

The Researcher  
as a  
Detective

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# Agenda

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- Acquiring Knowledge
- Scientific Method
- The Experiment
- Research Process & Idea
- Literature Search
- Critiquing the Research
- The Hypothesis



# Acquiring Knowledge (C. Peirce)

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- Tenacity: Repetition of information
- Authority: Experts
- Experience: Direct personal experience
- Reason and Logic

# The Scientific Method

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- Scientific Approach (W. Wundt):
  - Objective measurement of phenomenon under construction
  - Ability to verify or confirm measurements made by others “ability to replicate”
  - Self-correction of errors and faulty reasoning
  - Exercising control to rule out the influence of unwanted factors

# The Experiment

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- **Experiment** – An attempt to determine the cause-and-effect relations that exist in nature.
  - Involves the manipulation of an independent variable (IV), recording of changes in a dependent variable (DV), and control of extraneous variables.

# The Experiment (cont.)

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- The three factors in more detail:
  - **Independent variable (IV):** Factor that is directly manipulated. “causal” part
    - Two or more values (levels)
  - **Dependent variable (DV):** Recorded information or results. Changes in DV are dependent on manipulation of IV.
  - **Extraneous variables:** Factors other than IV that could influence the DV.

# The Research Process

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- Finding a problem or question
  - Gap in knowledge, or wonder about a relationship
- Literature review
  - Current knowledge and/or information
- Theoretical considerations
  - Current beliefs relating to problem or question

# The Research Process (cont.)

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- Hypothesis
  - Hypotheses that contribute to problem or question
  - Experimental hypothesis – Predicted outcome of experiment
- Research design
  - Detailed plan for conducting research
- Conducting experiment
  - Data collection



# The Research Process (cont.)

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- Data analysis & statistical decisions
  - Validate assumptions, conduct appropriate analysis
- Decisions in terms of past research and theory
  - Interpretation of results based on theories and findings
- Preparation of research report
  - Prepare content for dissemination

# The Research Process (cont.)

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- Sharing your results: presentation and publication
  - Poster sessions, professional society meetings, publication
- Finding a new problem
  - Results uncover (hopefully) another problem or question

# The Research Idea

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- Identification of a gap in the knowledge base or an unanswered question in an area of interest.



# The Research Idea (cont.)

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- Similar to decisions in investing in stocks, or where to buy a home, or even at the poker table, early decisions matter most!
  - Be sure not to rush the process of developing your research idea.
  - Rushing into a research idea is among the biggest mistakes in research.

# The Research Idea (cont.)

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- Characteristics of a good research idea (testable):
- How *reasonably* testable are the following activities
  - Measuring neural activity while playing basketball
  - Measuring time it takes to run 100 yards
  - Measuring how someone feels after watching a video
  - Measuring neural activity while watching a video
  - Measuring ability at decision making

# The Research Idea (cont.)

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- Characteristics of a good research idea:
  - Likelihood of Success
    - Measuring stress related to gambling
    - Associating IQ with decision making ability
    - Associating physician fatigue and cognitive performance

# The Research Idea (cont.)

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- Sources of Research Ideas
  - Nonsystematic – Ideas present themselves in an unpredictable manner.
    - Inspiration – Ideas pop into your mind
      - Serendipity – Situations where we look for one phenomenon but find something else. E.g., Pavlov's dog and classical conditioning
  - Everyday Occurrences
    - Daily encounters – Observations of patient behaviors based on length of time in the waiting room.

# The Research Idea (cont.)

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- Sources of Research Ideas (cont.)
  - Systematic – Purposeful examination of a topic
    - Past Research – Review of literature
    - Based on current hypotheses
      - Somatic marker hypothesis
    - Professional lectures
      - Hearing about research or content that sparks interest



