

Science and Psychology

An introduction to the philosophy of science as it applies to psychology

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Science and Psychology

- I. Introduction
- II. What is Science
- III. Domain of Science
- IV. The problem of the material world
- V. Approaches to Knowledge
- VI. Components of the Scientific Method
- VII. A Science of Psychology?

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I. Introduction

- A. What is science: a long history
- B. How can (or should) psychology be pursued as a science?

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II. What is Science

Possible Answers:

- A. A set of facts and a set of theories that explain the facts
- B. Whatever is being done by certain institutions or people who carry on "scientific" activity
- C. An approach to knowledge

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III. The Domain of Science

Campbell (1957)

- A. Science is concerned about judgments of the material world, and only those judgements

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III. The Domain of Science

B. As such science differs from:

- mathematics: concerned about the numerical world
- religion: concerns the spiritual world

Gallileo: religion is concerned with "...how a body gets to heaven, not with the heavenly bodies."

- philosophy: concerned with all worlds, imagined and/or real.

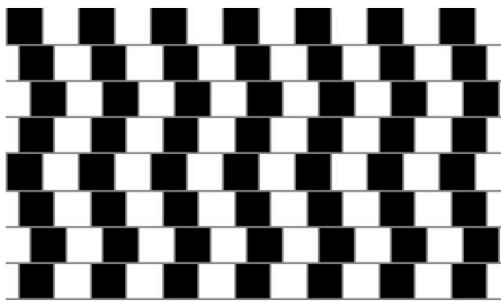
IV. The problem of the material world

A. Naïve Realism

There is an external world, and it is as our sensory systems tell us.

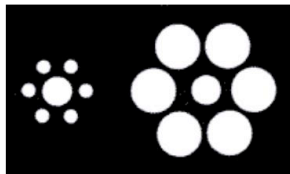
Problems:

- our sensory data are incomplete
- our sensory data are often in error
 - illusions
 - hallucinations

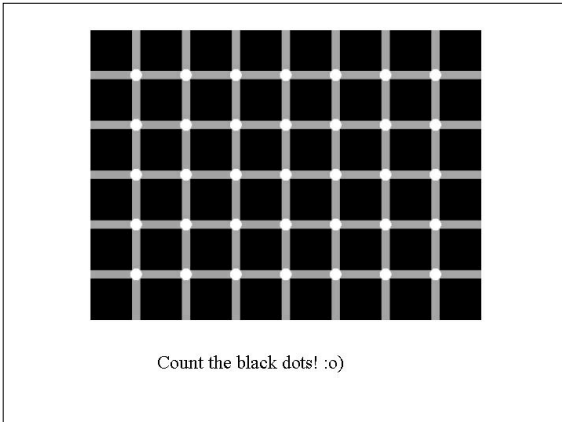


Are the horizontal lines parallel or do they slope?

Is the left center circle bigger?



No, they're both the same size



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The problem of the material world (cont.)

B. Phenomenology
(Lock, Berkeley, and the empiricist tradition) :

We can not have direct access to the material world, our access is through our sensory mechanisms, and these are often incorrect.

Problems:

- 1) solipsism
- 2) perhaps the real world does not exist?

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The problem of the material world (cont.)

C. Logical Positivism (B. F. Skinner)

Strict empiricists

The only legitimate knowledge that can be obtained is through the scientific method (direct observation)

The goal of science is to describe the phenomena of experience

Logical Positivism (cont.)

Problems:

1. does not adequately deal with the problems of phenomenology
2. leads to the collection of facts without theoretical constructs to hold the facts together

The problem of the material world (cont.)

D. Post-Positivism

- 1) Critical realism
- 2) There is a reality independent of (and potentially beyond) our thinking
- 3) This world can be studied, and is potentially knowable, through science
- 4) Constructivist: all observers (including scientist) construct perceptions from incomplete and inaccurate data

D. Post-Positivism (cont..)

- 5) Because our observations are potentially inaccurate, and biased by our theoretical perspective, triangulation across methods and observers is necessary.
- 6) Natural selection will guide progress toward knowledge about the world.
That is, good theories will survive the tests of repeated observations.

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V. Approaches to Knowledge

A. Tenacity

Accept as "truth" ideas that have been around a long time, or have been repeated over and over again.

Ideas not subjected to skeptical, critical, or objective analysis.

