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CAUSAL COMPARATIVE AND CORRELATIONAL RESEARCH DESIGNS IN EDUCATION

Rafika Nisa[1]
[1]Sekolah Tinggi Ilmu Tarbiyah (STIT) Ar-Raudhah Deli Serdang, Indonesia

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ABSTRACT

This research aims to explain the definition, objectives, characteristics, as well as the advantages and disadvantages of causal comparative and comparative research. This research is qualitative research using a literature review method. This research is certainly very important to study, especially for education researchers who want to study cause and effect and colleration in various variables in the field of education. The results of this research are causal-comparative and correlational research may be confused because both studies are without manipulation and the same thing regarding the interpretation of results. There is a difference between the two, namely that comparative causal studies usually involve two or more groups and one independent variable, while correlational studies usually involve two or more variables and one group. Comparative causal studies involve comparisons, while correlational studies involve correlations.

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Correspondence Author:

Rafika Nisa
Sekolah Tinggi Ilmu Tarbiyah (STIT) Ar-Raudhah Deli Serdang
rafika.nisa@gmail.com

1. INTRODUCTION

Curiosity is a basic human nature. Curiosity encourages humans to acquire knowledge. All humans are equipped with reason and thoughts to obtain knowledge, whether in the form of facts, concepts, principles or laws. Knowledge can be gained through experience through interaction with the five senses and interaction with the environment. There are many ways to gain knowledge, one of which is by conducting research.

Research is a scientific activity related to analysis and construction carried out methodologically, systematically and consistently. The systems and methods used to obtain information or material for scientific knowledge are called scientific methodology. So, research methods are ways of working to understand the research object. Research can be defined as an effort to find the correct answer to a problem based on logic and supported by empirical facts. Thus,

research is an activity carried out systematically through the process of collecting data, processing data, and drawing conclusions based on data using certain methods and techniques.

Research requires appropriate scientific methods. This is because research is an effort to obtain the truth. Mohammad Faizal Amir and Septi Budi Sartika explained that the scientific method is the basic framework for creating scientific knowledge. Research carried out uses scientific methods which contain 2 (two) important elements, namely observation and reasoning. The scientific method is based on the idea that if a statement is to be accepted as truth then the statement must be verifiable or tested for truth empirically (based on facts) (Mohammad Faizal Amir, 2017).

The author concludes that a research method in research is a comprehensive strategy for finding or obtaining the necessary data. Research methods must be distinguished from data collection techniques, namely more specific techniques for obtaining data. and one of the research methods in the field of education that is often used is comparative causal research. This research is certainly very important to study, especially for researchers in the field of education who want to study cause and effect or relationships in various variables in the field of education.

In the field of education, the complexity of learning phenomena influenced by social, cultural, psychological, and institutional factors necessitates the use of research designs that are capable of examining relationships and differences without experimental manipulation. Comparative and correlational research designs are particularly urgent in educational contexts where variables such as socioeconomic background, cultural values, learning environments, and educational policies cannot be controlled ethically or practically. Through comparative research, educators and researchers can identify meaningful differences between groups shaped by diverse social and cultural contexts, while correlational research enables the examination of interrelationships among educational variables that naturally coexist in real settings. These designs provide critical empirical insights for understanding patterns, tendencies, and associations that inform evidence-based decision-making in education. Moreover, in multicultural and socially dynamic societies, comparative and correlational studies play a strategic role in generating contextualized knowledge that supports inclusive, equitable, and culturally responsive educational practices. Therefore, the systematic design of comparative and correlational research is essential for advancing educational theory and practice in response to real-world educational challenges.

The word “causal” comes from the Latin “causalis,” which means “relating to causes.” The word causal is always related to causes/effects. Meanwhile, the word "comparative" from the word "compare" which means "to compare". In the KBBI, "causal" means causing an event; mutually causal; or a causal relationship. Meanwhile, "comparative" means regarding or based on comparison. Based on this etymology, comparative causality can be interpreted simply as a comparison of causes and effects.

Gay stated that causal–comparative research the researcher attempts to determine the cause, or reason, for existing differences in the behavior or status of groups or individuals. In other words, established groups are already different on some variable, and the researcher attempts to identify the major factor that has led to this difference. Such research is sometimes called ex post facto, which is Latin for “after the fact,” because both the effect and the alleged cause have already occurred and must be studied in retrospect (Gay, 2012).

