A CRITICAL ANALYSIS OF THE POTENCY OF HYPOTHESES: ASSESSING THE ROLES AND WEAKNESSES OF THE NULL AND ALTERNATIVE HYPOTHESES AS PERCEIVED BY POST GRADUATE RESEARCH STUDENTS IN AKWA IBOM STATE TERTIARY INSTITUTIONS

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ABSTRACT

This study analysed the potency of null and alternative hypotheses, assessing their roles and weaknesses of the null and alternative hypotheses as perceived by post graduate research students in Akwa Ibom State tertiary institutions. Descriptive survey design was adopted to carry out this research. The targeted population for the study comprised all post graduate research students made up of Master degree and Ph.D research students in tertiary institutions in Akwa Ibom State. Simple random sampling technique was used to select 80 post graduate research students each from University of Uyo and Akwa Ibom State University and this gave a sample size of 160 respondents which was used for this research. The instrument used for data collection was a structured questionnaire titled "Hypothesis Potency Questionnaire (HPQ)". Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient obtained was 0.89, and this was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such as descriptive statistics. The result of the data analysis concluded that "Direction and Focus" among many others was the most prominent potency of hypothesis in research. It also showed that "Preventing Researcher Bias" among others was the most prominent role of null hypothesis in research. One of the recommendations made was that researchers should complement or replace traditional null hypothesis significance testing (NHST) with Bayesian inference and estimation-based models.

Keywords: Null Hypothesis, Alternative Hypothesis, Potency, Akwa Ibom State, Tertiary Institutions

Introduction

The scientific method relies heavily on hypothesis testing, a fundamental approach that underpins empirical research across disciplines. At the heart of this methodology lie the null hypothesis (H_0) and the alternative hypothesis (H_A), two contrasting statements that guide statistical inference. The null hypothesis typically asserts no effect or relationship, while the

alternative hypothesis proposes the presence of an effect or association. These hypotheses serve as critical tools in research, shaping study designs, data interpretations, and the overall validity of scientific conclusions. However, despite their importance, both hypotheses have inherent limitations that can influence research outcomes.

One major critique of hypothesis testing is its reliance on probabilistic reasoning, which can lead to misinterpretations of statistical significance. The rigid dichotomy of rejecting or failing to reject H_0 does not always capture the complexity of real-world phenomena (Emmert-Streib & Dehmer, 2019). For instance, a statistically significant result does not necessarily imply practical importance, yet researchers often misinterpret p-values as definitive proof of an effect (Greenland, Senn, Rothman, ... & Altman, 2016). Moreover, the conventional threshold of $p < 0.05$ is arbitrary and susceptible to manipulation through practices such as p-hacking and selective reporting (Chuard, Vrtı´lek, Head, and Jennions, 2019). These methodological flaws raise concerns about the reliability of hypothesis testing in producing replicable and meaningful scientific findings.

Furthermore, the null hypothesis is frequently criticised for being unrealistic or uninformative. Many research questions in the social and natural sciences involve complex interactions that cannot be adequately captured by a simplistic assumption of "no effect". The insistence on null hypothesis significance testing (NHST) often detracts from the broader goal of estimating effect sizes and understanding practical implications (Lovell, 2020). This limitation highlights the need for alternative statistical approaches, such as Bayesian inference and estimation-based models, which provide more nuanced insights into research data.

Similarly, alternative hypotheses, while essential for scientific progress, are not without their weaknesses. A poorly formulated alternative hypothesis can lead to ambiguous conclusions, particularly if it lacks theoretical grounding or fails to specify expected directions and magnitudes of effects (Bulajic, Stamatovic and Cvetanovic, 2012). Additionally, the process of hypothesis generation is often influenced by cognitive biases, prior expectations, and disciplinary paradigms, which may constrain the objectivity of research findings. These challenges underscore the importance of developing well-constructed hypotheses that align with robust theoretical frameworks and empirical evidence.