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V. Approaches to Knowledge

B. Intuition

Knowledge is gained without effort, and without the sensory systems

Examples:

Extra-sensory perception

Woman's intuition

Psychic or religious revelation

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V. Approaches to Knowledge

C. Authority

Knowledge is derived from others who are presumed to have direct access to truth
Uncritical and un-skeptical acceptance of truth

Direct observation can be misleading

Example: How many teeth does a horse have?

look it up in Aristotle, vs. look in the horses mouth

V. Approaches to Knowledge

D. Rationalism (reason)

Knowledge can be gained through the reasoning (logical) process alone

Socrates is a man

All men are mortal

Therefore, Socrates is mortal

V. Approaches to Knowledge

E. Empiricism

Knowledge is gained through our sensory mechanisms

"I won't believe it unless I see it!"

V. Approaches to Knowledge

F. Science

Combines the methods of rationalism and empiricism

Knowledge is gained through systematic observation, agreed methodology, and skeptical analysis and verification of all claims.

V. Approaches to Knowledge

G. Science vs. Common Sense

Common sense (like science) is often based on rationality and direct observation. But in many ways common sense is "non-scientific"

Science vs. Common Sense

1. How are observations made?

Systematically vs. Haphazardly

2. How many cases are evaluated?

Many vs. Few

3. How are cases selected?

Systematically vs. What is available

4. To what extent are our conclusions subjected to critical review and revision?

Constantly vs. Never?

VI. Components of the Scientific Method

A. Logical Structure

Observations

Hypotheses

Experimentation

Laws

Theory

VI. Components of the Scientific Method

- B. Verifiability of claims
- Public process
- Repeatability
- Universal Assent

Universal Assent

- 1) operational definition
- A definition in terms of the operations (manipulations) performed and the observation that must be made to demonstrate a concept

Example: The statement "smoking is hazardous to your health" is not operational.

Universal Assent

- 2) Falsification
- Scientific statements must be made in a way that they are potentially capable of disproof.

Example: The statement: "Unicorns do not, and never did exist" is not falsifiable.

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Universal Assent

3) Parsimony
If two theories explain a set of observations equally well, the simpler theory (the one that explains the “facts” with the fewest mechanisms or assumptions) is preferred.
Example:
Ptolomyc vs the Copernican solar system

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VI. Components of the Scientific Method

C. Peer Review
Merit of scientific research is judge by other scientist
This is necessary because universal assent cannot be established by “the man on the street”

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VII. Science of Psychology

A. The Domain of Psychology
“Psychology is the science of mental life, both of its phenomena and their conditions. (W. James, 1890, p. 1)”

But, the “mental life” is not an “object of the material world”
How can we gain knowledge of the mental world?

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VII. Science of Psychology

B. The problem of consciousness
mind/body dualism:
Descartes: "I think therefor I am."

How does one bridge the gap between
the material world and the mental
world?

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C. Solutions to the mind/body problem:

Gottfried Wilhelm Leibniz (1646-1716):
psychophysical parallelism (two clocks)
George Berkeley (1685-1753)
immaterialism (No body)
Hodgson (1832-1912) Huxley (1825-
1895)
epiphenomenalism (brain enables
consciousness)

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Solutions to the mind/body problem: (cont)

William James (1842-1910)
Functionalism: mind has adaptive
significance!
Materialism: (no distinction between
mind/body)
behaviorism: no mind
cognitive science: two views of the
same thing

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Potential Solutions

1. Behaviorism J. Watson (1915 APA presidential address)
Psychology should be the study of behavior.

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B. Potential Solutions

2. Radical Behaviorism: (B.F. Skinner)
Psychological observation and theories should be restricted to explanations of behaviors.
Example: fear = a set of behaviors
Skinner argued that cognitive psychology is like creationism. The mind is used to explain behavior much like God is used to explain the creation of man.

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B. Potential Solutions

2. Radical Behaviorism: (B.F. Skinner)
Problems:
a) Problem: precludes the study of mental events (e.g., the conscious mind)
What about such topics as:
fear, anxiety, imagery, motivation, personality, etc.

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Problems with behaviorism (cont)

b) fails to address "dispositions"

Example: glass is brittle

disposition: the potential to shatter

internal property: molecular structure

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B. Potential Solutions

3. Modern Psychology (post-positivism)

Cognitive Science

The methods of psychology must be restricted to the study of observable events (behaviors, physiological or overt), but the topic may be mental events.

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D. How to Study mind?

1. Introspection: Adopted by the structuralist school (W. Wundt)

Problems:

a) lacks **universal assent**

b) does not provide access to the **unconscious mind**

2. Converging Operations

Just as we cannot have direct access to the "external world," we cannot have direct access to the "internal" or "mental" world. [Except through introspection]

Observations of the behavior of objects lead us to conclusions concerning the external world. Observations of behaviors of people lead us to conclusions concerning the mental world.