In simple terms, correlation can be interpreted as a relationship. However, when developed further, correlation cannot only be understood in this sense. Correlation is a statistical data analysis technique used to find the relationship between two or more quantitative variables. Two or more variables are said to be correlated if changes in one variable are followed by changes in the other variables regularly in the same direction (positive correlation) or in the opposite direction (negative correlation). numerical conclusions or in the form of numbers. These numbers, which are assumed to be a form of representation of a construct, are then analyzed. Therefore, the validity and reliability of instruments in correlational research is a crucial issue (Siroj et al., 2024).

Researchers in the field of education and teachers can use comparative causal research if they want to identify cause-and-effect relationships between independent and dependent variables. Researchers and teachers can study cause and effect retrospectively. This can help determine the consequences or causes of existing differences between or among different groups of people. This is needed to research methods, strategies, learning models and various important things and learning

processes that involve students. And also correlational research is used to understand the relationship between two or more variables, without trying to manipulate those variables.

2. METHOD

This research uses a literature review method, namely a method of collecting data by understanding and studying theories from various literature related to the research. Literature reviews are a vital part of a research project or paper, and they are particularly important during graduate school. This handout will focus on defining what a literature review is, how to organize and synthesize information, and what the different parts of a literature review are (Cantero, 2019). Literature review is an important and inseparable part of research. This literature review contains a review and analysis of various related literature that has been published previously. The process of preparing a literature review itself includes 6 (six) stages which are important to follow sequentially, namely starting from determining the topic, searching for related literature, developing arguments, conducting a survey of related literature, criticizing the literature, and writing a review. What you need to remember is that a literature review is not just a bibliography that simply describes publications or research results that have previously existed one by one. More than that, the literature review must be able to provide a critical review of the various literature so that it can provide confirmation and confirmation of the characteristics of the research to be carried out (Hadi, Nanang Faisal. Afandi, 2021).

There are four stages of literature review in research, namely preparing the necessary equipment, preparing a working bibliography, organizing time and reading or recording research material. This data collection uses the method of searching for sources and constructing them from various sources, for example books, journals and research that has already been carried out. Library materials obtained from various references are analyzed critically and must be in-depth in order to support the propositions and ideas.

3. RESULT AND DISCUSSION

Education is an activity based on interaction between students with educators and various educational resources. Interaction between students with educators and educational resources can take place in the situation educational interactions, teaching, training and guidance. Educational social situations This is called educational interaction. In educational interactions between students with educators who developed especially affective aspects, namely values, attitudes, interests, motivation, self-discipline, habits, etc (Efendi, Indra. Zulfani, 2022).

Education problems are still an unresolved problem in Indonesia. detikers need to know that the phenomenon of educational problems refers to formal, non-formal and informal education. Can be material for educational research topics. Problems that arise can come from various sides. Both from within the educational institution itself and factors outside the institution. The emergence of these various problems could be a problem worthy of research. The researchers or teachers can conduct research related to education. The scope of educational research is very broad. The most important thing is that it is still directly related to scientific disciplines. Such as psychology, sociology, politics and economics.

3.1. Causal-Comparative Research Design

Causal-comparative research is research carried out to compare a variable (research object), between different ones or at different times and find a cause-and-effect relationship. According to Kerlinger, comparative causal research (causal-comparative research) is also called ex-post facto research, namely systematic empirical investigation in which the researcher does not control the independent variable directly because the existence of the variable has already occurred or because the variable basically cannot be manipulated (Mohammad Faizal Amir, 2017). This is reinforced by an explanation by Gay who states that grouping variables in causal–comparative studies cannot be manipulated, should not be manipulated, or simply are not manipulated but could be (Gay, 2012).

Like experimental research, comparative causal research involves comparing groups to see whether some independent variable has an influence or causes a change in the dependent variable. However, the types of research questions addressed in causal-comparative research involve variables that are difficult or impossible to manipulate experimentally, often because existing experiences arise or variables that have already occurred.

Based on the definition above, it can be said that comparative causal research is part of ex-post facto research. Some experts even say that comparative causality is ex-post facto because researchers do not start the process from the beginning, but instead immediately look at the results. From the results obtained, researchers tried to find the causes of the incident. The aim of this research is to investigate possible cause-and-effect relationships based on observations of existing effects, and to look for facts that might be the cause through certain data.

