beyond the concept of statistical significance, which only considers whether the results are due to chance or not.

## 3. The Applied Aspect:

### 3.1. Study Methodology:

The descriptive-analytical method was used, which is considered suitable for the study's objective of revealing the reality of applying experimental designs in psychological and educational research on a sample of doctoral theses at the Algerian University.

### 3.2. Study Population and Sample:

The study population consists of doctoral theses that used the experimental method and were discussed between 2015-2019 and published on the National Portal for Theses. A random sample of 35 theses from various specialties in psychology and educational sciences was selected.

### 3.3. Study Tool:

To collect data on the study's topic, we designed a questionnaire to assess the reality of applying experimental designs in our sample of doctoral theses in the fields of psychology and educational sciences, using some previous studies such as Alili's study (2013), Al-Ajlani's study (1990), and Al-Najjar's study (1991).

The questionnaire was structured based on the study's research questions and consists of the following sections:

Section 01: Specific to the thesis number.

Section 02: Concerning the type of experimental design used in the thesis.

Section 03: Concerning the statistical method used in data processing.

Section 04: Concerning the researcher's adherence to assumptions of the statistical method used, including: level of measurement of variables, distribution normality, sample size (yes/no).

Section 05: Concerning the validity of the statistical method used (yes/no).

Section 06: Alternative statistical method in case the used statistical method is invalid.

Section 07: Concerning the researcher's adherence to practical significance calculation (yes/no), and what type if applicable?

#### **4. Presenting, Analyzing, and Discussing the Study Results:**

##### **4.1. Presenting, Analyzing, and Discussing the first question Result:**

In order to address the first question concerning the types of experimental designs utilized in psychological and educational research, we examined a sample of doctoral dissertations published on the National Theses Portal. We calculated the frequencies and corresponding percentages of these designs and summarized the findings in the following table:

**Table 1.** Types of Experimental Designs Used

Type of Experimental Design	Number	Percentage
Pretest-Posttest Design with a Single Group	10	28.57%
Between-Subjects Design: Control Group and Experimental Group with Pretest-Posttest Measurement	25	71.43%
<b>Total</b>	<b>35</b>	<b>100%</b>

According to the table, it can be observed that 25 doctoral theses, accounting for 74.43% of the sample, employed the design of two equivalent groups: control and experimental, with measurements taken before and after. Additionally, 10 theses, equivalent to 28.57%, utilized the design of a single group with pre-test and post-test measurements. Researchers tend to favour this experimental design as it ensures reliable and precise results. Moreover, it facilitates clear result comparisons and enables the identification of differences that may be influenced by the programs they developed on the dependent variable.

##### **4.2. Presenting, Analyzing, and Discussing the second and third questions Results:**

The second question focuses on the statistical methods used and their appropriateness in analyzing data from psychological and educational research. The third question examines the extent to which

researchers adhere to verifying the assumptions of the statistical methods, particularly regarding variable measurement levels, distribution normality, and sample size. To address these questions, frequencies and percentages were calculated, and the findings are presented below:

**Table 2.** Statistical methods used and their validity in psychological and educational studies

Statistical Methods Used	Number	Percentage	Validity of Statistical Methods			
			Appropriate Use		Inappropriate Use	
			Number	Percentage	Number	Percentage
Paired t-test	33	94.28%	12	34.28%	23	65.72%
Independent t-test	23	65.72%				
Mann-Whitney Test	2	5.71%				
Wilcoxon Test	2	5.71%				

It is evident from the table that most researchers have used parametric or non-parametric tests to analyze their data.

The paired t-test was used by 94.28% of the researchers, followed by the independent t-test with a percentage of 65.72%. Additionally, the Mann-Whitney test was used for independent samples, as well as the Wilcoxon test for paired samples in two doctoral theses. These non-parametric tests accounted for 5.71% of the sample. Researchers tend to favor parametric methods as they are considered more powerful in providing accurate results compared to non-parametric methods. However, what researchers may overlook is the need to verify the assumptions of these methods, otherwise the research findings may be misleading.

Researchers' preference for these methods in analyzing their data may also be due to their lack of awareness about alternative approaches. This is particularly true because academic coursework during their university studies tends to focus only on traditional methods, disregarding other options. Our study's findings diverged from a study by Alili (2013), which found that the most commonly used tests in psychological and educational research are non-parametric methods like the Wilcoxon test and the sign test. When it comes to the validity of using these statistical methods, we observed that 34.28% of theses employed these methods appropriately, while the majority of theses (65.72%) used them inappropriately.

Our study's results align with the studies conducted by Al-Ajlan (1990), Al-Nadjar (1991), and Al-Amri (2012), which indicate a misuse of statistical methods. The majority of statistical methods are used inappropriately, with a higher percentage of improper usage compared to appropriate usage. This can be attributed to researchers' low statistical analysis skills and their lack of familiarity with the conditions and requirements of each statistical method. This is especially evident with the availability of statistical software that facilitates calculations, leading researchers to rush into calculations without referring to the principles, laws, and theoretical conditions of these methods. This is the focus of our next idea.

The following table illustrates the frequencies and percentages that correspond to the extent to which researchers adhere to verifying the assumptions of the statistical methods used, particularly regarding the measurement level of variables, distribution normality, and sample size.