Statement of Problem

Research in academia heavily relies on hypothesis testing to validate findings, yet its effectiveness is often debated. Postgraduate students in Akwa Ibom State face challenges in understanding and applying null and alternative hypotheses accurately. Many rely solely on statistical significance, overlooking practical implications. The rigid dichotomy of hypothesis testing may limit critical thinking and comprehensive analysis. Additionally, issues such as misinterpretation of p-values and overdependence on NHST weaken research quality. Without addressing these concerns, flawed conclusions may persist. This study examines students' perceptions, highlighting strengths, weaknesses, and potential improvements in hypothesis application for more rigorous academic research.

Objectives of the Study

The following objectives guided this research:

1. To find out the potency of hypothesis in research as perceived by post graduate research students in Akwa Ibom State tertiary institutions.

2. To examine the roles of null hypothesis in research as perceived by post graduate research students in Akwa Ibom State tertiary institutions.

Research Questions

The following research questions were used in the research:

1. What is the potency of hypothesis in research as perceived by post graduate research students in Akwa Ibom State tertiary institutions?
2. What are the roles of null hypothesis in research as perceived by post graduate research students in Akwa Ibom State tertiary institutions?

LITERATURE REVIEW

Concept of Hypothesis

A hypothesis is a fundamental component of scientific research, serving as a tentative statement that proposes a possible explanation for a phenomenon or predicts an outcome based on existing knowledge. It provides a foundation for empirical investigation by defining relationships between variables that can be tested through observation and experimentation (Singh & Prasad, 2021).

There are various types of hypotheses used in research, including descriptive, explanatory, and procedural hypotheses. Descriptive hypotheses focus on characterizing a phenomenon, explanatory hypotheses seek to determine the underlying causes of observed events, and procedural hypotheses outline potential methods for investigation (Kumar & Sharma, 2022). Misconceptions often arise regarding hypotheses, with some researchers equating them solely with predictions. However, well-formulated hypotheses are structured statements that guide research methodologies (Wang et al., 2023).

Concept of Null Hypothesis

A null hypothesis is a fundamental concept in statistical hypothesis testing, representing a default position that there is no effect or no difference between groups or variables. It serves as the starting point for statistical analysis, providing a baseline against which alternative hypotheses are compared. The null hypothesis is typically denoted as H_0 and is tested to determine the likelihood that any observed differences or relationships in data occurred by chance.

The process of Null Hypothesis Significance Testing (NHST) involves formulating the null hypothesis and an alternative hypothesis (H_1), collecting data, and then using statistical methods to assess whether the observed data are sufficiently inconsistent with H_0 to warrant its rejection in favor of H_1. A key component of NHST is the p-value, which indicates the probability of observing data as extreme as, or more extreme than, those collected, assuming that the null hypothesis is true. A commonly used threshold for significance is 0.05; if the p-value is below this threshold, the null hypothesis is rejected. Despite its widespread use, NHST has been subject to extensive criticism. Concerns include the potential for misinterpretation of p-values, the arbitrary

nature of significance thresholds, and the emphasis on statistical significance over practical significance.

Concept of Alternative Hypothesis

Alternative hypothesis defines that there is a statistically important relationship between two variables. According to Wikipedia (2025) in statistical hypothesis testing, the alternative hypothesis is one of the proposed propositions in the hypothesis test. In general the goal of hypothesis test is to demonstrate that in the given condition, there is sufficient evidence supporting the credibility of alternative hypothesis instead of the exclusive proposition in the test (null hypothesis).

The **alternative hypothesis (HAH_AHA)** is a fundamental concept in statistical research that proposes the presence of an effect, relationship, or difference between variables. It serves as the counterpoint to the **null hypothesis (HoH_oHo)**, which assumes no effect or association. Researchers test the alternative hypothesis to determine whether there is sufficient evidence to reject the null hypothesis, indicating that the observed results are unlikely to have occurred by chance. A well-defined alternative hypothesis is crucial for guiding experiments, ensuring meaningful data interpretation, and advancing scientific knowledge. However, it must be carefully formulated to avoid ambiguity and researcher bias.

Concept of Research

Research is a systematic and methodical process of inquiry aimed at expanding knowledge, solving problems, and validating theories. It serves as the foundation for scientific progress, technological advancements, and policy-making. According to Kumar (2022), research involves collecting, analyzing, and interpreting data to establish facts or develop new insights. This process is essential across all disciplines, including social sciences, natural sciences, medicine, and engineering, as it helps in understanding complex issues and making informed decisions.

