Notes on Philosophy of Science: Criteria for Explanation

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Definition: Psychology

- **Psychology** is the study of alternative explanations of behavior of living beings.
- **Judgment and Decision Making**- a subset of psychology, dealing with certain types of behaviors and certain types of explanations. Responses often (not always) modeled as result of a decision based on evaluations of the likelihood that certain actions lead to certain consequences and comparisons with other possible actions.

Criteria for Explanation

- An **explanation** (for a set of events) is a set of statements satisfying the following criteria:
- 1. **deductive**: Can deduce the phenomena from the explanation
- 2. **meaningful**: not meaningless; testable.
- 3. **predictive**: In principle, if we knew the explanation in advance, we could have predicted the phenomena.
- 4. **causal**: in principle, can control phenomena.
- 5. **general**: premises are “laws”, not assumed or denied for each case.

Basic Terms

- **Definition:** A statement of equivalence in language. Bachelor = {Hum n Male n NeverM}
- **Operational definition**: specifies operations of measurement
- **Logical Statement:** truth known a priori.

  All Bachelors are unmarried.
- **Empirical Statement**: truth tested a posteriori

  All Bachelors are happy.

Meaning of Empirical Statement

- Empirical statements, unlike definitions and logical statements, have implications that can be tested.
- The empirical MEANING of a statement is equivalent to the set of operationally specifiable tests and outcomes.
- A TEST is a procedure to obtain observations that *in principle* could DISPROVE the statement, if it is false.

Theory of Unverifiable Brownies

- Everything that happens is the result of the actions of unverifiable brownies.
- Properties:
- Existence, completeness, uniqueness
- Inertia, Action/Reaction
- Fringes*

Deduction

- **Deduction** is logical procedure for reaching conclusions by means of rules that guarantee that if the premises are true, then the conclusion is true. Classic logic and set theory.
- Two principles of logic:
- 1. Transitivity of implication: If (All As are B and All Bs are C) then All As are C.
- 2. All As are B if and only if All not B are not A.

Deduction

- P1: Socrates is an Athenian
- P2: All Athenians are Greeks
- C: Socrates is a Greek

- If the premises are both true then logically deduced conclusion is true.

Quiz: The Wason Task

- To test your understanding of the last two slides, take the Wason task:
- http://psych.fullerton.edu/psych305/Chap_07/Ch7_exp1.htm
- Feedback:
- http://psych.fullerton.edu/psych305/Chap_07/Ch7_ex3.htm

Can we Deduce a True Conclusion from False Premises?

- P1: Bread is made of Cyanide
- P2: All things made of Cyanide are good to eat
- C: Bread is good to eat*
    - * operational definition of good to eat.
- Can we "prove" the theory by eating bread?
- True conclusion does not "validate" the premises.
- Debate with N. H. Anderson ("validating FM")

Induction vs. Deduction

- Deduction uses rules of logic
- Induction based on observations
- Principle of Induction: Past is relevant to predicting the future. Or: the laws of nature don't change.
- Examples: drop item, it falls. Old man who would live forever. Stock market rising, falling.

Correlation vs. Causation

- Two types of empirical induction are correlation and causation.
- Correlations based on surveys, ask if X predicts Y.
- Causation based on experiments.
- Classic, Triple-Blind, randomized experiment with placebo control. Independent & Dependent variables, role of statistics. Hypothesis testing.

Context Effects and Between-Ss designs with Judgments

- Randomly assign people to two groups
- One group judges the "size" of the number 9.
- Other group judges 221.
- Finding: 9 is significantly "bigger" than 221.
- Within-subjects, everyone says 221 > 9.
- Conclusion: Beware Between-Ss designs.
- Many examples of within and between-Ss designs yielding opposite conclusions.