# Steps in Conducting a Search of the Literature

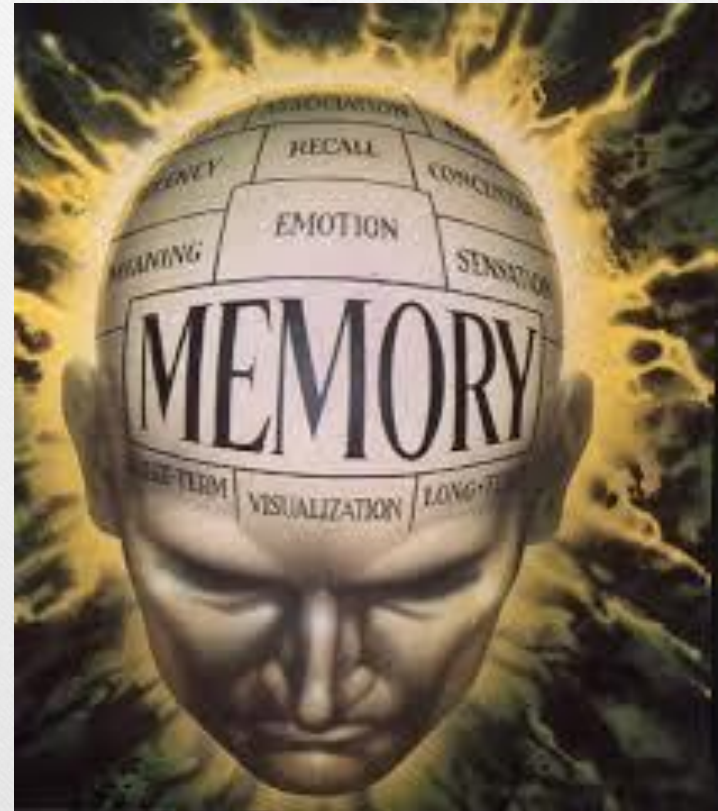
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- **Selection of Index Terms**: List all relevant terms related to your topic of interest
  - E.g., Social groups: related terms include, Cadres, Cliques, Groups, Ingroup, outgroup, Reference groups, Social networks.

# Steps in Conducting a Search of the Literature (cont.)

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- What are some relevant terms for the following:
  - Memory
  - Emotion
  - Health
  - Pain



# Steps in Conducting a Search of the Literature (cont.)

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- Computerize Search of the Literature:
  - Google scholar
  - PsycINFO
  - *Always evaluate the Internet source!*

# Steps in Conducting a Search of the Literature (cont.)

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- Obtaining Relevant Publications: Obtain relevant documents
  - Reading
  - Note taking
  - Photocopying
  - Interlibrary loan

\* *See Reviewing the Literature document for details on documenting relevant information.*

# Steps in Conducting a Search of the Literature (cont.)

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- Integrating Results of Literature. Search:
  - Summarize articles in a consistent manner
    - Copy reference list (needed for your own reference list)
    - Introduction – Why did the researchers conduct this study?
    - Methods – Participants, Apparatus, Procedure
    - Results – What did they find
    - Discussion – What conclusions did the authors reach? What do you think about the conclusions (agree, disagree)

# Critiquing Research

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- Guidelines:
  - Are the literature reviews within the article consistent with the research question?
  - Are the research questions clearly stated? Should have a clear understanding after reading introduction.
  - Are hypotheses clearly stated and appropriate?
  - Are key terms defined? IV, DV, extraneous variables, details of any apparatus

# Critiquing Research (cont.)

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- Are the IV's and their levels appropriate?
  - Asking how much coffee a participant drank that morning is not as accurate as directly providing the coffee to the participant.
  - Levels should relate to research question.
    - Gender & intelligence should not have three levels
- Does the DV appear to be appropriate?
  - Would GPA be a good measure of intelligence?

# Critiquing Research (cont.)

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- Can you think of any uncontrolled variables that could influence the results?
  - The influence of diet on BMI.
  - Blood pressure and exercise
  - Test anxiety and gastrointestinal symptoms



# Critiquing Research (cont.)

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- Did author use an appropriate design to test the specific hypothesis?
  - Compare research question with design.
- Does the Method section provide enough detail for you to replicate the research?
  - Assuming you had access to all materials

# Critiquing Research (cont.)

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- Did researchers use appropriate sampling procedures to select participants and assign them to groups?
  - Select participants from 1 location or specific time?
    - Survey individuals at a mall on a weekday in the afternoon
  - Was the assignment to groups random?