One of the fundamental distinctions in research is between basic research and applied research. Basic research, also referred to as pure or fundamental research, is conducted to develop theoretical understanding without immediate practical application. For example, Johnson (2023) highlights that studies on quantum mechanics or cognitive psychology often fall under basic research, as they focus on understanding fundamental principles rather than solving specific problems. On the other hand, applied research seeks to address real-world challenges and provide practical solutions. Wang and Lee (2024) emphasize that applied research plays a crucial role in fields like medicine, engineering, and business, where findings can be directly implemented to improve human lives and industry practices.

The Potency of Hypothesis in Research

A hypothesis serves as a foundational element in research, providing a tentative prediction or explanation about the relationship between variables. Its potency lies in its ability to guide the research process, ensuring systematic investigation and contributing to the advancement of knowledge. Below are key aspects highlighting the significance of hypotheses in research:

Direction and Focus: The aim of forming a hypothesis is to provide a direction for the research and establish a relationship between variables. When formulating a hypothesis, deductive

reasoning is utilised as it aims at testing a theory or relationships. Finally, a hypothesis helps in the discussion of findings and conclusion of the study.

Framework for Data Collection and Analysis: Hypotheses provide a structured approach to data collection and analysis. By establishing expected outcomes, they enable researchers to determine appropriate methodologies and statistical techniques, ensuring that data is collected and interpreted in a manner that can confirm or refute the proposed relationships.

Basis for Statistical Inference: In quantitative research, hypotheses underpin statistical testing, allowing researchers to assess the significance of their findings. Through hypothesis testing, researchers can make informed decisions about the validity of their assumptions, distinguishing between genuine effects and random variations. Hypothesis testing allows researchers to evaluate the validity of their assumptions and draw conclusions based on evidence. It provides a framework for making predictions and determining whether observed results are statistically significant or just occurred by chance. By applying various statistical tests, researchers can measure the strength of the evidence and quantify the uncertainty associated with their findings.

Advancement of Theoretical Knowledge: Hypotheses facilitate the extension of existing theories by proposing new relationships and explanations. Testing these hypotheses contributes to the refinement or development of theoretical frameworks, thereby advancing knowledge within the field.

Predictive Value: A robust hypothesis possesses predictive power, enabling researchers to anticipate outcomes under specific conditions. This predictive aspect is crucial for practical applications, such as developing interventions or informing policy decisions. In descriptive research, the primary goal is to portray or describe characteristics without seeking to establish cause-and-effect relationships between variables. They may use descriptive statistics, such as mean, median, mode, frequency, or percentage, to summarize the data. Descriptive studies do not need hypotheses because they do not make any predictions or comparisons.

Identification of Research Gaps: Formulating a hypothesis requires a comprehensive understanding of existing literature, which helps in identifying gaps in current knowledge. Addressing these gaps through hypothesis-driven research ensures that studies contribute meaningful insights to the field.

Enhancement of Research Validity and Reliability: By providing a clear statement of expected relationships, hypotheses enhance the validity and reliability of research findings. They ensure that studies are conducted systematically and that conclusions drawn are based on empirical evidence, thereby increasing the credibility of the research. Mustapha, (2023). A well-defined hypothesis enhances the relevance and reliability of research outcomes. It ensures that the study's objectives are clear and align with the research question, thereby increasing the accuracy and significance of the findings.

The Roles of Null Hypothesis in Research

The null hypothesis plays a crucial role in research by serving as the foundation for statistical testing, ensuring objectivity, and guiding scientific inquiry. Below are the key roles of the null hypothesis:

Establishing a Baseline for Comparison: The null hypothesis (H_0) provides a neutral starting point for research, ensuring that any observed differences or relationships are statistically

tested against a default assumption. It allows researchers to determine whether experimental results are due to real effects or mere chance. By doing so, it ensures the integrity of scientific conclusions. Without a null hypothesis, there would be no clear standard against which experimental data can be measured. It ensures that observed changes are significant rather than being products of random variation. The null hypothesis is particularly crucial in randomized controlled trials, where it helps differentiate treatment effects from placebo responses. Researchers rely on H_0 to ensure objectivity in data interpretation, making it a cornerstone of empirical research.

