

## Chapter 1:

# Thinking Critically With Psychological Science

## The Need for Psychological Science

- Hindsight bias -
  - the tendency to believe, after learning an outcome, that one would have foreseen it.
- Judgmental overconfidence -
  - everyday thinking is limited by our tendency to think we know more than we do.

## The Need for Psychological Science

- Critical thinking
  - examine assumptions
  - discern hidden values
  - evaluate evidence
  - assess conclusions

## The Need for Psychological Science

- Scientific research
  - Develop a theory
    - an organized set of principles that describes, predicts and explains some phenomenon.
  - Form a hypothesis
    - a specific, testable prediction, often derived from a theory that provides operational definitions
      - operational definitions detail a research variable in terms of the procedures needed to control and measure it and allow others to replicate, or repeat their observations.

## Overview of Research Process

- Develop a theory (may be influenced from world events, personal experiences, past research findings, or logic and common sense).
- Hypothesis
- Empirical Research
  - Design a study
  - Collect the data
  - Analyze the results
  - Draw Conclusions: Theory is supported, discarded, or revised and retested.

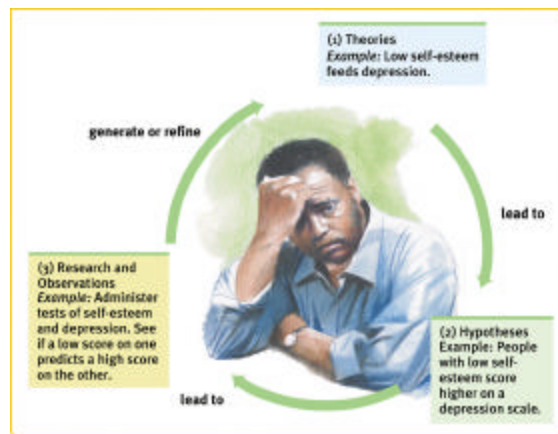


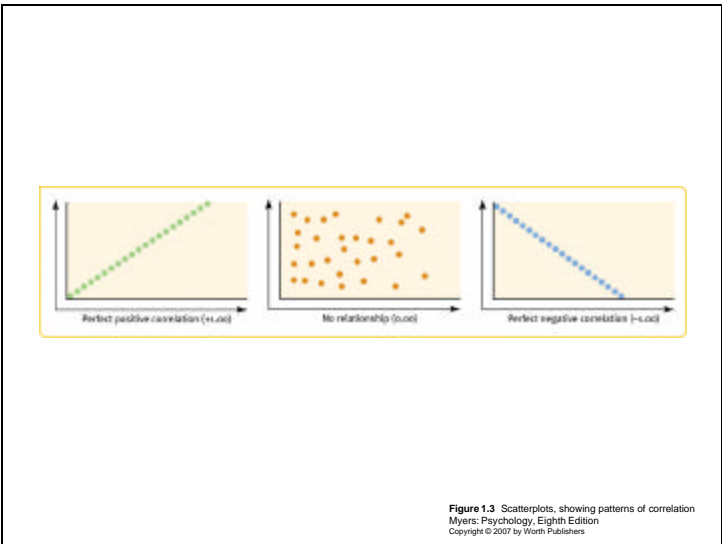
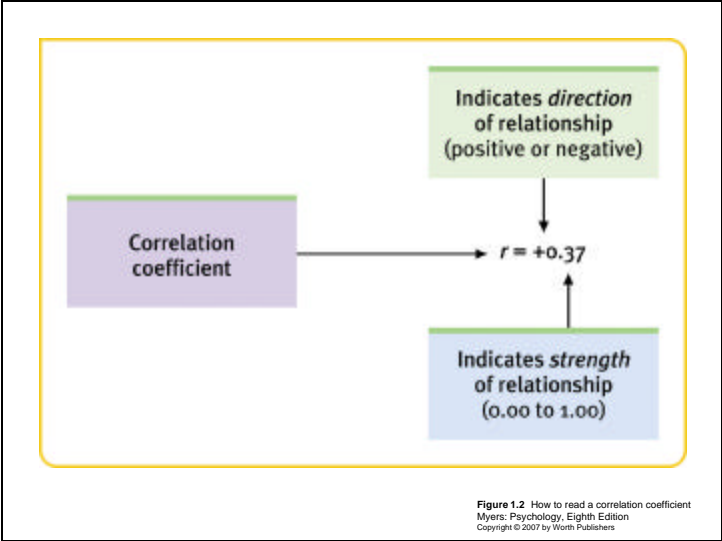
Figure 1.1 The scientific method  
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## Descriptive Research

- Case studies - in-depth observations of individual persons.
- Surveys - looks at many cases in less depth and relies on self-report.
- Naturalistic observations - involves observing and recording the behavior of organisms in their natural environment.

