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Study material for M.P.Ed Students

THE HYPOTHESIS

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The most common use of hypotheses is to test whether on existing theory can be used to solve the problem. In everyday situations those who confront problems often propose information hypotheses that can be tested directly.

We know very well theories and hypothesis is the spinal cord of scientific studies, especially those that are experimental, and they share the common platform of definition. Hypothesis serve in scientific inquiry are the development of theory and the statement of parts of an existing theory in testable form. Snow (1973) describes six level of theory, with the first level being hypothesis formation. At this initial level, the theory developer has a hunch based on theory, past experience, observations, and/or information gained from others. A hypothesis is formulated in such a way that this hunch can be tested.

A hypothesis is a tentative generalized the validity of which remains to be tested. It is most elementary stage, the hypothesis may be any guess, imaginative idea which becomes the basis for further investigation.

DEFINITION OF HYPOTHESIS

According to Sinku Singh “Hypothesis is the anticipated outcome of the whole study ”

According to Cicciarella (1997), a hypothesis may be “ defined as a proposition formulated for purpose of argument or study ”

Best (1983) called hypothesis “ a shrewd guess or inference that is formulated and provisionally adopted to explain observed facts or conditions and to guide in further investigation ”

Stangor (1998) defined as a specific and falsifiable prediction regarding the relationship between or among two or more variable.

In the context of a typical research study, hypothesis is a prediction or expectation regarding out come of the study.

TYPES OF HYPOTHESIS

Based on how they are derived, hypothesis is divided into two types.

1. Inductive Hypothesis.
2. Deductive Hypothesis.

1) INDUCTIVE HYPOTHESIS

An inductive hypothesis is a generalization based on observation. Such inductively derived hypothesis can be very useful but are of limited scientific value.

They are derived from specific to general.

2) DEDUCTIVE HYPOTHESIS

Deductive hypothesis is derived from theory. They contribute to the science of education by providing evidence that supports, expands or contradicts a given theory and by suggesting future studies. It derived from general to specific.

Based on how they are stated hypothesis is classified into two types.

1. Statistical or Null hypothesis.
2. Scientific or Research hypothesis.

1) STATISTICAL OR NULL HYPOTHESIS ::

A Statistical or null hypothesis states that there is no difference or relationship between variables and that any relationship found will be by chance, not a true one.

e.g. There will not be / would not be any significant difference in occurrence of injuries between low and high level of achievement of footballers.

The Statistical hypothesis relates to a statistical method of interpreting conclusions about population characteristics that are inferred from the variable relationship observed in samples. The statistical hypothesis asserts that observed differences or relationships merely result from chance errors inherent in the sampling process. Most hypothesis are the opposite of the statistical hypothesis. In such a case, if the researcher rejects statistical hypothesis, he or she accepts the research hypothesis, concluding that the magnitude of the observed variable relationship is probably too great to attribute to sampling error.

2) SCIENTIFIC OR RESEARCH HYPOTHESIS ::

Scientific hypothesis is staged in declarative form. A research hypothesis states on expected relationship or difference between two variable in other words, what relationship the researcher expects to varify through the collection and analysis of the data. e.g. There will be significant difference in occurrence of injuries to footballer at low and high level of achievement with respect to different field position.

The scientific or research hypothesis is a formal affirmative statement predicting a single research out-come, a tentative explanation of the relationship between two or more variables. For the hypothesis to be testable, the variables must be operationally defined. That is, the researcher specifies what operations were conducted, or tests used to measure each variable. Thus, the hypothesis focuses the investigation on a definite target and determines what observations or measures, are to be used.

A number of years ago the hypothesis was formulated that there is a positive causal relationship between cigarette smoking and the incidence of coronary heart disease. This hypothesis proposed a tentative explanation that leads to many studies comparing the incidence of heart disease among cigarette smokers and nonsmokers. As a result of these extensive studies, the medical profession now generally accepts that this relationship has been established.

IMPORTANCE OF HYPOTHESIS ::

By formulating hypothesis the researcher puts himself on the right track. Hypothesis is based on other experiences and one's own to serve as the torch light to the researcher. It makes him to decide what to look for. He must keep on to the right track so as to reach the final goal, hypothesis gives right direction to the research.