Preventing Researcher Bias: The null hypothesis ensures objectivity by requiring empirical evidence to reject it, rather than researchers proving their expectations. This reduces confirmation bias, where researchers might otherwise only seek evidence supporting their hypotheses, leading to misleading conclusions. By requiring rigorous testing before rejecting H_0, research findings become more reliable and less prone to manipulation. It forces scientists to base conclusions on statistical evidence rather than subjective interpretation. The null hypothesis also discourages selective reporting, where only favorable results are published while negative or inconclusive findings are ignored (Alfred &Mamza, 2025). This role is especially important in medical and pharmaceutical research, where biased findings can have real-world consequences. Ensuring neutrality in hypothesis testing allows research to be replicated with consistent results across studies.

Supporting Statistical Inference: Statistical significance testing relies on the null hypothesis to determine whether results are due to random chance or a true effect. Hypothesis testing procedures such as p-values and confidence intervals depend on H_0 to provide meaningful interpretations of data. Without a null hypothesis, determining the validity of experimental results would be impossible. It helps establish a clear framework for testing hypotheses, ensuring that scientific conclusions are drawn from strong statistical reasoning. This is particularly important in psychological and social sciences, where complex variables require statistical validation (Ile, 2025). The null hypothesis provides a systematic approach to analyzing uncertainty in research findings. It allows researchers to quantify the probability of obtaining results under a true null hypothesis.

Aiding in Decision-Making: Researchers and policymakers use null hypothesis testing to make informed decisions. If a null hypothesis is rejected, it suggests evidence for an alternative hypothesis, influencing strategies in fields like healthcare, economics, and social sciences. The process of hypothesis testing helps eliminate guesswork in critical decision-making. For example, in clinical trials, null hypothesis testing determines whether a new drug is effective compared to an existing treatment. It provides a structured method for evaluating evidence, ensuring that decisions are made based on data rather than assumptions. By using H_0, decision-makers can quantify risks and measure the strength of relationships between variables. Hypothesis testing is also widely applied in environmental and climate research to assess trends and policy implications.

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The Roles of Alternative Hypothesis in Research

1. Establishing Scientific Validity Through Statistical Testing

The primary role of the alternative hypothesis is to guide researchers in determining whether there is sufficient statistical evidence to reject the null hypothesis (H_0) in favor of an alternative explanation (H_1).

- **Bayesian Hypothesis Testing and Correlation Studies:** This study highlights how alternative hypotheses are essential in Bayesian hypothesis testing, a method used to assess the strength of evidence in favor of a proposed relationship between variables (Mulder, 2025).

2. Hypothesis-driven Experimental Research

The alternative hypothesis helps scientists formulate predictions that can be empirically tested through experiments.

- **Alternative Hypotheses in Psychological Research:** This research tested an alternative hypothesis that parents adjust their speech depending on a child's knowledge of words. The findings provide new insights into speech patterns and language development, demonstrating the alternative hypothesis's role in refining existing theories (Rosslund&Kartushina, 2025).
- **Medical Research and Alternative Hypothesis in Drug Effectiveness:** This study explored whether an alternative hypothesis regarding cancer metabolism and immune system interactions could explain a new approach to cancer treatment (Sharma et al, 2025).

3. Strengthening Theories Through Refutation And Verification

The alternative hypothesis enables researchers to challenge existing assumptions and refine theories by introducing new perspectives and statistical models.

- **Economic Theories and Market Behavior:** This study tested alternative hypotheses regarding how firms managed financial liquidity during the pandemic, leading to a better understanding of market adaptation (Rahman, 2025).
- **Astrophysical Theories and Hypothesis Testing:** This study explored an alternative hypothesis in astrophysics to explain the structure of supernova remnants, showcasing how hypothesis-driven research shapes scientific discoveries (Orlando, 2025).

