CHIP-3
Concepts and history in psychology

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http://www.psy.gla.ac.uk/~steve/courses/chip.html

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1

Part 3:

Experiments

2

Why experiment? (1)

The triad only requires observation, data, empirical studies for its 3rd leg. Why do some people (especially in psychology) think experiments are strongly preferred for the role of observation?

Aristotle's biology.   Everything but the experiment (spontaneous generation of flies)   [Armand Leroi; swan's neck flasks]

Expt. does 2 things:

> A] Isolates one factor from all others
>
> B] Establishes causal direction.

3

Why experiment? (2)
A] Isolating one factor from all others

Expt. isolates one factor and varies it independently [the independent variable], and shows the links of that factor independently of others.

For these purposes, demonstrating causation is only useful as one means to the end.

If you have established what factors are independently active, then you can consider creating new combinations which haven't occurred naturally (at least in your samples).

We never know all the factors.

Does this work even if it is not you manipulating, but pre-selecting subsets of people? [Homework 2]

4

Why experiment? (3)
B] Demonstrating causal direction

Correlation vs. experiment.
Fixes the direction of causation.

BUT:
Bertrand Russell: the most advanced science does NOT talk about causes but relationships.

Causation (apart from establishing the independence of factors) is for applied projects.

5

Why experiment? (4)

How important is experiment? [ethology, spontaneous generation]

But: there are few experiments in astrophysics, or evolution, or epidemiology. So there is a lot of science that doesn't use expt.

Bertrand Russell: the most advanced science does NOT talk about causes but relationships. So arguably, causation is what engineers need to know, but isn't important in most pure science.

Homework: in what areas does psychology NOT use experiment? Is this OK?

6

Causation (cont.)

2-way causation; 3 part relationships

Even if you are focussing on causation, it may not be 1-way

7

Causation (cont.)

I pointed out that establishing causation and its direction was one of the special properties of experiments.

But I also raised the view that causation is NOT the central feature of science. It is in fact essential to applications, not to all theory.

8

Multiple Causes

Even simple events always have multiple causes, even though ordinary conversation (and the blame game) almost always assigns a single cause. Why? because most of the time we are deciding what one thing to change.

A glass falls and shatters. Why?

Who thinks there is really one main cause for an event?

Multiple causes corresponds to studies with more than one independent variable
Brown & Harris. Multiple interacting causes.

3-part relationships where not one but 2 independent vars determine the person's behaviour e.g. in deep and surface learning.
=> So an experiment that demonstrates one cause may not tell the important story. (Effect size.)

Correlation and causation

• A causes B

• B causes A

• A third factor C causes both A and B not necessarily at the same time (the electrical discharge of lightning causes both flash and boom, light and sound arriving at different times).

• A and B both increase (cause) the other, as in any positive feedback loop (vicious circle). Or each decreases the other (negative feedback loop cf. homeostasis). *(See next slide.)*

• A ≡ B. Tautology / identity. A and B have to occur together because they turn out to be the same by definition. E.g. miles and kilometres measure the same thing, and are always perfectly correlated. (Mass and weight.)   10

Causation not 1-way

A and B both increase (cause) the other, (<u>positive feedback loop</u>)

• Two adjacent blocks of explosive: if one goes off, it will set off the other
• If person A annoys B, B is likely to retaliate
• If a student's motivation is high they are more likely to learn, but if they succeed at learning their motivation will rise (so motivation is often an effect, a symptom, not a prime mover)
• If A sees B as beautiful A is more likely to be attracted to B, but if A loves B then A is more likely to see B as beautiful.

Such 2-way causation is usual in human psychology. Arousal, .. group laughter, perceived attractiveness, ...

<u>Negative feedback loop</u>
Dieting: the forces of stability. Mood self-remediation. Student auto-compensation for bad lectures.

Why experiment? — recap

A] Isolates one factor from all others

B] Establishes causal direction.

A] is central to "pure" science

B] is central to applied science

Causation is NOT the central feature of science. It is in fact essential to applications, not to all theory.

12

Part 4:

Kuhn, critical thinking, RMS

13

Kuhn

Thomas Kuhn "The structure of scientific revolutions"
Buzzword "Paradigms"

In fact in real life scientists can be very slow to abandon disproved
   theories. Why?
• Personal vanity, inability to change ideas, …
• Science as sociology, anthropology   [Read Bruno Latour]
   Kuhn was vastly more important to social scientists than to
   physicists

But perhaps there is a different angle on this: CT, RMS ….

14

"Reason maintainence systems"

A little considered everyday mental activity, which is also a version
   of critical thinking aimed at decision making under uncertainty,
   is "RMS": maintaining provisional knowledge as a network of
   linked ideas. When contradiction is detected, this is adjusted
   by finding an assumption that can be abandoned to retain the
   maximum overall probability of the revised network.

We do it to understand everyday stories.
In CT we do it to give our best overall judgement on balance.
In science, it would lead to what Kuhn described: it takes more
   than one little data point usually to abandon a big network that
   explains a lot.

15

Homework from last time

1. What are the cases (the kinds of cases) where experiment is
    not used in psychology.
    How do the objections apply to each or not?

2. Does experiment have the same power if you don't manipulate
    causality, but just select different types of people for the two
    groups (e.g. different personality types)?

3. What examples can you think of or find, where statistics act
    like a telescope: to see things that otherwise we could never
    know.

16

Audio-tagging facility

There is for my lectures a facility for adding tags (labels, pointers)
   to the recordings of these lectures ("podcasts").

And to share these tags with the rest of the class, thus making the
   recordings increasingly useful by providing an index into them.

Pointers to this facility:
http://www.astro.gla.ac.uk/podcasting/track/chip

You can also get there from:
         http://www.psy.gla.ac.uk/~steve/courses/chip.html

17

A place to stop

For the slides, handout etc. see:

http://www.psy.gla.ac.uk/~steve/courses/chip.html

18