Hypothesis provides the researcher with rational statements consisting of elements expressed in a logical order of relationship which seek to describe conditions or events that have not yet been confirmed by facts. Here it acts as a binding buckle between the cause and its effect.

Hypothesis defines scope of the problem and puts a fence around it in terms of objectives, goals, variables, subjects etc.

Hypothesis serves as a plinth of the study as it provides some infrastructure of facts on which the researcher builds up the super structure of his investigation.

Hypothesis supplies framework for the studies that aim at establishing cause and effect relationship among varibales.

Hypothesis prepares the basis for reporting conclusions of the research study.

CHARACTERISTICS OF GOOD HYPOTHESIS ::

A good hypothesis should have a following characteristics :

1) It should be testable an effective way of formulating a testable hypothesis would be to start conducting small prior studies on the subject.

2) A good hypothesis must be clearly stated specified in unequivocal terms the relationship between dependent and independent variables.

3) A good hypothesis should be limited in scope and must be specific in its focus. Hypothesis is global in nature is difficult to tackle in the sense that they require more time, more energy and more effort and involvement of a greater number of researchers.

4) Hypothesis must have consistency into the known facts. Many issues in behavioral field specifically in physical education and sports are either controversial or have not been succulently resolved, under these circumstances it is natural for the hypothesis to be consistent with some available facts and inconsistent with others.

5) A good hypothesis should be stated in simple terms. The language used should be direct and clear. Vague, ambiguous and double meaning terms should not be used while stating hypothesis.

6) Hypothesis should be testable within reasonable time. It should be in such a manner that its testing can be completed within stipulated time except in special circumstances where extension of time limit is warranted.

7) Hypothesis should be set up in such a manner that it can be modified in the light of latest facts, Due to explosion in knowledge, theories and principles in almost all subjects are changing very fast. That is way a researcher must keep himself abreast of the newest.

HYPOTHESIS TESTING :

Hypothesis testing with an assumption , called a hypothesis. Hypothesis is a supposition made as a basis for reasoning.

The procedure of testing hypothesis is described below :-

1) SET UP A HYPOTHESIS ::

The first things in hypothesis testing is to set up a hypothesis about a population parameter. The hypothesis must be so constructed that if one hypothesis is accepted, the other is rejected and vice versa.

The two hypotheses in a statistical test are normally referred to as :

(i) Null hypothesis or Statistical hypothesis and

(ii) Alternative hypothesis or Scientific or Research hypothesis

The Null hypothesis is a very useful tool in testing the significance of difference. In its simplest form the hypothesis asserts that there is no true difference in the sample

and the population in the particular matter under consideration (hence the word " Null " which means invalid, void or amounting to nothing) and that the difference found is accidental and unimportant arising out of fluctuations of sampling.

The rejection of the null hypothesis indicates that the differences have statistical significance and the acceptance of the null hypothesis indicates that the difference are due to chance. Since many problems aim at establishment of statistical significance of differences, rejection of null hypothesis may thus indicate success in statistical project. As against the null hypothesis, the alternative hypothesis specifies those values that the researcher believes to hold true, and, of course, he hopes that the sample data lead to acceptance of this hypothesis as true. The alternative hypothesis may embrace the whole range of value rather than single point.

The null and alternative hypothesis are distinguished by the use of two different symbol, Ho representing the null hypothesis and Ha the alternative hypothesis.
Thus a psychologist who wishes to test whether or not a certain class of people have a mean I.Q. higher than 100 might establish the following null and alternative hypothesis.

Ho: u = 100 (Null hypothesis)

Ha: u # 100 (Alternative hypothesis)

or, if he is interested in testing the differences between the mean I.Q. of two groups, this psychologist may like to establish the null hypothesis that the two groups have equal means (u_1-u_2 = 0) and the alternative hypothesis that their means are not equal (u_1-u_2 # 0)

Ho : u_1-u_2 = 0 (Null hypothesis)

Ha : (u_1-u_2 # 0) (Alternative hypothesis)

2) <u>SET UP A SUITABLE SIGNIFICANCE LEVEL</u> ::

Having set up the hypothesis, the next step is to test the validity of H_O against that of Ha at a certain level of significance. The confidence with which an experimenter rejects – or retains a null hypothesis depends upon the significance level is adopted. The significance level is customarily expressed as a percentage, such as 5 percent, 1 percent and the like. A level of significance of, say 5 percent, is the probability of rejecting the null hypothesis if it is true when the hypothesis in question is accepted at the 5 percent

level, the statistician is running the risk that in the long run, he will be making the wrong decision about 5 percent of the time.