The basis of comparative causal research is: 1) Assessing with different subjects the independent variables and trying to determine the different consequences. Example: The influence of single parents and complete parents (dependent variable) on truancy (independent variable) of students in high school. 2) Starting from a different subject as the dependent variable and trying to determine the cause of the difference. Example: Comparison of Strata 1 graduate students with students who dropped out (dependent variable) on motivation and discipline in the business world (independent variable) (Ibrahim, 2018).

According to Hartono, comparative causal research aims to investigate possible causal relationships by observing existing effects and then tracing back factors that might be the cause using certain data. Comparative causal research is a research activity that tries to find information about why a cause and effect relationship occurs, and researchers try to trace back the relationship (Hartono, 2019).

The characteristics of comparative causal research are as follows: 1) Research directed at investigating cause-and-effect relationships based on observing the effects that occur and looking for causal factors through the data collected. 2) The basic approach is to start with the differences between the 2 (two) groups and then look for factors that might be the cause or effect of these differences. 3) The causal variable is not manipulated because it has already occurred.

In some cases, comparative methods can be more time and resource efficient than more complex research approaches. This is especially true when researchers have budget or time constraints. The comparative causal method can be used in various scientific disciplines, including education, social sciences, economics, political science, and medicine. This approach can provide deeper insight into various phenomena or symptoms.

Causal comparative research, like other research, is carried out in the following five stages: 1) Determining the research problem; 2) Determine the group that has the characteristics you want to research; 3) Selection of comparison group; 4) Data collection and 5) Data analysis (Santoso, 2021). As for the way to analyze comparative causal research, if you want to find out significant differences, you can use the "t" test or t test, and chi square if the data to be analyzed consists of data from two variables. However, if the variables to be compared consist of more than two variables that will be analyzed, you can use analysis of variance (Anava) or co-variance analysis (Anacova). The analysis used is almost the same as experimental research, in comparative causal research comparing two or more variables while in experimental research comparing control variables and experimental variables (Hartono, 2019).

Based on the explanation above, it can be concluded that in its implementation, comparative causal research is carried out in five stages, starting from determining the research problem, determining the group that has the characteristics to be studied, selecting a comparison group, data collection, and finally data analysis. In formulating a research problem or research question, we speculate about the causes of a phenomenon based on research.

Causal comparative research has advantages and disadvantages. The advantages of comparative causal research are:

a. The comparative causal method is a research that is good for various situations, for example previously the researcher wanted to use the experimental method, but it cannot be used when: 1) if it is not possible to select, control and manipulate the factors necessary to investigate the cause-and-effect relationship directly . 2) If controlling all variables except the independent variable is very unrealistic and artificial which prevents normal interactions with other influential variables. 3) If

control in the laboratory for various research purposes is impractical, too expensive, or from an ethical perspective is questionable. So in this case researchers can choose comparative causal research.

b. Comparative causal studies yield very useful information about the nature of the phenomena in question: with what, under what conditions, in what sequence and pattern and so on.

c. Improvements in techniques, statistical methods, and designs with partial control have recently made causal-comparative studies more accountable (Mohammad Faizal Amir, 2017).

The disadvantages/weaknesses of comparative causal research are:

a. The main weakness of any ex-post facto design is that there is no control over the independent variables. Within the limits of the selection that can be made, the researcher must take the facts as he encounters without the opportunity to adjust the conditions or manipulate the influencing variables. To be able to reach a conclusion, the researcher must consider all possible reasons or hypotheses that may be put forward that influence the results achieved.

b. It is difficult to obtain certainty that the relevant causal factors are actually included in the group of factors being investigated.

c. The fact that the causal factor is not a single factor, but rather a combination and interaction between various factors under certain conditions to produce the effect witnessed, causes the problem to be very complex.

d. A symptom may not only be the result of multiple causes, but can also be caused by one cause in a particular event and by another cause in another event.

e. If an interrelationship between 2 (two) variables has been found, it may be difficult to determine which is the cause and which is the effect.

f. The fact that two or more factors are interconnected does not always imply a cause-and-effect relationship. This fact may only be because these factors are related to other unknown or unobserved factors.