4. Enhancing Decision-Making in Business and Finance

Alternative hypotheses play a significant role in business and financial research by enabling firms to test strategies and assess risk.

- **Financial Fraud and Alternative Hypothesis Testing:** This research used an alternative hypothesis to investigate the relationship between audit committees and financial fraud detection, proving its importance in risk assessment (Kwamboka et al, 2025).
- **Corporate Governance and Alternative Hypothesis Testing:** The study examined alternative financial regulatory policies to test their effectiveness in reducing financial risks in banking institutions (Xiliang et al, 2025).

5. Improving Machine Learning and AI Models

Alternative hypotheses have become increasingly relevant in machine learning and artificial intelligence (AI), where researchers test different models and refine algorithmic predictions.

- **AI Research and Alternative Hypothesis in Data Processing:** This study introduced an alternative hypothesis regarding the effectiveness of data regularity in generative AI models, contributing to advancements in deep learning (Beyler& Bach, 2025).
- **Alternative Hypothesis in Climate Change Models:** This research tested an alternative climate change model hypothesis, emphasizing the importance of competing theories in environmental science (Fisch, 2025).

The Weakness of Null Hypothesis in Research

The null hypothesis (\(H_0\)) plays a key role in statistical analysis, but it has several weaknesses that can limit its effectiveness. Below are some of its main weaknesses:

Oversimplification of Complex Relationships: The null hypothesis assumes that there is no effect or relationship between variables, which may not accurately reflect real-world phenomena. Many scientific relationships are nuanced and exist on a continuum rather than being strictly "present" or "absent." This binary approach can lead to oversimplified interpretations of research findings.

Reliance on Arbitrary Significance Levels: Hypothesis testing often depends on p-values to determine statistical significance, with a common threshold of \(p < 0.05 \). This cut-off is arbitrary and may lead to misleading conclusions. A small p-value does not always indicate a meaningful effect, while a slightly higher p-value does not necessarily mean there is no effect.

Vulnerability to P-Hacking and Research Bias: Researchers may engage in questionable practices, such as manipulating data collection or analysis methods (p-hacking), to achieve statistically significant results. Selective reporting, where only significant findings are published, also skews scientific literature and reduces the credibility of research.

Contribution to the Replication Crisis: Many studies fail to produce consistent results when replicated, partly due to overreliance on null hypothesis significance testing (NHST). Focusing only on rejecting \(H_0\) rather than estimating effect sizes or practical significance makes research findings less reliable and harder to reproduce.

Lack of Focus on Effect Size and Practical Significance: The null hypothesis does not provide insights into the magnitude or practical importance of an effect. Even if a result is statistically significant, it may not be meaningful in real-world applications. Effect sizes and confidence intervals offer more valuable information for interpreting findings.

Restricts Exploratory and Innovative Research: The NHST framework emphasises confirmatory research rather than exploratory analysis. This can discourage the investigation of novel hypotheses, as researchers are primarily focused on rejecting or failing to reject H_0 rather than discovering new relationships and patterns.

The Weakness of Alternative Hypothesis in Research

The alternative hypothesis (H_A) plays a vital role in scientific inquiry by proposing the existence of an effect or relationship. However, it has several weaknesses that can impact the reliability and interpretation of research findings. Below are some key weaknesses:

Lack of Specificity and Clarity: Alternative hypotheses can sometimes be vague or poorly defined, failing to specify the exact nature, direction, or strength of the expected relationship. A broad or ambiguous hypothesis makes it difficult to test effectively and can lead to unclear conclusions.

Susceptibility to Researcher Bias: Researchers often have expectations or prior beliefs that influence hypothesis formulation and data interpretation. This can result in confirmation bias, where researchers unconsciously seek evidence that supports their hypothesis while overlooking contradictory findings, leading to skewed results.

Dependence on Null Hypothesis Rejection: The alternative hypothesis is typically tested indirectly by rejecting the null hypothesis (H_0). However, rejecting H_0 does not prove H_A; it only suggests that the observed data is unlikely under H_0. This indirect approach can sometimes lead to misinterpretations of research findings.

