

How to Frame a Good Hypothesis in Research?

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Abstract:

In the present paper, the author has explained the meaning and definition of the hypothesis & discussed the 'TTSV' formula. 'TTSV' formula can be utilized to find out whether a statement is a hypothesis or not. As part of the 'TTSV' formula, the author has explained positive, negative, and null associations between or amongst the variables. In this paper, there is an exposition on the need for the existence of variables to create scientific knowledge and exceptions thereof. A proposition to be a hypothesis, should meet the conditions depicted in this paper. Therefore, every hypothesis is a proposition, but every proposition is not a hypothesis. The author further explains the kinds of research wherein the hypothesis is demanded and the types of research in which hypothesis are not required.

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1. INTRODUCTION

The hypothesis is one of the critical stages in research. In a research, once a problem is stated, the researcher looks forward to find out a tentative solution or answer to the problem. According to Dias (1994), after the material has been identified, the study may proceed in any direction, and progress can be achieved by formulating tentative hypotheses, the logical implications of which may be checked as to accuracy and admissibility [1].

After the finalization of the research problem, the researcher can make certain assumptions about the solution to the problem. These tentative solutions or answers to the problem are known as hypotheses. A 'hypothesis' here means a provisional theory or basis of explanation [2]. These tentative explanations-though unverified and untested- sounded plausible and reasonable; that is, they appear consistent with the socio-cultural situation of the group under study [3]. Tentative statement(s) may be proved (accepted) or

disproved (rejected) after a scientific investigation. If the hypothesis is proved, the problem for which it was a tentative solution is solved. If it is not proved, i.e., falsified owing to non-support of proof, alternative hypotheses or solutions would be required to be formulated and tested [4]. In a research about cause or effect, scientific inquiry without a hypothesis is like searching for an island in a sea without any prefixed or pre-decided direction. According to Kerlinger (1979), hypotheses are powerful tools for the advancement of knowledge, because, although formulated by man, they can be tested and shown to be correct or incorrect apart from man's values and beliefs [5]. Therefore, it can be a piece of scientific knowledge. It is to be remembered that no hypothesis can be evolved out of nothing. It presupposes prior knowledge of the problem presented by the material; the deeper the knowledge, the more fruitful the hypothesis [6].

2. MEANING AND DEFINITION OF HYPOTHESIS

2.1. Meaning of Hypothesis

Hypothesis in simple words is a hunch, educated guess, an imagined idea or assumption. It is a guess, hunch, or imagination of the researcher about the solution to problem/research outcome or conclusion. The word 'hypothesis' is derived from two words, 'hypo' and 'thesis'. 'Hypo' has originated from the Greek word, 'hypo', which means less than, below normal or under [7]. It also means tentative or subject to verification [8]. 'Thesis' means an original contribution to the stock of knowledge [9]. A thesis is a piece of scientific knowledge. 'Hypothesis' is a knowledge which is less than thesis/scientific knowledge. It is an idea or opinion to be defended by a person, thus 'hypothesis' means an idea formed beforehand, which has less value than tested or scientific knowledge. It is not at par with scientific knowledge or proved theory because of a lack of examination. Scientific knowledge of social research pre-supposes examination by collecting, analyzing, interpreting, and concluding the data or observations in a systematic and scientific manner. Therefore, it is a tentative proposition that is subject to verification through subsequent investigation [10] or a proposed explanation based on limited evidences¹ used as a starting point for further investigation [11]. These proposed solutions or explanations are called hypotheses, which the researcher is obliged to test based on facts already known or which can be made known [12].

In other words, a hypothesis means knowledge which is not yet tested, proved, investigated, examined, conclusive, or which is not yet scientific knowledge. Testing, re-testing, or verification and re-verification are key elements of scientific knowledge. The hypothesis is not tested (tentative knowledge); therefore, it is less than proved or established theory or knowledge.

¹In maximum cases, the hypothesis is based on a pilot study, previous research, or other available information.

Since the hypothesis is a prediction or guess of the researcher, the goal of research is to determine whether this guess is right or wrong.

2.2. Definition of Hypothesis

According to Goode and Hatt (1981), "*hypothesis states what we are looking for. It is a proposition which can be put to a test to determine its validity. It may seem contrary to, or in accord with, common sense. It may prove to be correct or incorrect.*"[13]

According to George A Lundberg (1942), "*a hypothesis is a tentative generalization, the validity of which remains to be tested. In its most elementary stage the hypothesis may be any hunch, guess, imaginative idea or intuition whatsoever which becomes the basis for action or investigation.*"[14]

According to Zina O'Leary (2004), "*hypothesis is logical conjecture (hunch or educated guess) about the nature of relationship between two or more variables expressed in the form of a testable statement.*"[15]

According to Barr and Scates (2010), "*a hypothesis is a statement temporarily accepted as true in the light of what is, at the time, known about a phenomenon and it is employed as a basis for action in the research for new truth, when the hypothesis is fully established, it may take the form of facts, principles and theories.*"[16]

3. 'TTSV' FORMULA TO FIND OUT WHETHER A STATEMENT IS A HYPOTHESIS OR NOT

Students of research methodology and novice researchers are many times confused about whether a particular statement is a hypothesis or not. For identification and formulation of an accurate hypothesis, 'TTSV' formula is one of the useful formulas; with the help of this formula, the researcher can easily understand, whether a statement is a hypothesis or not.