## Correlations

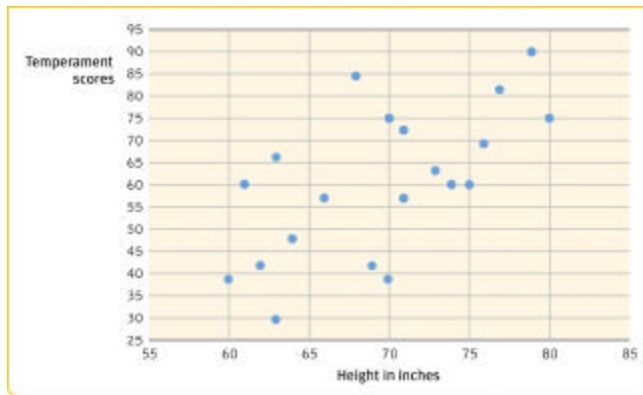
- Correlation - a statistical measure of relationship.
  - Positive correlation - two variables increase or decrease together
  - Negative correlation - inverse relationship, as one thing increases the other decreases.
  - Scatterplot a graph that depicts the relationship. Each point plots the value of two variables.



**TABLE 1.2**  
**HEIGHT AND TEMPERAMENT OF 20 MEN**

Height	Height in inches	Temperament
1	60	75
2	61	85
3	61	60
4	78	97
5	74	80
6	68	87
7	62	42
8	75	69
9	77	86
10	68	99
11	66	68
12	75	59
13	71	74
14	65	57
15	73	82
16	78	75
17	64	89
18	71	57
19	68	84
20	78	39

**Table 1.2**  
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**Figure 1.4** Scatterplot for height and temperament  
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## Explaining a Correlation

- Correlations indicate relationship patterns, not causes.
- Illusory correlation: the perception of a relationship where none exists
  - more likely to notice and recall confirming instances of a belief
  - tendency to look for meaningful patterns in random events.

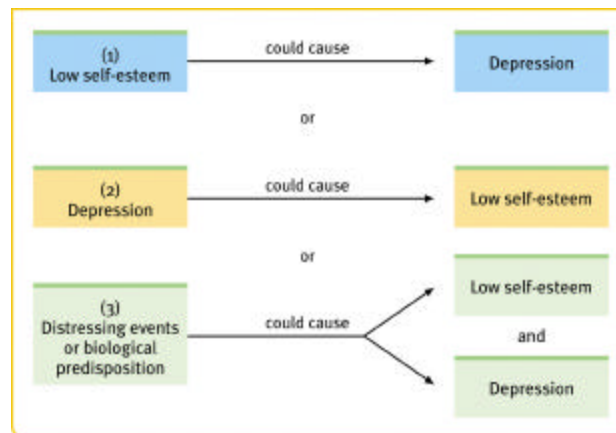
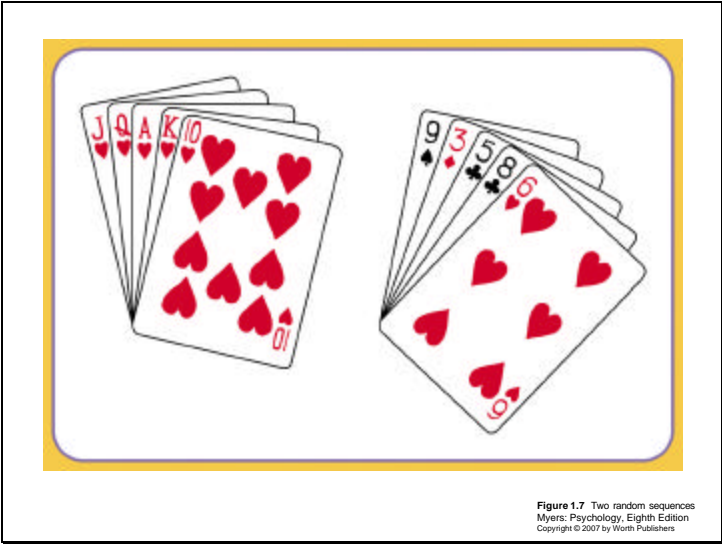


Figure 1.5 Three possible cause-effect relationships  
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	Conceive	Do not conceive
Adopt	confirming evidence	disconfirming evidence
Do not adopt	disconfirming evidence	confirming evidence

Figure 1.6 Illusory correlation in everyday life  
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## Experimentation

- Experiments a research method in which the investigator manipulates one or more variables to observe their effects on some behavior or mental processes while controlling other relevant factors.
- Can determine cause and effect.