Causal-comparative research holds several distinct advantages that make it particularly valuable in educational research when compared to experimental and purely descriptive designs. Unlike experimental research, which requires manipulation and control of variables, causal-comparative research allows researchers to investigate cause-and-effect relationships in naturally occurring conditions where manipulation is impractical, unethical, or impossible, such as differences arising from social background, cultural context, or prior educational experiences. This design is especially useful in education because many critical variables, such as parental involvement, socioeconomic status, or school culture, cannot be assigned or controlled experimentally. Compared to correlational research, which focuses primarily on identifying relationships without exploring potential causes, causal-comparative research offers deeper explanatory power by systematically comparing groups to infer possible causal factors underlying observed differences. Its unique strength lies in its ability to bridge the gap between descriptive observation and experimental inquiry by providing plausible causal interpretations based on real-world educational phenomena. Consequently, causal-comparative research serves as a pragmatic and context-sensitive approach that generates meaningful insights for educational theory, policy, and practice.

Based on the explanation above, it can be concluded that the comparative method has its own advantages and disadvantages. The advantage is of course that it allows researchers to understand the causal relationship between two or more variables by comparing variations in one variable to variations in other variables. This helps identify factors that may influence changes in a phenomenon. Meanwhile, the weakness of this research is that the comparative method often involves subjective judgments, especially when people have to compare several options. Individual views and preferences may influence the results, which may reduce objectivity.

3.2. Correlational Research Design

Correlation research is a part of ex-post facto research because in general researchers do not manipulate the state of existing variables and directly look for a relationship and the level of variable relationship expressed in the correlation coefficient. Correlation research is research that involves data collection activities to determine whether there is a relationship and the level of relationship between 2 (two) or more variables. The existence of a relationship and the level of this variable is

important, because by knowing the level of the existing relationship, researchers will be able to develop it in accordance with the research objectives.

Correlational designs focus on determining a statistical relationship between two or more variables without trying to determine causation. Correlational research aims to identify the extent to which these variables are related to each other. Therefore, the main goal of correlational research is to answer questions such as "Is there a relationship between variable X and variable Y?" or "How does the level of one variable correlate with the level of another variable?" Correlational research is useful for identifying relationships and trends in data, but does not provide evidence of causation. Results from correlational research can lead to causal hypotheses, but further experimental designs are needed to test these relationships in more detail.

Gay stated that correlational research involves collecting data to determine whether and to what degree a relation exists between two or more variables. The degree of relation is expressed as a correlation coefficient. If two variables are related, scores within a certain range on one variable are associated with scores within a certain range on the other variable. A relation between variables does not imply that one is the cause of the other. You should not infer causal relations on the basis of data from a correlational study (Gay, 2012).

Penelitian korelasi memiliki tujuan untuk menentukan ada atau tidaknya hubungan antara 2 (dua) variabel atau lebih, ke arah manakah hubungan tersebut positif atau negatif, dan seberapa jauh hubungan yang ada antara 2 (dua) variabel atau lebih yang dapat diukur. Misalnya: hubungan antara kecerdasan dengan kreativitas, tinggi badan dengan umur, motivasi dengan prestasi, nilai bahasa Inggris dengan nilai statistika, dan sebagainya (Hikmawati, 2020).

The purpose of correlation investigation is to reveal or establish a relationship or use relationships in making predictions or estimates. In the field of education, correlation studies are generally used to conduct research on a number of variables which are thought to have a significant role in achieving the learning process. For example, regarding learning outcomes with motivation, intensity of attendance at lectures, learning strategies, and Semester Achievement Index.

Researchers will be appropriate to use correlation research for the following reasons: a) There is a need for information that there is a relationship between variables which the correlation coefficient can achieve; b) Correlation research must take into account its benefits if the variables that emerge are complex, and the researcher cannot possibly control and manipulate the variables; c) If in research it is possible to measure several variables and relationships that exist in a realistic setting and d) Correlation research is appropriate if one of the research objectives is to achieve a prediction formula, namely a condition that shows the existence of an assumed relationship between variables (Santoso, 2021).

Correlation research has 3 important characteristics for researchers who will use it. These three characteristics include: a) Correlation research is appropriate when the variables are complex and it is not possible for researchers to manipulate and control variables as in experimental research. ; b) Allows variables to be measured intensively in real settings or environments and c) Allows researchers to obtain a significant degree of association (Mohammad Faizal Amir, 2017).