**Table 3.** Researchers' adherence to assumptions of applying the "t-test" for independent samples and the "t-test" for paired samples

adherence to assumptions of applying the "t-test" for independent samples and the "t-test" for paired samples.	Variable Level		Distribution Normality		Distribution Normality	
	N	%	N	%	N	%
Appropriate	33	100%	11	33.33%	8	24.24%
Inappropriate	/	/	22	66.67%	25	75.76%

We notice from the table that out of a total of 35 theses, 33 have used parametric and non-parametric statistical methods, represented by the independent samples t-test and the paired samples t-test. We also observe variation in the researchers' adherence to verifying the assumptions of applying these statistical methods. Regarding the assumption related to the level of measurement of variables, all the variables in the studies were at the interval level, so we find that all the studies adhered to verifying this assumption.

As for verifying the nature of the distribution, we notice that 11 doctoral theses had data distributions suitable for the applied statistical test, which accounts for 33.33%. In 3 theses, it was mentioned that the normality of the distribution was verified through skewness and kurtosis coefficients or Shapiro-Wilk and Kolmogorov-Smirnov tests, with a sample size of less than 30. The rest of the sample variables had sample sizes larger than 30, allowing the researcher to assume that the data follows a normal distribution without verifying it, and thus the possibility of using parametric methods for data analysis.

On the other hand, it is worth noting that 66.67% (22 out of 33) of the doctoral theses did not mention whether their data distribution was suitable for the applied statistical test. This means that the assumption of normality was not verified, despite the sample sizes being less than 30. Looking at the sample size assumption, we can see from the table that only 24.24% (8 out of 33) of the theses that used t-tests had a large sample size (30 or more), while the remaining 75.76% (25 out of 33) had a small sample size. In fact, some studies were conducted with sample sizes as small as 4 or 5 individuals.

Therefore, from the previous presentation, we find that the most neglected assumptions among the study sample are those related to sample size. The researchers applied their guidance, training, or therapeutic programs to small samples that require the statistical methods they use to be non-

parametric. Also, the assumption of distributional normality has not received the researchers' attention.

However, we find that the assumption regarding the level of measurement of variables was a priority adhered to by the researchers in our study sample, contrary to the findings of Nadjar's study (1991) and Al-Ajlani's study (1990), where the assumption of the level of measurement of variables was ranked first in terms of non-compliance. As for Alili's study (2013), it agreed with the results of our study in this aspect.

#### **4.3.Presenting, Analyzing, and Discussing the second and fourth question Result:**

To answer the fourth question regarding the researcher's commitment to calculating practical significance and its type, if found, in psychological and educational research represented in our sample of published doctoral dissertations on the National Theses Portal, the frequencies and corresponding percentages were calculated and summarized in the following table:

**Table 4.** Commitment to calculating practical significance in psychological and educational research

The practical significance has been calculated		The practical significance has not been calculated	
Number	Percentage	Number	Percentage
12	34.28%	23	65.72%

By examining the table, we can see that practical significance has been calculated in 12 theses, accounting for 34.28% of our sample. Interestingly, there is no mention of practical significance in the interpretation of the results for 23 doctoral theses, making up 65.72% of our sample.

The table below provides a breakdown of the types of practical significance calculated for interpreting the results, along with their frequencies and percentages.

**Table 5.** Types of practical significance in psychological and educational research

The type of practical significance	Number	Percentage
Eta squared	12	100%
Eta squared + Black's modified gain ratio	2	16.66%
Eta squared + D	1	8.33%

We observe from the table that all the doctoral dissertations that focused on calculating practical significance used the eta-squared measure. Two dissertations added the Cohen's d effect size to eta-squared, and one study added the D index to eta-squared.

Our study's results align with Nassar's (2006) observation that many published psychological and educational research studies fail to mention the effect size value, despite its importance in interpreting results. It allows for the detection of the variation caused by the independent variable in

explaining the dependent variable.

## 5. CONCLUSION

Based on the findings of this study, it is clear that researchers have limited knowledge about the application of statistical methods in experimental designs. They often rely on parametric methods, such as the paired t-test and independent t-test, without considering the assumptions related to sample size and data distribution. Furthermore, researchers tend to focus solely on statistical significance and overlook the practical implications of their findings.

To address these issues, we propose the following recommendations:

- The inclusion of non-parametric statistical methods as an alternative to parametric statistical methods in cases where the assumptions for their application are not available at the level of software and curricula for graduate and postgraduate students in the fields of psychology and education, as well as in relation to practical significance and its importance in interpreting results.
- We propose that there be studies in later time periods to determine the impact of temporal evolution on familiarity with the assumptions for the application of parametric statistical methods in psychological and educational research.
- There should also be studies on larger samples of master's, master's, and doctoral theses, from various Algerian universities, as well as at the level of articles published in peer-reviewed scientific journals in Algeria.
- It is important to consider non-parametric statistical methods as an alternative to parametric statistical methods when the necessary assumptions cannot be met in software and educational curricula for graduate and postgraduate students in the fields of psychology and education. Additionally, the practical significance and importance of interpreting results should be emphasized.
- We suggest conducting studies over extended periods of time to assess how the evolving landscape impacts the understanding of assumptions required for the application of parametric statistical methods in psychological and educational research.
- Furthermore, it is crucial to conduct studies on larger samples of master's, master's, and doctoral theses from various Algerian universities, as well as analyzing articles published in reputable scientific journals in Algeria.

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