

Correlation Research

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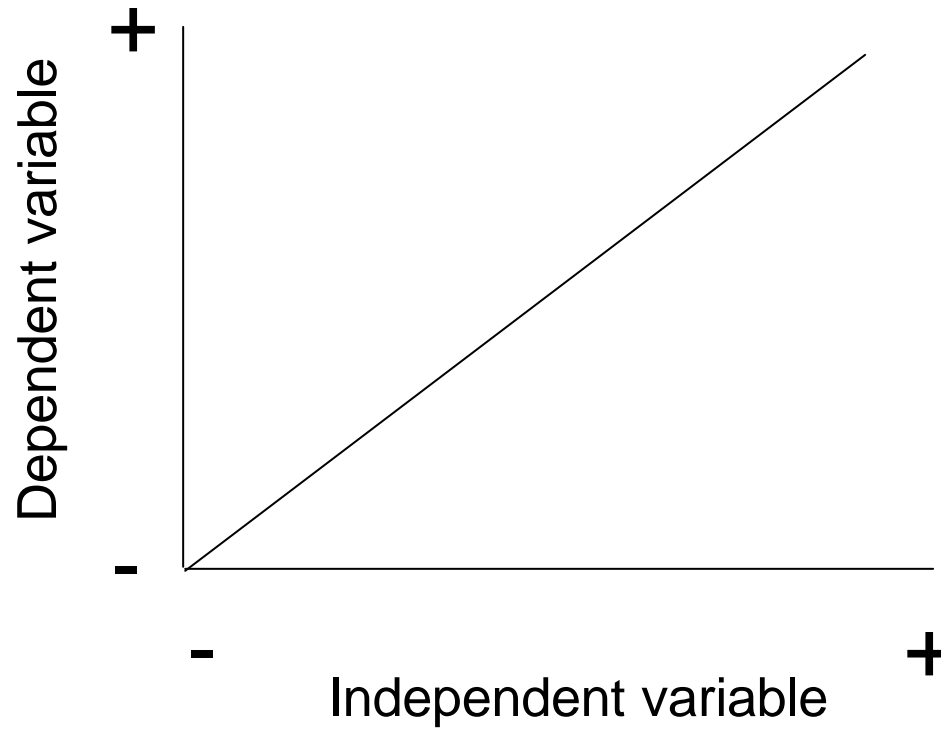
- ***correlational research***—strength of a relationship between two or more variables is quantified
 - variables must be quantifiable and usually represent at least ordinal scale of measure
 - variables not usually manipulated
 - cannot be used to determine causality but still useful in science
 - a consistent relationship can be used to predict future events
 - provide data that are either consistent or inconsistent with some currently held scientific theory (correlation cannot prove a theory but can negate a theory)
 - accurate prediction is a principal goal of correlation research