By rejecting the hypothesis at the same level he runs the risk of rejecting a true hypothesis in 5 out of every 100 occasions. By testing at the 1 percent level he seeks to reduce the chance of making a false judment but some element of risk remains (1 out of 100 occasions) that he will make the wrong decision, i.e., he may accept where he ought to have rejected or vice versa.

The following diagram illustrates the region in which we would accept or reject the null hypothesis when it is being tested at 5% level of significance and a two - tail test is employed.

The above diagram illustrates how to interpret a 5%level of significance. It may be noted that 2.5% of the area under the curve is located the each tail.

3) SETTING A TEST CRITERION ::

The third step in hypothesis testing procedure is to construct a test criterion. This involves selecting an appropriate probability of distribution for the particular test, that is, a probability distribution which can properly be applied. Some probability distributions that are commonly used in testing procedures are t, F and x^2. Test criteria must employ an appropriate probability distribution; for example, if only small sample information is available, the use of the normal distribution would be in appropriate.

4) DOING COMPUTATIONS ::

Having taken the first three steps, we have completely designed the statistical test we now proceed to the fourth step – performance of various computations – from a random sample of size, necessary for the test. These calculations including the testing statistics and the standard error of the testing statistics.

5) MAKING DECISIONS ::

Finally, as a fifth step, We may draw statistical conclusions and take decisions. A statistical conclusions or statistical decision is a decision either to reject or to accept the null hypothesis. The decision will depend on whether the computed value of the test criterion falls in the region of rejection or the region of acceptance.

If the hypothesis is being tested at 5% level and the observed set of results has probabilities less than 5 percent, We consider the difference between the sample statistics and the hypothesical parameter significant. In other words, we think that the sample result is so rare that it cannot be explained by chance variation alone. We then decide to reject H_O and state : " the null hypothesis is false" or " the sample observation are not consistent with the null hypothesis "

On the other hand, if at 5% level of significance the observed set of results has probability more than 5 percent gives reason that the difference between the sample result and the hypothetical parameter can be explained by chance variations and therefore, is not significant statistically. Similarly, we decide not to reject Ha and state : " The sample observations are not inconsistant with the null hypothesis."

TWO TYPES OF ERRORS IN TESTING HYPOTHESIS :

1) The hypothesis is true but our test rejects it. (Type I error).
2) The hypothesis is false but our test accepts it (Type II error).
3) The hypothesis is true and our test accepts it (Correct decision).
4) The hypothesis is false and our test rejects it (Correct decision).

Obviously, the first two possibilities lead to errors.

In a statistical hypothesis testing experiment, a type error is committed by rejecting the null hypothesis when it is true.

The probability of committing type I error is denoted by a, where

 = Prob. (Type I error)

= Prob. (Rejecting Ho/Ha is true)

On the other hand, a type II error is committed by not rejecting (i.e. accepting) the null hypothesis when it is false. The probability of committing a type II error is denoted by Þ, where

Þ = prob. (Type II error)

= Prob. (Rejecting Ho/Ha is false)

The distinction between these two types of error can be made by an example. Assume that the difference between two population means is actually zero. If our test is significance when applied to the sample means to lead us to believe that the difference in population means is significant, we make a type I error. On the other hand, suppose there is true difference between the two population means. Now if our test is significance leads to the judgment " not significant" We commit a type II error. We thus find ourselves in the situation which is described by the following table.

	Accept Ho	Reject Ho
Ho is True	Correct decision	Type I error
Ho is false	Type II error	Correct decision

While testing hypothesis the aim is to reduce both the types of error, i.e. type I and Type II. But due to fixed sample size it is not possible to control both the errors simultaneously.

It is more dangerous to accept a false hypothesis (Type II error) than to reject a correct one (Type I error). Hence we keep the probability of committing Type I error at a certain level, called the level of significance. The level of significance (also known as the size of the rejection region or size of the critical region or simply size of the test) is traditionally denoted by the Greek letter . In most statistical test, the level of significance is generally fixed at 5%. This means that the probability of accepting a true hypothesis is 95%.

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