'TTSV' means tentative, testable statement between two or more variables. In simple words, 'hypothesis is a *tentative, testable statement* between two or more variables (TTSV)'. Explanation of 'TTSV' is as follows:

3.1. Explanation on first 'T' in 'TTSV' formula

First 'T' in 'TTSV' stands for tentative. Tentative means not conclusive, not yet proved or disproved, it is not yet confirmed or established.

3.2. Explanation on second 'T' in 'TTSV' formula

Second 'T' in 'TTSV' stands for testable. Testable means (statement/proposition) which can be tested with the help of scientific methodology, methods, tools, and techniques adopted in social science research. 'Test' means an examination of knowledge [17] or either to prove it wrong or to confirm it. In other words, testable means the statement which can be tested, examined, or verified by the researcher. Testing a hypothesis is very important because science does not admit anything as valid knowledge until a satisfactory test of its validity has been completed [18].

3.3. Explanation on 'S' in 'TTSV' formula

'S' in 'TTSV' stands for a statement. A hypothesis shall be a statement or proposition. It shall not be in question/issue form. The hypothesis is a tentative answer to your problem, or it is an assumption about the solution to the problem, i.e. conclusion of the research. Whereas the conclusion or solution to the problem is not assumed in the question/issue. The question/issue is raised to seek an answer/solution to the problem. Few questions are answered in 'Yes' or 'No'; others require explanation. As depicted above, a hypothesis is an assumption about the solution to the problem; in that sense, it is an assumption of conclusion or finding of the research. In a question sides are open while doing the inquiry, the researcher assumes nothing. Therefore, a question or an issue cannot be a hypothesis. For example, in a study relating to the co-relation of poverty and crime, the question would be: whether poverty leads to crime? Or whether poverty is a cause of crime? An answer to this question may be affirmative or negative, but while doing inquiry, both sides are open. Hence, the researcher is not assuming a conclusion or

solution to the problem. Therefore, it cannot be a hypothesis. The above question can be raised to find out whether poverty is a cause of crime. In this example, the correct hypothesis would be, '*poverty is positively associated with crime rate*'.

3.4. Explanation on 'V' in 'TTSV' formula

'V' in 'TTSV' stands for variables. In order to be a hypothesis, there shall be two or more variables in a statement or proposition. Merely having the variables is not enough, it shall fulfill two conditions:

- Firstly, there shall be an assumption of association between or amongst the variables;
- Secondly, the variables shall be the existence of the facts (past or present) or future reality (for a survey) and not merely perceived reality.

3.4.1. An assumption about the association between or amongst the variables

In a hypothesis, there shall be an assumption of association between or amongst the variables. The assumption of an association between variables or facts can be of three following categories:

- a) An assumption of the positive association between or amongst the variables;
- b) An assumption of the negative association between or amongst the variables;
- c) An assumption of the null association between or amongst the variables.

Explanation about the assumption of associations is as follows.

3.4.1.1 An assumption of the positive association between or amongst the variables

There can be an assumption of a positive relation/association between two or more variables. In an assumption of positive association, if one variable exists, there is an assumption of the existence/presence of

another variable. In a hypothesis, if 'V1' is a variable and 'V2' is another variable, in a positive association assumption would be 'V1' exists, therefore, there shall be the existence of 'V2' (i.e. 'V1' is positively associated with 'V2'). In this association, there is an assumption of co-relation or co-existence of two or more variables. In a statistical calculation, an assumption may be an increase of value/scale of one variable increases the value/scale of another variable.

In an inquiry into causes of habitation of the women in the red-light area in Pune city, a hypothesis with positive association may be: "Lack of adequate education and skills are positively associated with the habitation of the women working in the red-light area of the Pune city".

In this example, variable no. 1 (V1) would be 'lack of adequate education and skills', and variable no. 2 (V2) would be 'habitation of women in the red-light area of the Pune city'. In above example, it has been assumed that there is existence of variable no. 1 (V1), i.e. 'lack of adequate education and skills' and therefore, there is existence of variable no. 2 (V2), i.e. 'habitation of women in the red-light area of Pune city'.