This correlational or correlational research has 3 (three) distinctive characteristics, namely: 1) This correlation research will be considered appropriate, if there are variables in the research it is not possible to manipulate the data and there is no possibility of being able to control these variables as in experimental research; 2) Allows researchers to carry out intensive variable measurements in a real environment and 3) Allows researchers to obtain a significant degree of association.

There are three types of correlation research (Santoso, 2021):

1. Relationship Studies

Relationship studies seek to gain an understanding of factors or variables related to complex variables, such as academic learning outcomes, motivation, and self-concept. Variables that are known to be unrelated can be eliminated from further attention/consideration.

2. Prediction Study

If two variables have a high correlation, the score on one variable can be used to predict the score on the other variable. Predictive studies are often used for certain research that is indeed supportive. Usually it will make it easier for researchers to draw conclusions from the research carried out. So the process is faster and there are no complicated elements when drawing conclusions. For example, research to determine the relationship between student rankings at high school level and predicting

the rankings they will get when they become students. Generally, students who excel at high school level will also have equally good achievements when they enter college.

3. Correlation and Causality

Correlational research refers to studies that aim to reveal relationships between variables through the use of correlational statistics (r). The square of the correlation coefficient yields the variance explained (r square). A correlational relationship between two variables is sometimes the result of another source.

The stages in making correlation research are (LP2M UMA, 2021):

a. Defining the Problem

The first stage in writing correlational research is determining the problem, also known as formulating the problem. This stage will of course also be found in other research. Because there will be no research if there is no problem, this problem is the topic of the research.

b. Literature Study

After the problem has been determined and found, the next stage in correlational research is literature study. So, researchers at this stage will search for theoretical foundations from various literature and other reference sources that are relevant and meet their needs.

c. Research methodology

The next stage is to determine the research methodology or determine the research methods that will be used. So, at this stage the researcher will need to decide which methodology is appropriate for the research being conducted. So at this stage the researcher has the obligation to determine the research subject. Next, carry out the process of collecting research data that is most appropriate. The determination of research subjects needs to be adjusted to the main focus of the research itself. The determination of the subject should be homogeneous, so that the results of the variable relationships are not very different or exactly the same.

d. Data collection

The next stage is data collection which can be done in several ways. For example, with questionnaires, questionnaires, tests, interview guidelines, observation guidelines, and so on. In this process or stage, it is carried out at relatively the same time except for predictive methods where there must be a time lag.

e. Data analysis

The next stage is of course to carry out data analysis, so that all the research data that has been collected will later be analyzed to find out the relationship between one variable and other variables. The data analysis technique that can be used is to connect research results with other results.

f. Conclusion

The final stage of correlational research is concluding or drawing up conclusions. At this stage the researcher will explain the research results in a correlational manner in language that is easy for readers to understand. At this stage, the researcher will present the results of data analysis and observations. So that readers of research reports can know the relationship between each variable studied from start to finish. At the same time, you can conclude whether there is a relationship or not and how high the level of the relationship is on two or more variables.

Correlation research has various types of designs including (1) bivariate correlation, (2) regression and prediction, (3) multiple regression, (4) factor analysis, and (5) correlation designs used to make causal conclusions (Mohammad Faizal Amir, 2017). The types of data in correlational research are divided into 4, namely:

1) Nominal data is the simplest measure, where the number given to an object has meaning only as a label, and does not indicate any level. To facilitate analysis, nominal data is usually used as a number, namely a process which are called categories. Numbers are used only as symbols/symbols to differentiate each category. This number is given only as a symbol or sign, it is not ranked, meaning that it cannot be said that male teachers are better than female teachers and so on.

2) Ordinal scale data is data obtained by categorization or classification, but there is a relationship between the data. Ordinal data includes qualitative data which is at a higher level than nominal data. Ordinal data already shows symbols and levels or levels (ranks) that are bigger or smaller. The smaller the number the worse it is and the bigger the better, so the bigger the number the higher the ranking.

3) Intervals are included in the type of quantitative data, in the form of numbers, can be graded, can indicate ranking (the larger the number, the higher the ranking), numbers indicate distances (intervals), and the zero point is not an absolute point. The zero point is stated based on agreement. Data obtained by measurement, where the distance between two points on the scale, is already known. This is different from an ordinal scale, where the distance between two points is not considered (such as the distance between satisfaction and dissatisfaction, which actually only concerns people's feelings).

