

Correlation & Causation

Psychology's Two Disciplines

Correlational

- Studies individual differences
- Observes variables and relates them
- How do people differ from each other?



Experimental

- Control for individual differences
- Manipulates variables and observes outcome
- How are people alike?



Popularity of Correlational Research

- Second hand status in the 1940's
 - Synthesis of approaches advocated
- Currently experiencing increased use and respect
 - Both techniques applied by experimental psychologists
 - Computers enable sophisticated correlational procedures
 - Only method available to answer certain questions

Correlational Research

- Method of determining whether two variables are related to each other
- Quasi experimental
 - Does not include independent variables
 - Describes behavior
 - Does not determine CAUSES of behavior



Effects of TV Violence on Human Behavior

- Prime time T.V.
 - Avg. 5 acts of violence per hour
- Saturday morning cartoons
 - Avg. 20 violent acts per hour
- By the age of 18
 - Witness 32,000 successful TV murders
 - Witness 40,000 attempted TV murders



Effects of TV Violence on Human Behavior

- Police shows
 - Police fires guns every episode
 - In reality, fire once every 27 years
- Does unrealistic TV violence affect people in a negative way?



Experiment

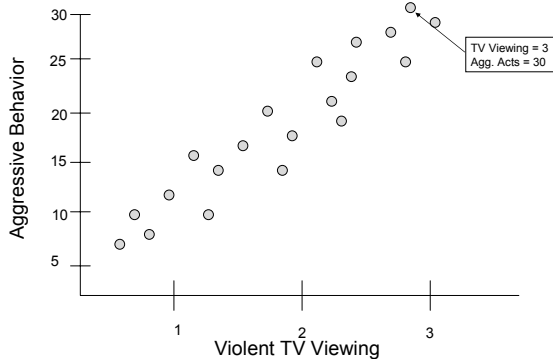
- Independent variable
 - Amount of violent television viewed
- Dependent variable
 - Number of violent/aggressive acts
- Issues of control
- Ethical considerations



Correlation

- Can measure variables of interest
- Dependent variable 1
 - Amount of violent TV watched in 1 week
- Dependent variable 2
 - Number of aggressive acts performed in 1 week
- Relationship between DV's in many Ss
 - Suspect some link between DV's

Scatterplots

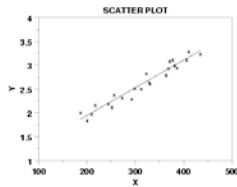


“Eyeballing” the data

- Positive correlation
- Negative correlation
- No correlation
- Curvilinear relationship

Positive Correlation

- Increases in one variable associated with increases in the other variable
 - High X = High Y
 - Low X = Low Y



Positive Correlation: Examples

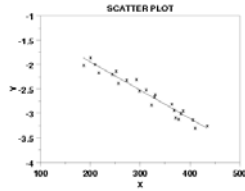
- X = Amount of calories consumed in a day
- Y = Weight gained in a month

- X = Number of hours spent studying for class
- Y = Class GPA

- X = Glasses of beer consumed in 1 hour
- Y = Number of slurred words in 1 hour

Negative Correlation

- Increases in one variable associated with decreases in the other variable
 - High X = Low Y
 - Low X = High Y
- Inverse relationship



Negative Correlation: Examples

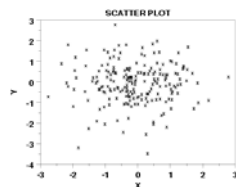
- X = Hours spent exercising in 1 week
- Y = Weight gained in 1 week

- X = Hours spent working each week
- Y = Hours studying for classes each week

- X = Golf score
- Y = Games won

No Correlation

- No relationship between variables
- Data points fall randomly throughout graph



No Correlation: Examples

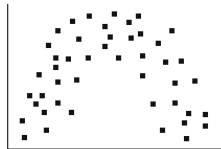
- X = Mother's IQ
- Y = Son's criminal activities

- X = Adult shoe size
- Y = Yearly income

- X = # books read in a year
- Y = # vacations taken in 10 years

Curvilinear Relationship

- Data appear to form a curve
- Correlational statistics can only measure straight lines