3.4.1.2. An assumption on negative association between or amongst the variable

There can be a negative association between or amongst the variables. In a negative association, if one variable exists, there is an assumption of the non-existence of another variable. The assumption is the existence of one variable negates the existence/presence of another variable. In a hypothesis, if 'V1' i.e. variable no. 1 exists, the assumption would be that there shall be no existence of 'V2' variable no. 2. In a statistical calculation, an assumption may be an increase of value/scale of one variable decreases value/scale of another variable.

In a research on causes of non-rehabilitation of the women working in the red-light area, a hypothesis with a negative association may be: "Lack of adequate education and skills are negatively associated with the rehabilitation of

the women working in the red-light area of the Pune city".

In above example, it has been assumed that there is existence of variable no. 1 (V1), i.e. 'lack of adequate education and skills' and therefore, there would be non-existence of variable no. 2 (V2), i.e., 'rehabilitation of the women working in red-light area of the Pune city'. The assumption is existence of 'V1' negates the existence of 'V2'.

3.4.1.3. Assumption of null association between or amongst the variables

There can be a null or zero association between or amongst the variables. Null association shows that there is no impact of the existence of one variable on another variable. Two or more variables are not associated with each other. In a hypothesis assumption would be the existence/presence of variable no. 1 (V1) would have no association or zero ['0'] association with variable no. 2 'V2'. A hypothesis with no association/relation is known as a null hypothesis. In a statistical calculation, an assumption may be an increase or decrease of value/scale of one variable would have no impact on the value/scale of another variable. It does not either increase or decrease the value/scale of another variable.

In an example of causes of habitation or non-rehabilitation of women in the red-light area of Pune city, may be, 'lack of adequate education and skills are not associated with either with habitation or rehabilitation of the women working in the red-light area of the Pune city'.

3.4.2. The variables shall be the existence of the facts/future possibility and not mere perceived reality/assumption

In a research, a variable may be an actual reality (i.e., the existence of fact) or perceived, imaginary facts or reality. It is also known as 'learned ignorance'. In a number of scientific inquiries, the variables in a hypothesis shall not be imaginary or merely perceived assumptions. In several scientific empirical pieces of research, if variables are imaginary or merely perceived reality, scientific knowledge cannot be created. In a majority of empirical research, the creation of scientific

knowledge/theory demands existence variables.

In an empirical scientific inquiry on the association between 'corruption in Police machinery' and 'discretion to arrest' under section 41 of Criminal Procedure Code, 1973, a hypothesis may be: *'Discretion to arrest is positively associated with corruption by Police in the State of Maharashtra'*. In the above hypothesis, there are two variables, namely, 'discretion to arrest' and 'corruption by Police'. In this example, variables, i.e., 'discretion to arrest' and 'corruption by Police' shall be the existence of facts, it shall be actual reality. Otherwise, an inquiry would not lead to scientific knowledge/theory.

In a number of inquiries on propositions which are either merely perceived reality (learned ignorance) or cannot be a subject matter of scientific social research methodology, methods, tools, and techniques, scientific knowledge cannot be created. For example, in an empirical inquiry on a proposition viz., 'shaking of the hood by the snake is positively associated with an earthquake'. The above hypothesis cannot be a part of scientific inquiry under social science research. Firstly, because variable no. 1, i.e., 'shaking of the hood by the snake', is a perceived reality in India. In a survey of a remote village in India, a considerable number of samples/units may approve the above proposition, but it cannot lead to scientific social knowledge/theory because of variable no. 1 is merely a perceived reality. Secondly, the causes of earthquakes require study under seismology and not under social science. In a number of scientific inquiries, the researcher needs to explain the variables to establish that it is an actual social reality and not merely perceived assumption(s).

In instances of variables on future/possible social reality, there may be a survey conducted by the researcher.

3.4.2.1. Exceptions to the need of the existence/presence of variables

There may be a scientific inquiry on imaginary, merely perceived variables. The scientific inquiry on the causes of belief, faith,

ideology, customs, attitude, etc. can be conducted with the help of an imaginary or merely perceived variable(s). In a scientific inquiry on causes of worship of snakes in the Hindu religion, one of the variables may be related to 'the blessing of snakes by Lord Shiva'. Hypothesis for this scientific inquiry may be, 'blessing of the snakes by Lord Shiva is positively associated with worship of snakes in Hindu religion'. In the above example, the researcher may not be able to prove existence of one of the variables (i.e. 'blessing of snakes by Lord Shiva') with the help of scientific social researcher methodology. In that sense for social science research it may be treated as a merely perceived fact. However, a researcher can lead to a scientific and reliable finding on causes of worship of snakes in India.

