Research Hypothesis [1]

A research hypothesis (H_1) is the statement created by researchers when they speculate upon the outcome of a research or experiment.

Every true experimental design [3] must have this statement at the core of its structure, as the ultimate aim of any experiment.

The hypothesis is generated via a number of means, but is usually the result of a process of inductive reasoning [4] where observations lead to the formation of a theory. Scientists then use a large battery of deductive methods [5] to arrive at a hypothesis that is testable [6], falsifiable [7] and realistic.

Reasoning Cycle - Scientific Research

The precursor to a hypothesis is a problem, usually framed as a question.The precursor to a hypothesis is a research problem [8], usually framed as a question [9]. It might ask what, or why, something is happening.

For example, we might wonder why the stocks of cod in the North Atlantic are declining. The problem question might be 'Why are the numbers of Cod in the North Atlantic declining?'

This is too broad as a statement and is not testable by any reasonable scientific [10] means. It is merely a tentative question arising from literature reviews [11] and intuition. Many people would think that instinct and intuition are unscientific, but many of the greatest scientific leaps were a result of 'hunches'.

The research hypothesis is a paring down of the problem into something testable and falsifiable. In the above example, a researcher might speculate that the decline in the fish stocks is due to prolonged over fishing. Scientists must generate a realistic and testable hypothesis [12] around which they can build the experiment.

This might be a question, a statement or an 'If/Or' statement. Some examples could be:

- Over-fishing affects the stocks of cod.
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If over-fishing is causing a decline in the numbers of Cod, reducing the amount of trawlers will increase cod stocks.

These are acceptable statements [13] and they all give the researcher a focus for constructing a research experiment. The last example formalizes things and uses an ‘If’ statement, measuring the effect that manipulating [14] one variable [15] has upon another. Though the other one is perfectly acceptable, an ideal research hypothesis should contain a prediction, which is why the more formal ones are favored.

A A hypothesis must be testable, but must also be falsifiable [7] for its acceptance as true science.

scientist who becomes fixated on proving a research hypothesis loses their impartiality and credibility. Statistical tests [16] often uncover trends, but rarely give a clear-cut answer, with other factors often affecting the outcome and influencing the results [17].

Whilst gut instinct and logic tells us that fish stocks are affected by over fishing, it is not necessarily true and the researcher must consider that outcome. Perhaps environmental factors or pollution are causal effects influencing fish stocks.

A hypothesis must be testable [6], taking into account current knowledge and techniques, and be realistic. If the researcher does not have a multi-million dollar budget then there is no point in generating complicated hypotheses. A hypothesis must be verifiable by statistical [18] and analytical means, to allow a verification [19] or falsification [7].

In fact, a hypothesis is never proved, and it is better practice to use the terms ‘supported’ or ‘verified’. This means that the research showed that the evidence supported the hypothesis and further research is built upon that.

Your hypothesis should...

- Be written in clear, concise language
- Have both an independent and dependent variable
- Be falsifiable – is it possible to prove or disprove the statement?
- Make a prediction or speculate on an outcome
- Be practicable – can you measure the variables in question?
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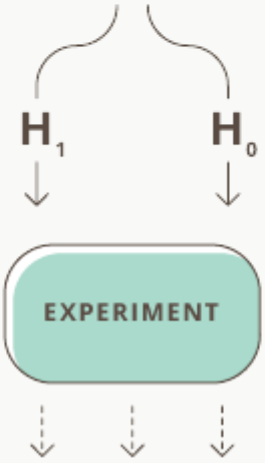
> Hypothesize about a proposed relationship between two variables, or an intervention into this relationship

A research hypothesis [20], which stands the test of time, eventually becomes a theory, such as Einstein's General Relativity. Even then, as with Newton's Laws, they can still be falsified or adapted.

The research hypothesis is often also callen H_1 and opposes the current view, called the null hypothesis [21] (H_0).

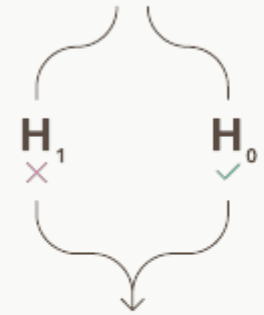
Research question:

DOES EATING ONLY FISH INCREASE IQ?



Result:

NO SIGNIFICANT DIFFERENCE BETWEEN GROUPS



Conclusion:

ONLY EATING FISH DOES NOT INCREASE IQ

Mini quiz:

Questions:

Consider the following hypotheses. Are they likely to lead to sound research and conclusions, and if not, how could they be improved?

1. Adding mica to a plastic compound will decrease its viscosity.
2. Those who drink a cup of green tea daily experience enhanced wellness.
3. Prolonged staring into solar eclipses confers extrasensory powers.
4. A decline in family values is lowering the marriage rate.
5. Children with insecure attachment style are more likely to engage in political dissent as adults.
6. Sub-Saharan Africa experiences more deaths due to Tuberculosis because the HIV rate is higher there.

Answers:

1. This is an ideal hypothesis statement. It is well-phrased, clear, falsifiable and merely by reading it, one gets an idea of the kind of research design it would inspire.
2. This hypothesis is less clear, and the problem is with the dependent variable. Cups of green tea can be easily quantified, but how will the researchers measure “wellness”? A better hypothesis might be: those who drink a cup of green tea daily display lower levels of inflammatory markers in the blood.
3. Though this hypothesis looks a little ridiculous, it is actually quite simple, falsifiable and easy to operationalize. The obvious problem is that scientific research seldom occupies itself with supernatural phenomenon and worse, putting this research into action will likely cause damage to its participants. When it comes to hypotheses, not all questions need to be answered!
4. Provided the researchers have a solid method for quantifying “family values” this hypothesis is not too bad. However, scientists should always be alert for their own possible biases creeping into research, and this can occur right from the start. Normative topics with moral elements are seldom neutral. A better hypothesis will remove any contentious, subjective elements. A better hypothesis: decrease in total

discretionary income corresponds to lower marriage rate in people 20 – 30 years of age.

5. This hypothesis may yield very interesting and useful results, but practically, how will the researchers gather the data? Even if research is logically sound, it may not be feasible in the real world. A researcher might instead choose to make a more manageable hypothesis: high scores on an insecure attachment style questionnaire will correlate with high scores on a political dissention questionnaire.

6. Though complex, this is a good hypothesis. It is falsifiable, has clearly identified variables and can be supported or rejected using the right statistical methods.

Links
[1] https://staging.explorable.com/research-hypothesis
[2] https://staging.explorable.com/
[3] https://staging.explorable.com/true-experimental-design
[4] https://staging.explorable.com/inductive-reasoning
[5] https://staging.explorable.com/deductive-reasoning
[6] https://staging.explorable.com/testability
[7] https://staging.explorable.com/falsifiability
[8] https://staging.explorable.com/defining-a-research-problem
[9] https://staging.explorable.com/research-paper-question
[10] https://staging.explorable.com/what-is-the-scientific-method
[11] https://staging.explorable.com/what-is-a-literature-review
[12] https://staging.explorable.com/hypothesis-testing
[13] https://staging.explorable.com/what-is-a-thesis-statement
[14] https://staging.explorable.com/independent-variable
[15] https://staging.explorable.com/research-variables
[16] https://staging.explorable.com/statistical-hypothesis-testing
[17] https://staging.explorable.com/statistically-significant-results
[18] https://staging.explorable.com/statistics-tutorial
[19] https://staging.explorable.com/verification-error
[20] http://en.wikipedia.org/wiki/Hypothesis
[21] https://staging.explorable.com/null-hypothesis