Curvilinear Relationship: Example

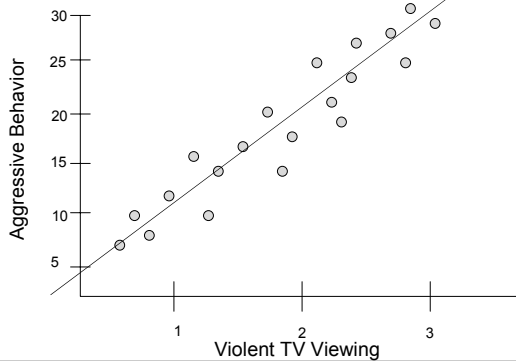
- X = Arousal Level
- Y = Performance

- Low levels of arousal = low levels of performance
- Moderate levels of arousal = high levels of performance
- High levels of arousal = low levels of performance

Statistical Analysis

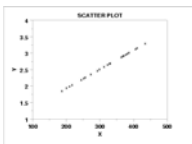
- Correlation coefficient (r)
 - Ranges from -1 to +1
- Strong positive relationship
 - r close to +1
- Strong negative relationship
 - r close to -1
- No relationship
 - r close to 0

Central Tendency

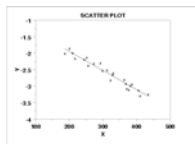


Variability

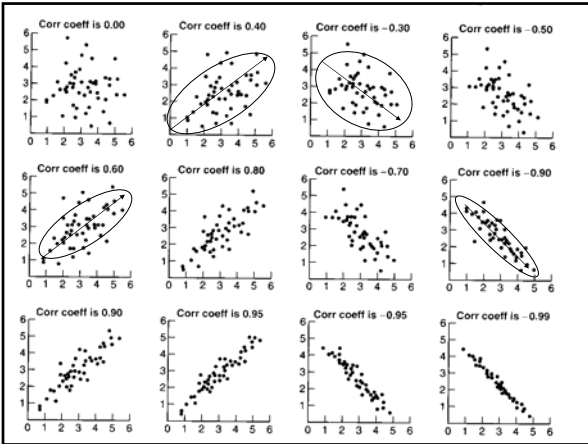
Perfect Positive (1.0)



Very Strong Negative (-.95)



- Scatter of data points around line of best fit indicates variability
 - Indicated by absolute value of r



Common Errors in Interpreting Correlations

1. Assuming Causation
2. Directionality Problem
3. Third variable Problem
4. Restricting range
5. Selection bias and spurious correlations

Assuming Causation

Correlation does not imply causation!

Correlation does not imply causation!

Correlation Does NOT Imply Causation!

Correlation does not imply causation!

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Correlation does not imply causation!

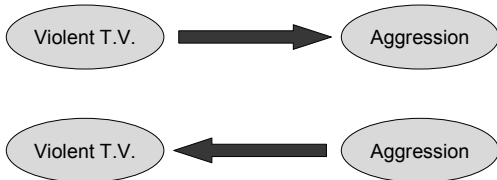
Directionality Problem

- Direction of causality difficult to determine in correlational research
 - Fire Truck problem



TV Violence and Aggression (revisited)

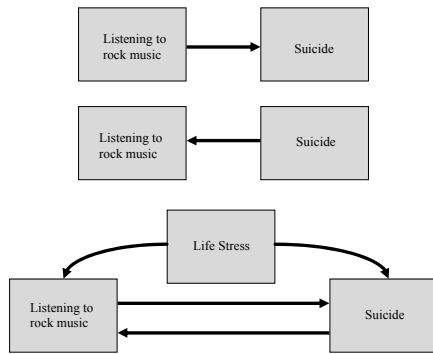
- Positive relationship between watching violent TV and aggression



Third Variable Problem

- Third (unmeasured) variable causes spurious correlation
- Partial correlation
 - Measure all three variables
 - Statistically remove effect of third variable
 - Correlation remains – relationship exists
 - Correlation disappears – relationship spurious

Variables: Rock music and suicide



Restricting Range of Data

- Occurs when data not gathered from full range of possibilities
- Beware of looking only at the extremes of behavior
 - Does not reveal true relationships
- Miss curvilinear relationships