4) Ratio data is the highest type of data, can be expressed as a ranking, expresses distance, and has a zero point as an absolute point, and can be operated mathematically (added, divided, subtracted and multiplied). Ratio scale data is data obtained by a method of measurement, where the distance between two points on the scale is known, and has an absolute zero point. This is different from the interval scale, where there is no absolute zero point. Like the 0°C point, of course it is different from the 0°F point. or the change of year in the Gregorian calendar system (every January 1) is different from the change of Javanese, Chinese and other years. So there is no new year in the sense that all calendars recognize it as a new year (El Hasbi, 2023).

Correlation research has advantages, including: its ability to investigate the relationship between several variables together (simultaneously) and correlation research is able to provide information about the degree of strength of the relationship between the variables studied. Furthermore, this research is useful for addressing problems related to the educational, social and economic fields. Correlation research makes it possible to investigate several intensively investigated variables and this research can carry out predictive analysis without requiring a large sample (Siroj et al., 2024).

Correlational research has several weaknesses, including: a) onlyidentifying relationships between variables, not identify cause-and-effect relationships, b) less orderly and strict when compared with experimental methods due to lack of doing control over the independent variables, c) tend to identify patterns of pseudo-relationships which is less reliable and valid, d) pattern relationships are often uncertain and blurred, e) often provides stimulation for its use a kind of "shoot gun" approach, enter data indiscriminately from diverse and providing sources meaningful or useful interpretation (Arsyam, 2021).

From all the explanations above, the author can conclude that research using the correlation method can be interpreted as research aimed at finding out the relationship between two or more variables. So during the research process, researchers will collect data from two variables and then determine the relationship between the two. Then it will also be known whether the relationship tends to be a strong relationship or not. Knowing the level of relationship between several variables in research is important. Because knowing how strong the relationship between these variables is helps researchers to prepare further research. So that the research can be further developed and then adjusted to the initial objectives of the research.

Future correlational research in education offers significant opportunities to explore complex relationships among social, cultural, psychological, and instructional variables that naturally coexist in authentic educational settings. Advances in data availability, learning analytics, and large-scale educational databases enable researchers to examine multivariate relationships with greater precision and broader population coverage, thereby strengthening predictive and explanatory models of educational phenomena. Correlational research also provides a valuable foundation for theory development and hypothesis generation, particularly in contexts where experimental manipulation is not feasible. However, these opportunities are accompanied by notable challenges. One major challenge lies in the risk of misinterpreting correlation as causation, which requires researchers to exercise strong theoretical grounding and cautious interpretation. Additionally, issues related to measurement validity, confounding variables, and contextual bias may limit the robustness of findings if not carefully addressed. Therefore, future correlational studies must employ rigorous research designs, validated instruments, and complementary methodologies, such as longitudinal or mixed-method approaches, to maximize their contribution to educational research and practice.

4. CONCLUSION

Based on the explanation that has been given, it can be concluded that comparative causal research, which is called ex-post facto research, is a systematic empirical investigation in which scientists do not control independent variables directly because the existence of these variables has

already occurred, or because these variables basically cannot be manipulated. Comparative causal studies usually involve two or more groups and one independent variable. Comparative causal research is carried out for several reasons: 1) the data may already exist/have occurred; 2) comparative causal research allows the investigation of variables that cannot or should not be studied experimentally; 3) complete initial instructions for experimental studies; and (4) it is less expensive than experimental research.

Correlation research is a part of ex-post facto research because in general researchers do not manipulate the state of existing variables and directly look for a relationship and the level of variable relationship expressed in the correlation coefficient. Correlation research is research that involves data collection activities to determine whether there is a relationship and the level of relationship between 2 (two) or more variables. The existence of a relationship and the level of this variable is important, because by knowing the level of the existing relationship, researchers will be able to develop it in accordance with the research objectives.

Novice researchers often find it difficult to differentiate between comparative causal research and correlational and experimental research. Correlational research and comparative causal research may be confused because both studies are without manipulation and the same thing regarding the interpretation of results. There is a difference between the two, namely that comparative causal studies usually involve two or more groups and one independent variable, while correlational studies usually involve two or more variables and one group. Comparative causal studies involve comparisons, while correlational studies involve correlations.

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