3.5. Examples to understand 'TTSV' formula

Example 1): *'Political interference in the investigation is positively associated with low conviction rate in India'*.² If the researcher wants to know whether this statement is a hypothesis or not, he/she can apply a 'TTSV' formula. In order to apply the 'TTSV' formula, the following questions shall be considered by the researcher: a) Is it a *tentative* statement? An answer to this question would be 'Yes', because a researcher or any other person has not yet proved or disproved it. The researcher is not sure whether political interference is a cause of low conviction or not. b) Is it *testable*? An answer to this question also would be 'Yes', because it can be tested by empirical study. c) Is it a *statement*? Again answer would be 'Yes', it is a statement. d) Are there two or more *variables*? Yes, there are two variables in the statement, i.e., *political interference* and *low conviction rate*. e) Is there an *association* between variables? Yes, there is a positive association shown in the

² Various commissions including Punjab Police Commission (1961-62); Delhi Police Commission (1968); Gore Committee on Police Training (1972); National Police Commission (1977-80), etc. have commented on political interference in the investigation.

statement. f) Are the variables *existing facts*? The answer to this question would be 'Yes'. Therefore, the above statement is a hypothesis.

Example 2): '*The Congress party has won the election of 2009.*' Is this statement a hypothesis? A researcher can use the above set of questions to apply the 'TTSV' test and to identify whether it is a hypothesis or not. Is it *tentative*? An answer to this question would be 'No'. The above statement explains an event which has already occurred. It is a fact and not an assumption or tentative statement, which needs to be tested. The first requirement of the 'TTSV' test is not satisfied. Therefore it is not a hypothesis.

Example 3): '*Nobody shall kill a human being.*' Is it a *tentative* statement? This statement is not tentative or testable because it is a normative statement or a diktat. There is nothing to prove or disprove in this statement. A mere normative statement cannot be a hypothesis. It is not a tentative, testable statement between two or more variables.

Few examples of the hypothesis:

A) If a researcher is conducting research on low conviction rate in the State of Maharashtra or having low conviction rate as a problem, the following may be examples of the hypothesis:

- 1) The inefficiency of the judiciary is positively associated with the low conviction rate in the State of Maharashtra.
- 2) The highest standard of proof (i.e., beyond a reasonable doubt) is positively associated with a low conviction rate in the State of Maharashtra.
- 3) The inefficiency of the investigation machinery is positively associated with/ cause of low conviction rate in the State of Maharashtra.
- 4) The right of silence is positively associated with a low conviction rate in the State of Maharashtra (or in India).

- 5) The poor witness protection mechanism is positively associated with the low conviction rate in the State of Maharashtra.

Some other examples of hypothesis:

1) Ignorance of the right to seek redressal against unfair trade practice and unscrupulous exploitation of consumers leads to ineffective implementation of the Consumer Protection Act, 1986 in Pune city.

2) Children from broken homes tend to become delinquents.

3.6. Statements which cannot be treated as a hypothesis

A few examples of statements that cannot be treated as hypothesis and the reasons for not treating them as hypothesis are explained below.

- 1) Curse of God is positively associated with swine flu. This statement is not testable with the help of available scientific methodology, methods, tools, and techniques of sociological research.
- 2) Snakes are blessed by Lord Shiva. This statement is not testable.
- 3) People shall go for walking in the morning. This statement is a normative/not a tentative statement, there is nothing to prove or disprove in this statement.

4. DO WE NEED A HYPOTHESIS IN RESEARCH?

Framing a hypothesis is one of the key stages in a research. Positivists believe that the hypothesis is the cornerstone of the scientific method and that it is a necessary component of the research process [19]. Post positivists, however, often view the hypothesis as a reductionist device designed to constrain social research and take all life force from it [20]. According to positivists, without a hypothesis, an investigation is relatively an aimless search [21]. According to Cohen and Nagel, "we cannot take a single step forward in an inquiry unless we begin with suggested

explanation or solution of the difficulty which originated it.” [22] According to others, “hypotheses, though important, are not essential for a study [23]. In a doctrinal legal research, which does not involve a field study, it is not necessary to have a hypothesis (or series of hypotheses) before conducting a research [24].

A hypothesis is not demanded in descriptive research, research by judges and lawyers for systematic application of the law to the fact, and, exploratory or formulative research. However, there may be a working hypothesis in exploratory or formulative research.

5. CONCLUSION

Hypothesis though not a sacrosanct stage yet plays a very important role in a research. Hypothesis helps in narrowing the scope, bringing clarity, precision and focus in a scientific inquiry. ‘TTSV’ test is a very useful test to frame a scientific hypothesis. After framing a hypothesis, the researcher needs to examine the variables (including examination on the existence of the variables) and an association between or amongst the variables.

A proposition/statement to be a hypothesis, should meet the above conditions. Therefore, every hypothesis is a proposition, but every proposition is not a hypothesis. In addition to the above, the researcher shall spend some time in defining variables on objective and testable parameters.

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