Post-lecture Questions I.1 – Psychology as an Empirical Science

Psychology is an empirical science. What does that mean? [Note: there are two parts to the answer, one that is related to "science" and one related to "empirical."]

What is the "falsification" (or Modus Tollens) approach to testing theories?

Psychologists make two different types of assertion. What are they and how do they differ?

What are objectivity and replicability, and why are they important?

What are the three levels of determinism and which do psychologists (and all other empirical scientists, actually) assume is true? Why do we care about this?

Example multiple-choice questions for this material (taken from Fall, 2010, Exam 1):

1. Psychologists are empirical scientists; therefore, _____ .
    (A) they use logic to prove that their theories are correct
    (B) they use data to test whether their theories make the correct predictions
    (C) they let the leader of the empire tell them what to do
    (D) *all of the above*

2. In order for an empirical science to function and be successful, _____ .
    (A) everyone must agree on the data, even if they argue about which theories are correct
    (B) everyone must agree on which theories are correct, even if they argue about the data
    (C) everyone must agree on both the data and which theories are correct
    (D) no-one should agree about anything

Psychology is a science because it proposes explanatory theories that can be shown to be wrong. (Note: this is not to say that we go out of way to say things that are wrong, just that we always make sure that it's possible to show that what we said is wrong. A good way to check whether a theory is scientific is to make sure that you can dream up some hypothetical [i.e., imaginary] data that would disprove the theory.) Psychology is an empirical science in particular because the way we test whether a theory is wrong is by comparing its predictions to actual data. Empirical science is not an arm-chair science; you have to get up and go collect some data.

The falsification approach to testing theories works like this: the theory predicts a certain pattern of data; if you don't get that pattern of data, then the theory is (in some way) wrong. Note how this approach allows you to rule out a theory – i.e., show that it is wrong – but it never allows you to prove that a theory is correct. At best, from the point of view of the theory, is that it "survives" the test. Every time a theory survives a test (by making the correct prediction), your confidence in the theory may increase, but it should never reach complete confidence. Some new data down the road could prove the theory to be wrong.

Psychologists make phenomenological assertions, which are (just) factual claims, as in *what* happen *when*; psychologists also make theoretical assertions, which are claims about *why*. Note that the first type of claim should always be non-controversial; anyone who wants to should be able to verify (or disprove) the claim by collecting their own data. In other words, we must always agree on the facts; if there is any doubt about the facts, everything else should stop until these doubts are dealt with. In contrast, everyone should feel free to disagree with a theoretical claim, although they ought to base their disagreement on other data or, ideally, have an alternative explanation ready.

Objectivity (which contrasts with subjectivity) means that the data do not depend on who is collecting them; the data are out in the open and can be verified by others; they are not private and hidden, being only accessible by one person. Replicability means that anyone else can re-run the entire experiment or study and – presumably – get the same results. These two things are important because these are the main prerequisites for our having agreement on the facts. As mentioned before, we must agree on the facts. We can argue about their meaning or implications – in terms of which theories are supported or ruled out – but we must agree on the facts.

Weak determinism is just the idea that events have causes. No-one (I hope) has a problem with this. Strong determinism is the idea that if you knew everything (that was relevant), then you could predict exactly what will happen next. A lot of people seem to think that science assumes strong determinism, but, ever since quantum theory appeared (and the Heisenberg Uncertainty Principle, in particular), most scientists don't (or, at least, shouldn't) assume this. This brings us to the middle-ground idea: stochastic determinism is a slight step back from strong determinism, but it's more specific than weak determinism. It doesn't claim that you can predict exactly what will happen next (even if you knew everything that was relevant), but it does allow you to make probabilistic statements about what will happen next. In fact, you can specify the entire distribution of next events, which is a fancy way of saying that you can assign a probability to every possibility. This is what we assume. And we care about this issue because it implies that we won't be testing theories by comparing specific predictions to single pieces of specific data. Rather, our theories make predictions about probabilities and/or average data, so that's the kind of data that we collect.

The correct answer to the first multiple-choice question is B. It's not A for two reasons: that's rational science and we never prove theories to be correct; we only (sometimes) prove them to be wrong. It's not C because that's just silly. It, therefore, can't be D.

The correct answer to the second multiple-choice question is A. We must agree on the data, but we should feel free to argue, politely, about which theories are supported by the data.