## Experimentation

- Random assignment of subjects to conditions.
  - Experimental condition - involves exposure to the treatment.
  - Control condition - no exposure to treatment.
- Double Blind: both the participant and researcher are blind to which condition the participant is in.

## Experimentation

- Placebo effect: just thinking one is receiving treatment can lead to symptom relief.
- Independent variable: the experimental factor that is being manipulated.
- Dependent variable: the variable that may change in response to the manipulations of the independent variable.

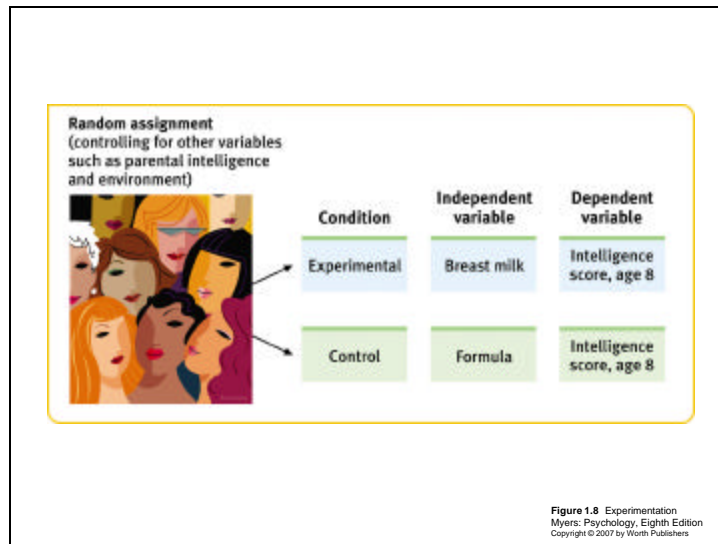


TABLE 1.3

## COMPARING RESEARCH METHODS

Research Method	Basic Purpose	How Conducted	What Is Manipulated	Weaknesses
Descriptive	To observe and record behavior	In case studies, surveys, or naturalistic observations	Nothing	No control of variables; single cases may be misleading
Correlational	To detect naturally occurring relationships; to assess how well one variable predicts another	Compute statistical associations, sometimes among survey responses	Nothing	Does not specify cause and effect
Experimental	To explore cause and effect	Manipulate one or more factors; use random assignment	The independent variable(s)	Sometimes not feasible; results may not generalize to other contexts; not ethical to manipulate certain variables

Table 1.3  
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## Statistics

- Statistics help us to organize summarize and make inferences from data.
- Measures of Central Tendency
  - Mean: arithmetic average of a distribution
  - Median: middle score in a distribution
  - Mode: most frequently occurring score in a distribution.