5. An Example

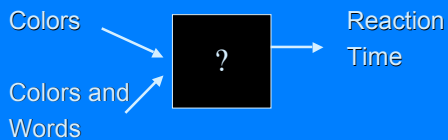
Stroop (1935) effect



What Goes in the Box?

Manipulation

Observation



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Stroop effect (cont.)









Two Explanations:

- 1) Perceptual inhibition: word meaning interferes with the processing of the word color.
- 2) Response Competition: both the word meaning and the color word are elicited as a response. Competition between the responses slows pronunciation.













































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Converging Operations

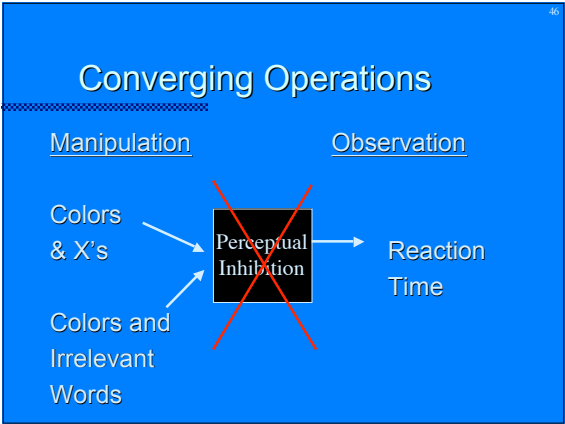
Egeth, Blecker, & Kamlet (1969)

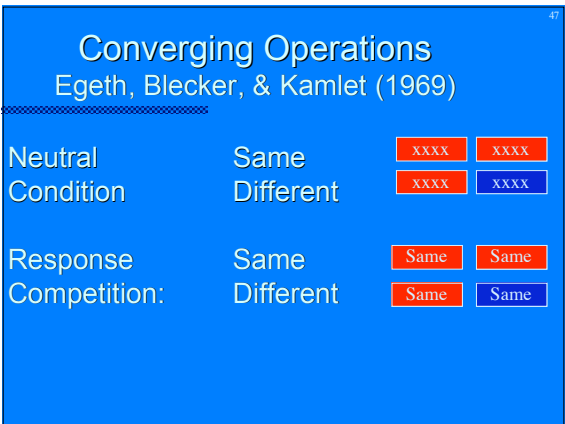
Neutral Condition	Same		
	Different		
Perceptual Inhibition:	Same		
	Different		

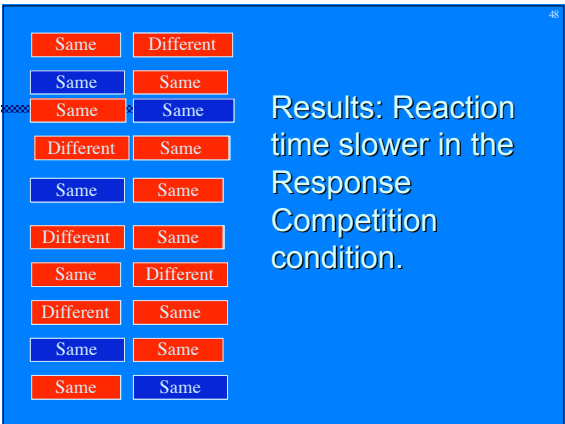
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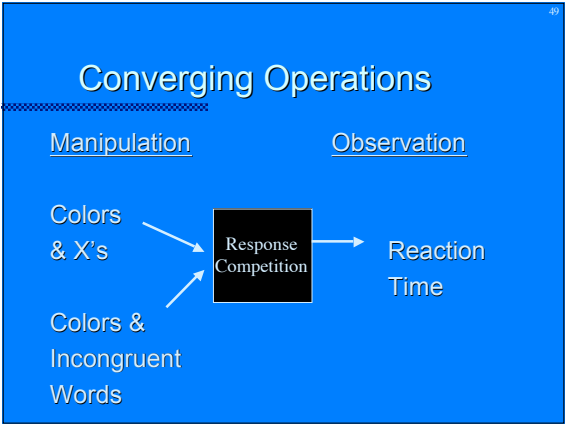
			
			
			
			
			
			
			
			
			
			
			

Results:
No difference in reaction time









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- ## Conclusions
1. We cannot directly observe the mental world.
 2. Mental constructs must be tied (through operational definitions) to observable behaviors.
 3. Through converging operations, we can determine what mental constructs are operative in an experimental task.

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Another example

How to study a mental event: Imagery
Copper & Shepard (1973)

R
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∂
∂
∂
∂

0
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180
270
360

∂
∂
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