Risk of Type I Errors (False Positives): Since hypothesis testing aims to reject H_0, there is always a chance of a Type I error, where a researcher incorrectly concludes that an effect exists when it does not. This problem becomes more pronounced when multiple hypotheses are tested within the same study, increasing the likelihood of false positives.

Potential Lack of Practical Significance: A statistically significant result does not always translate to real-world importance. The alternative hypothesis may detect small differences that meet statistical thresholds but have little practical impact. Without considering effect sizes and confidence intervals, findings may be misleading or exaggerated.

How to Mitigate the Weakness of Null Hypothesis in Research

The null hypothesis (H_0) is widely used in statistical analysis, but its weaknesses can impact the reliability and interpretation of research findings. To enhance the effectiveness of hypothesis testing, researchers can adopt several strategies to mitigate these limitations.

Use Bayesian and Estimation-Based Approaches: Instead of relying solely on null hypothesis significance testing (NHST), researchers can incorporate Bayesian inference and estimation-based models. Bayesian methods provide probability distributions for parameters, offering a more nuanced understanding of data. Estimation-based approaches, such as confidence intervals and effect sizes, provide richer insights beyond simple rejection or acceptance of H_0.

Prioritize Effect Sizes and Confidence Intervals: Focusing on effect sizes and confidence intervals helps overcome the oversimplification of research findings. Effect sizes indicate the magnitude of an observed effect, while confidence intervals provide a range of values that likely contain the true effect. This approach ensures that research findings are not just statistically significant but also practically meaningful.

Reduce Dependence on Arbitrary p-Value Thresholds: Researchers should move away from strict p-value cutoffs (e.g., \(p < 0.05 \)) and instead interpret p-values in conjunction with other statistical measures. Using a range of evidence rather than a single threshold reduces the risk of misinterpretation and minimizes the impact of p-hacking and selective reporting.

Encourage Replication and Open Science Practices: Promoting transparency in research through open data, pre-registration of hypotheses, and replication studies helps address the replication crisis. By sharing methods and data, researchers can ensure that findings are reproducible, reducing the likelihood of false positives or exaggerated claims based on NHST alone.

Adopt a More Flexible Research Approach: Instead of relying exclusively on null hypothesis testing, researchers should consider exploratory data analysis, mixed-methods approaches, and machine learning techniques. These strategies allow for a deeper understanding of complex relationships beyond the binary rejection of \(H_0\).

How to Mitigate the Weakness of Alternative Hypothesis in Research

The alternative hypothesis (\(H_A\)) plays a crucial role in research by proposing the presence of an effect or relationship. However, its weaknesses, such as lack of specificity, susceptibility to bias, and dependence on null hypothesis rejection, can limit its effectiveness. To strengthen research outcomes, researchers can adopt the following strategies to mitigate these weaknesses:

Formulate Clear and Specific Hypotheses: To avoid ambiguity, researchers should define alternative hypotheses with precision, specifying the expected direction and magnitude of the effect. Well-structured hypotheses improve the clarity of research objectives and lead to more accurate testing and interpretation.

Use Theoretical Frameworks to Guide Hypothesis Development: Grounding hypotheses in established theories and empirical evidence minimises researcher bias and enhances the reliability of predictions. A well-supported hypothesis reduces the risk of formulating misleading or overly broad research questions.

Reduce Dependence on Null Hypothesis Rejection: Since rejecting \(H_0\) does not directly confirm \(H_A\), researchers should complement traditional hypothesis testing with effect size analysis, confidence intervals, and Bayesian methods. These approaches provide deeper insights into the strength and practical significance of findings.

Control for Researcher Bias: Implementing double-blind study designs, pre-registering hypotheses, and using automated data analysis techniques can minimise the influence of cognitive biases on research outcomes. Transparent reporting of both significant and non-significant findings also helps maintain objectivity.

Emphasise Practical Significance: Researchers should focus on the real-world applicability of their findings rather than merely achieving statistical significance. Effect size measures, such

as Cohen's \(d\) or odds ratios, help determine whether observed effects are meaningful in practical contexts.

