Null and alternative hypotheses

Lesson 7.2.5 | A Level issues, debates and methods

Core ideas

A hypothesis is a testable prediction about a relationship, difference or effect in a study.

The alternative hypothesis predicts that there will be a relationship, difference or effect between variables.

The null hypothesis predicts that there will be no relationship, no difference or no effect beyond chance variation.

A directional hypothesis states the expected direction of the result, such as higher, lower, positive or negative.

A non-directional hypothesis predicts a difference or relationship without saying which direction it will take.

Hypotheses should name the variables clearly so that the prediction can be tested and interpreted.

Key terms

Hypothesis: A testable prediction about what a study expects to find.

Null hypothesis: A prediction that there will be no relationship, difference or effect.

Alternative hypothesis: A prediction that there will be a relationship, difference or effect.

Directional hypothesis: A prediction that states the expected direction of the result.

Non-directional hypothesis: A prediction that expects a result but does not state its direction.

Null and alternative hypotheses

Continued

Independent variable: The variable changed or compared by the researcher.

Dependent variable: The outcome measured in the study.

Chance variation: Differences in results that could occur randomly rather than because of a real effect.

Further detail and evidence

For A Level, write and apply null hypotheses and both directional (one-tailed) and non-directional (two-tailed) alternative hypotheses to the actual operationalised variables. Hypothesis writing is part of Paper 4 planning; Paper 2 planning does not require aims or hypotheses.

An alternative hypothesis predicts a difference or association; a directional prediction gives its expected direction, while a non-directional prediction does not. A null states no population difference/association, with observed variation attributable to chance. Operationalise conditions, measures and the population relevant to the plan.

Experimental hypotheses refer to defined IV conditions and a measurable DV. Correlational hypotheses refer to two measured co-variables and the proposed relationship. Observations and self-reports require wording that matches their actual design rather than an invented manipulated variable.

Use previous theory/evidence to justify direction where appropriate. A hypothesis should be testable before results are known. Null and alternative should concern the same variables and comparison; they should not describe different research questions.

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Applying the ideas

Example: mean seven-point comfort ratings will be lower after viewing a six-inch than a 24-inch restaurant-table gap. Null: mean comfort will not differ beyond chance between those defined conditions. A correlational alternative could instead predict that greater perceived crowding relates to lower satisfaction.

Worked example: A researcher predicts that students who revise with practice questions will score higher than students who only reread notes. How should the alternative and null hypotheses be written? The alternative hypothesis could state that students who revise with practice questions will score higher on the test than students who only reread notes. This is directional because it predicts the direction of the difference. The null hypothesis would state that there will be no difference in test scores between the two revision groups, or that any difference will be due to chance.

Worked example: In a study of phone use and sleep quality, a student writes, 'Phones are bad for sleep.' What is weak about this as a hypothesis? The statement is too vague because it does not clearly name measurable variables or say what result will be tested. A better non-directional hypothesis would be that there will be a relationship between amount of phone use before bed and sleep-quality score. A directional version would predict that greater phone use before bed will be associated with poorer sleep-quality scores.

Evaluation and connections

Statistical decisions do not prove a theory true or eliminate all alternative explanations. A non-significant result is not proof of no possible effect. The syllabus does not require calculations or unspecified inferential tests. Paper 4 plans require aims/hypotheses; the 2027 Paper 2 planning expectations differ.