# Critiquing Research (cont.)

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- Sufficient number of participants?
  - Comparing intelligence of two groups would require a larger sample (typically due to effect size – see effect size presentation).
  - Studying the neural activity of individuals watching emotional videos might require fewer participants.
  - Formula's are used such as G power to generate an estimate of participants needed

# Critiquing Research (cont.)

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- Did authors report appropriate statistical results?
  - Mean – Average of group
  - Standard Deviation (SD) – Deviation from mean
  - Confidence intervals
  - p value
  - **Effect Size** – Amount of variance explained by the IV
    - Very Important! See Effect size presentation

# Critiquing Research (cont.)

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- Did author appropriately interpret the results?
- Are conclusions justified by data results?
  - Did they consider other possible conclusions?
- Do all references cited in text appear in reference section?
- Were ethical procedures followed?

# Critiquing Research (cont.)

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- Last but not least!
  - *Was the article easy to read or did it seem like you were reading another language?*

# The Research Hypothesis

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*The experimenter's  
predicted outcome of  
a research project.  
What you believe will  
occur.*



# Characteristics of the Research Hypothesis (cont.)

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- General format of the hypothesis, If/then
  - If portion relates to IV manipulation, then portion relates to the DV changes we expect

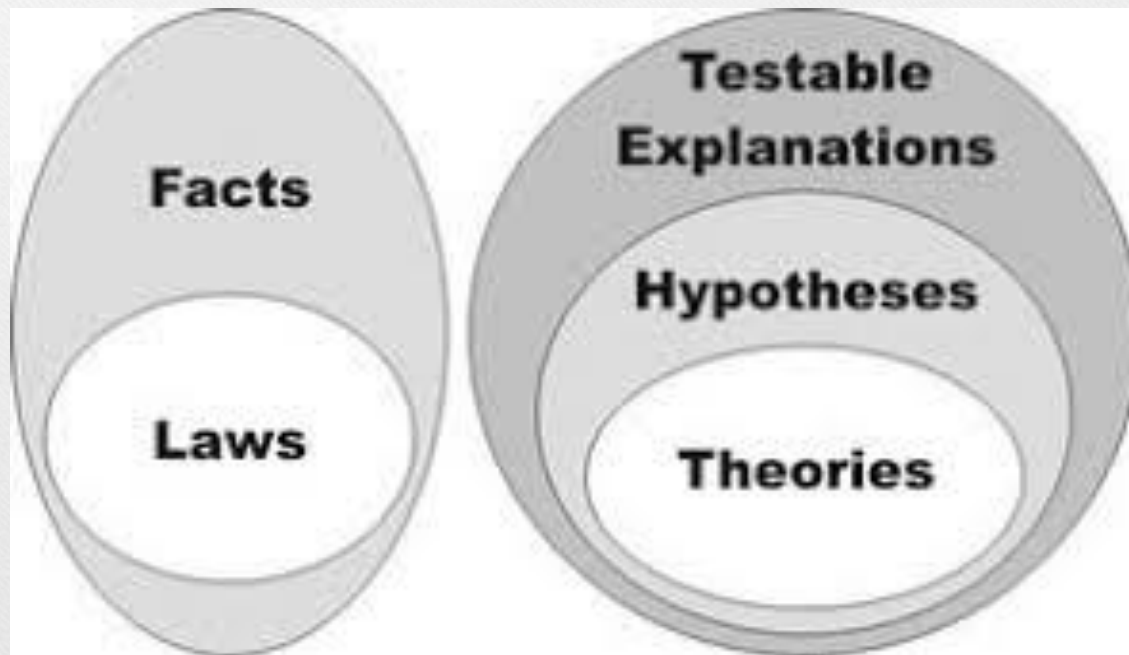
*If students receive candy each time they spell a word correctly, then their spelling performance will be better than that of a group who does not receive candy for each correctly spelled word.*

- What's the IV and DV in this statement?



# Characteristics of the Research Hypothesis (cont.)

- Principle of falsifiability – Hypothesis can be considered as a scientific theory only if it can be disproved



## Characteristics of the Research Hypothesis (cont.)

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- Types of Reasoning – Must be aware of type of reasoning when stating a hypothesis
  - **Inductive logic** - Reasoning that proceeds from specific cases to general conclusions.
  - **Deductive logic** – Reasoning that proceeds from general theories to specific cases.

# Characteristics of the Research Hypothesis (cont.)

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- Directional vs. Non-directional
  - Directional – Prediction to the direction of the outcome
    - Group A will score significantly higher than group B
  - Non-directional – No direction is predicted.
    - Group A's scores will differ significantly from group B's

The End

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