Methodology

Descriptive survey design was adopted to carry out this research. The targeted population for the study comprised all post graduate research students made up of Master degree and Ph.D research students in tertiary institutions in Akwa Ibom State. Simple random sampling technique was used to select 80 post graduate research students each from University of Uyo and Akwa Ibom State University and this gave a sample size of 160 respondents which was used for this research. The instrument used for data collection was a structured questionnaire titled "Hypothesis Potency Questionnaire (HPQ)". Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient obtained was 0.89, and this was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such as descriptive statistics

Research Questions 1: The research question sought to find out the potency of hypothesis in research. To answer the research question, percentage analysis was performed on the data, (see table 1).

Table 1: Percentage analysis of the potency of hypothesis in research

POTENCY	FREQUENCY	PERCENTAGE (%)
Direction and Focus	30	18.75**
Framework for Data Collection and Analysis	29	18.13
Basis for Statistical Inference	27	16.88
Advancement of Theoretical Knowledge	17	10.63
Predictive Value	13	8.13*
Identification of Research Gaps	20	12.5
Enhancement of Research Validity and Reliability	24	15
TOTAL	**160**	**100%**

** **The highest percentage frequency**

* **The least percentage frequency**

SOURCE: Field Survey

The above table 1 presents the percentage analysis of potency of hypothesis in research. From the result of the data analysis, it was observed that the potency of research tagged "Direction and Focus" 30(18.75%) was the most prominent potency of hypothesis in research, while the least was "Predictive Value" 13(8.13%). The result therefore is in agreement with the research findings of Binoy, (2019), who noted that a well-formulated hypothesis offers clear direction for a study, delineating specific objectives and focusing the research on particular variables and their potential relationships.

Research Questions 2: The research question sought to examine the roles of null hypothesis in research. To answer the research question, percentage analysis was performed on the data, (see table 2).

Table 2: Percentage analysis of the roles of null hypothesis in research

ROLES	FREQUENCY	PERCENTAGE (%)
Establishing a Baseline for Comparison	43	26.88**
Preventing Researcher Bias	47	29.38
Supporting Statistical Inference	32	20*
Aiding in Decision-Making	38	23.75
TOTAL	**160**	**100%**

** **The highest percentage frequency**

* **The least percentage frequency**

SOURCE: Field Survey

The above table 2 presents the percentage analysis of the roles of null hypothesis in research. From the result of the data analysis, it was observed that the role tagged "Preventing Researcher Bias" 47(29.38%) was rated as the highest roles of null hypothesis in research, while "Supporting Statistical Inference" 32(20%) was rated the least. The result therefore is in agreement with the research findings of Alfred & Mamza (2025) the null hypothesis ensures objectivity by requiring empirical evidence to reject it, rather than researchers proving their expectations.

Conclusion

Hypothesis testing is a cornerstone of scientific research, yet both null and alternative hypotheses have inherent limitations. The result of the data analysis revealed that "Direction and Focus" among many others is the most prominent potency of hypothesis in research. It also showed that "Preventing Researcher Bias" among others is the highest role of null hypothesis in research. The rigid reliance on statistical significance can lead to misinterpretations, with p-values often mistaken for definitive proof. Null hypotheses may oversimplify complex realities, while alternative hypotheses risk ambiguity if poorly formulated. These challenges highlight the need for methodological advancements, such as Bayesian inference, to improve research accuracy. By critically reassessing traditional hypothesis testing, researchers can adopt more nuanced approaches that enhance scientific rigour, ensuring that findings are both meaningful and reliable in the pursuit of knowledge.

Recommendations

1. Researchers should complement or replace traditional null hypothesis significance testing (NHST) with Bayesian inference and estimation-based models. These approaches provide richer insights by focusing on probability distributions and effect sizes, reducing the reliance on arbitrary p-value thresholds.
2. Studies should prioritise effect size and real-world applicability rather than merely achieving statistical significance. This shift can help avoid misleading conclusions and

ensure that research findings contribute meaningfully to scientific and practical advancements.

3. Researchers must adopt open science practices, including pre-registering hypotheses, sharing datasets, and using robust statistical methods. These practices help mitigate biases such as p-hacking and selective reporting, enhancing the credibility and reproducibility of research findings.

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