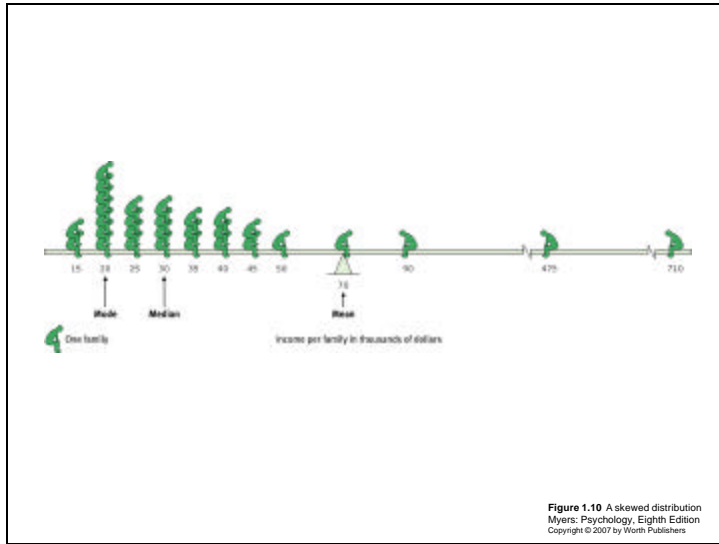


Figure 1.10 A skewed distribution  
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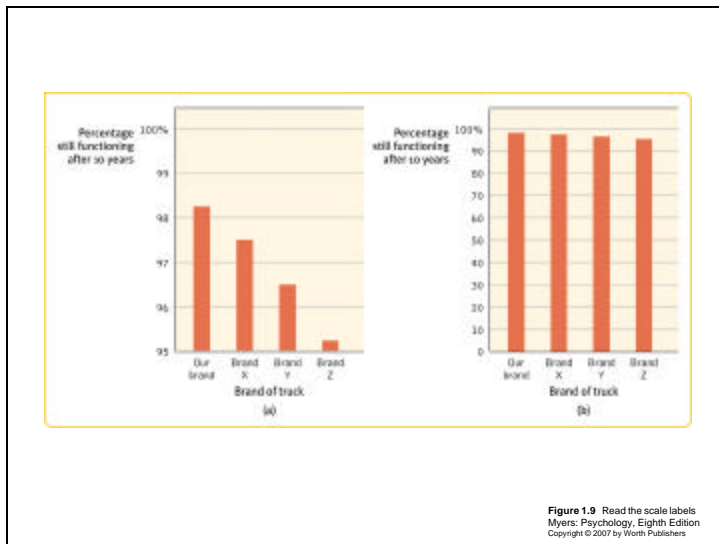


Figure 1.9 Read the scale labels  
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# Statistics

- Measures of Variation
- Range = gap between the highest and lowest score
- Standard deviation: a better gauge of how scores are distributed.

TABLE 1.4

**STANDARD DEVIATION IS MUCH MORE INFORMATIVE THAN MEAN ALONE**

Note that the test scores in Class A and Class B have the same mean (80), but very different standard deviations, which tell us more about how the students in each class are really doing.

Test Scores in Class A			Test Scores in Class B		
Score	Deviation From the Mean	Squared Deviation	Score	Deviation From the Mean	Squared Deviation
72	-8	64	60	-20	400
74	-6	36	60	-20	400
77	-3	9	70	-10	100
79	-1	1	70	-10	100
80	+2	4	90	+10	100
84	+4	16	90	+10	100
85	+5	25	100	+20	400
87	+7	49	100	+20	400
<b>Total = 620</b>		<b>Sum of Deviations<sup>2</sup> = 204</b>	<b>Total = 620</b>		<b>Sum of Deviations<sup>2</sup> = 2000</b>
<b>Mean = 620 ÷ 8 = 77.5</b>			<b>Mean = 620 ÷ 8 = 77.5</b>		
<b>Standard deviation =</b>			<b>Standard deviation =</b>		
$\sqrt{\frac{\text{Sum of Deviations}^2}{\text{Number of scores}}} = \sqrt{\frac{204}{8}} = 5.0$			$\sqrt{\frac{\text{Sum of Deviations}^2}{\text{Number of scores}}} = \sqrt{\frac{2000}{8}} = 15.8$		

Table 1.4  
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## Statistics

- Generalizing from samples to the population is enhanced when:
  - Representative (unbiased) samples
  - Less variability of scores
  - Large sample size.
- Statistical significance:
  - when the differences between groups very likely reflects a real difference not due to chance.

## Ethical Factors in Research

- Animal research
- Deception:
  - when participants are misled about the true purpose of the research, debriefing is necessary
- Informed Consent:
  - participants receive enough information to decide freely whether to participate in a study.
  - Data is kept confidential
  - discomfort must be minimized
  - free to withdraw at any time.

## Careers in Psychology: Appendix A

- Psychology is the second most popular undergraduate degree.
- 70,000 psychology majors graduate each year.
- 42% go on to graduate school in psychology
- Skills allow marketability for a variety of positions.

**TABLE A.1**

**TOP 10 U.S. OCCUPATIONS THAT EMPLOY PEOPLE WITH A BACHELOR'S DEGREE IN PSYCHOLOGY**

1. Top- and mid-level managers, executives, administrators
2. Sales occupations, including retail
3. Social workers
4. Other management-related occupations
5. Personnel, training, labor relations specialists
6. Other administrative (record clerks, telephone operators)
7. Insurance, securities, real estate, business services
8. Other marketing and sales occupations
9. Registered nurses, pharmacists, therapists, physician assistants
10. Accountants, auditors, other financial specialists

Source: Fogg, Harrington, & Harrington (2004).

Table A.1  
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## Postgraduate Degrees

- Masters degree - research or clinical provided under supervision
- Doctoral Degrees
  - Clinical psychology most popular specialty
  - Counseling
  - Developmental
  - Health
  - Industrial/Organizational

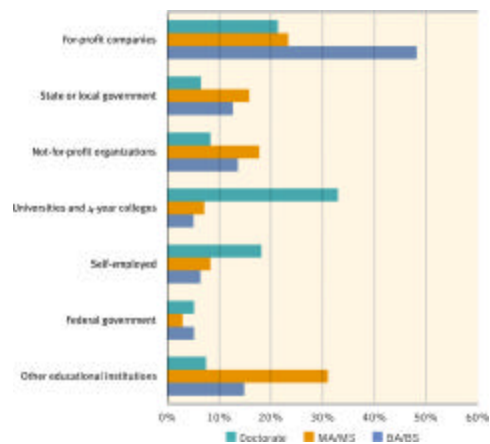


Figure A.1 Work settings for psychology degree recipients  
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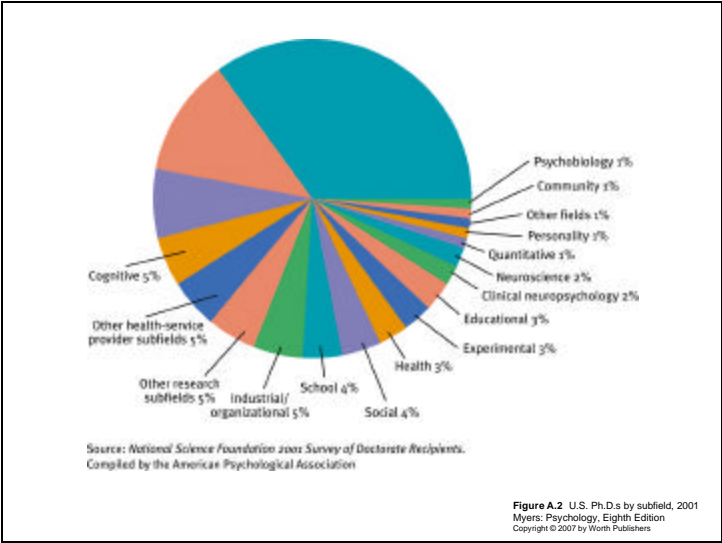


Figure A.2 U.S. Ph.D.s by subfield, 2001  
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TABLE A.2 APL SUBFIELDS BY NUMBER AND NAME	
1. Applied Behavior Analysis	26. Psychology
2. Applied for the Health/Healthcare	27. Applied/Professional Agency
3. Developmental Psychology	28. State, Federal, and District
4. Health Services	29. Psychology and Neuroscience
5. Health Services	30. Health Services
6. Health Services	31. Health Services
7. Health Services	32. Health Services
8. Health Services	33. Health Services
9. Health Services	34. Health Services
10. Health Services	35. Health Services
11. Health Services	36. Health Services
12. Health Services	37. Health Services
13. Health Services	38. Health Services
14. Health Services	39. Health Services
15. Health Services	40. Health Services
16. Health Services	41. Health Services
17. Health Services	42. Health Services
18. Health Services	43. Health Services
19. Health Services	44. Health Services
20. Health Services	45. Health Services
21. Health Services	46. Health Services
22. Health Services	47. Health Services
23. Health Services	48. Health Services
24. Health Services	49. Health Services
25. Health Services	50. Health Services
26. Health Services	51. Health Services
27. Health Services	52. Health Services
28. Health Services	53. Health Services
29. Health Services	54. Health Services
30. Health Services	55. Health Services
31. Health Services	56. Health Services
32. Health Services	57. Health Services
33. Health Services	58. Health Services
34. Health Services	59. Health Services
35. Health Services	60. Health Services
36. Health Services	61. Health Services
37. Health Services	62. Health Services
38. Health Services	63. Health Services
39. Health Services	64. Health Services
40. Health Services	65. Health Services
41. Health Services	66. Health Services
42. Health Services	67. Health Services
43. Health Services	68. Health Services
44. Health Services	69. Health Services
45. Health Services	70. Health Services
46. Health Services	71. Health Services
47. Health Services	72. Health Services
48. Health Services	73. Health Services
49. Health Services	74. Health Services
50. Health Services	75. Health Services
51. Health Services	76. Health Services
52. Health Services	77. Health Services
53. Health Services	78. Health Services
54. Health Services	79. Health Services
55. Health Services	80. Health Services
56. Health Services	81. Health Services
57. Health Services	82. Health Services
58. Health Services	83. Health Services
59. Health Services	84. Health Services
60. Health Services	85. Health Services
61. Health Services	86. Health Services
62. Health Services	87. Health Services
63. Health Services	88. Health Services
64. Health Services	89. Health Services
65. Health Services	90. Health Services
66. Health Services	91. Health Services
67. Health Services	92. Health Services
68. Health Services	93. Health Services
69. Health Services	94. Health Services
70. Health Services	95. Health Services
71. Health Services	96. Health Services
72. Health Services	97. Health Services
73. Health Services	98. Health Services
74. Health Services	99. Health Services
75. Health Services	100. Health Services

Table A.2  
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