Types of Relationships Between Variables

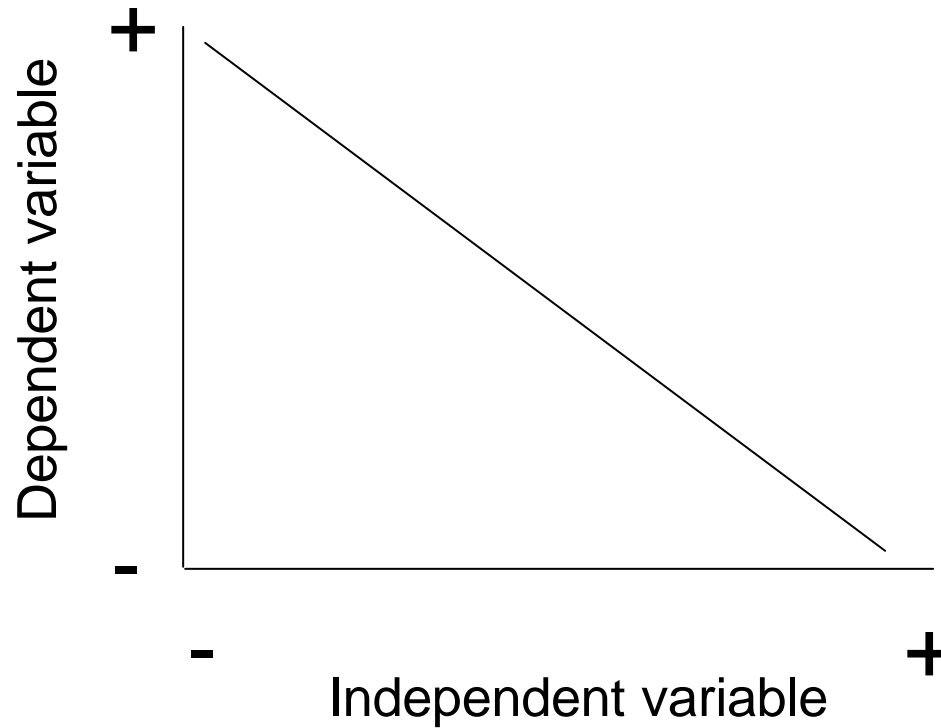
Types of Relationships

- Positive
- Negative
- None
- Curvilinear

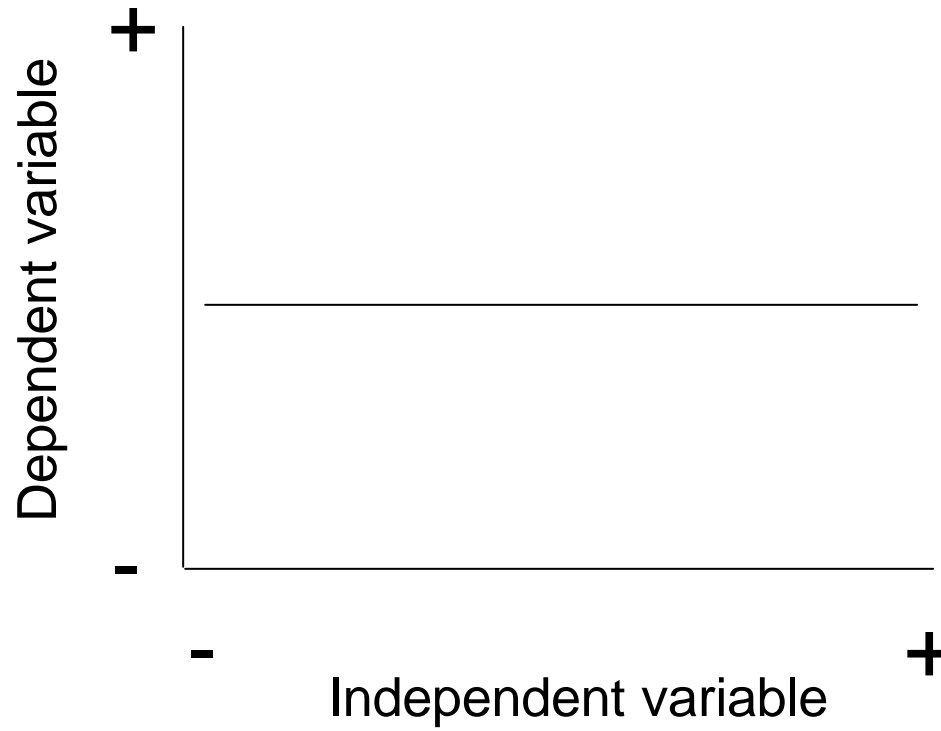
Positive Relationship



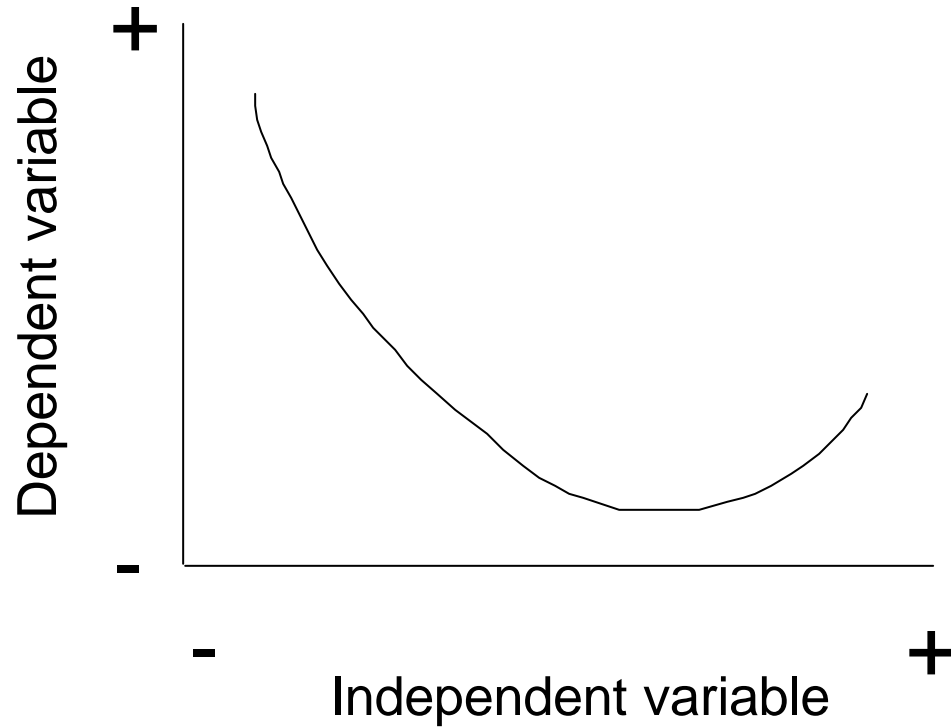
Negative Relationship



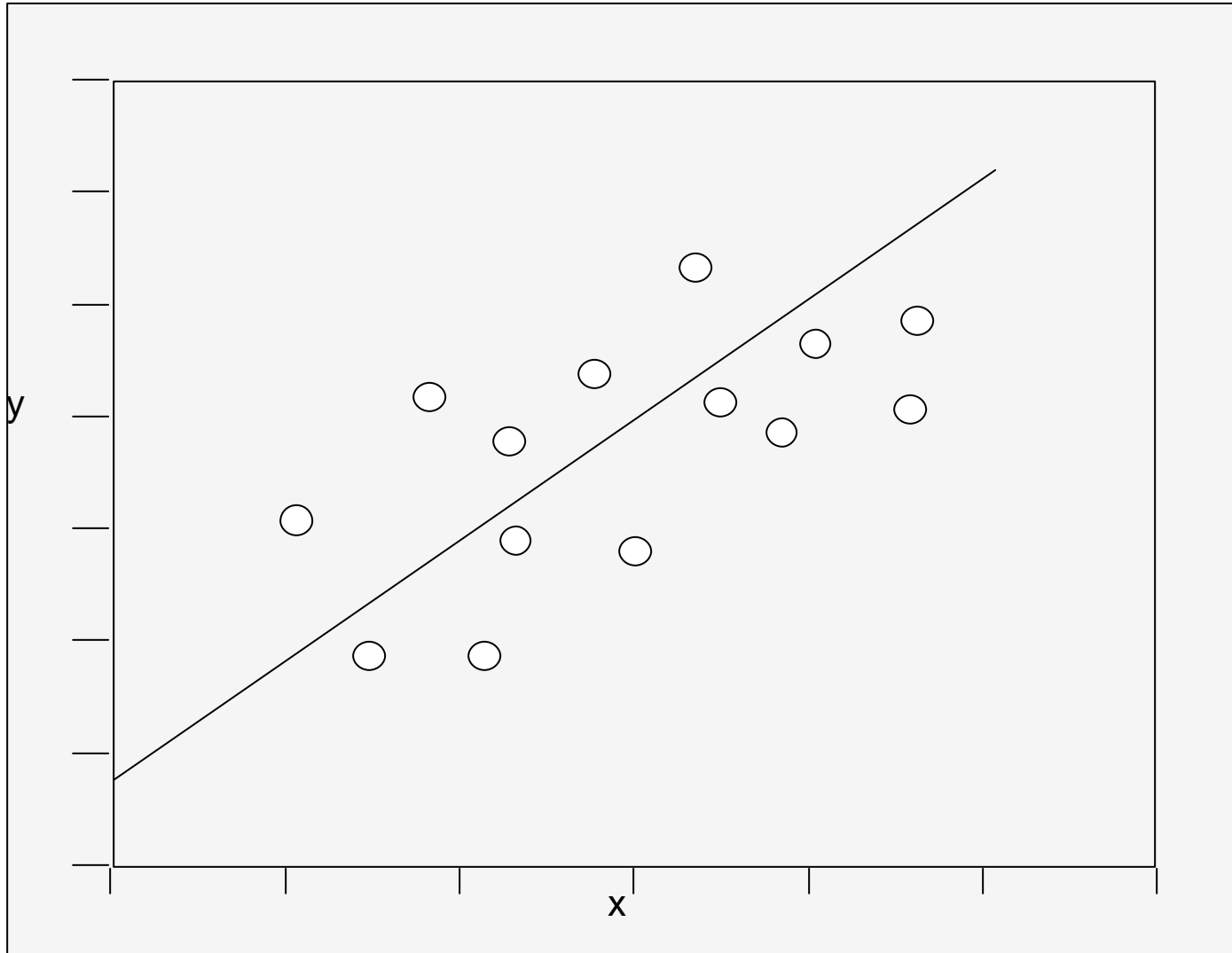
No Relationship



Curvilinear Relationship



Scatterplots Reveal Potential Relationships



Problem Statements for Correlational Research

- *What is the strength and direction of the relationship between variable X and Y?*

May also want to develop regression equation for prediction

$$y = b_0 + b_1x \text{ (equation for straight line)}$$

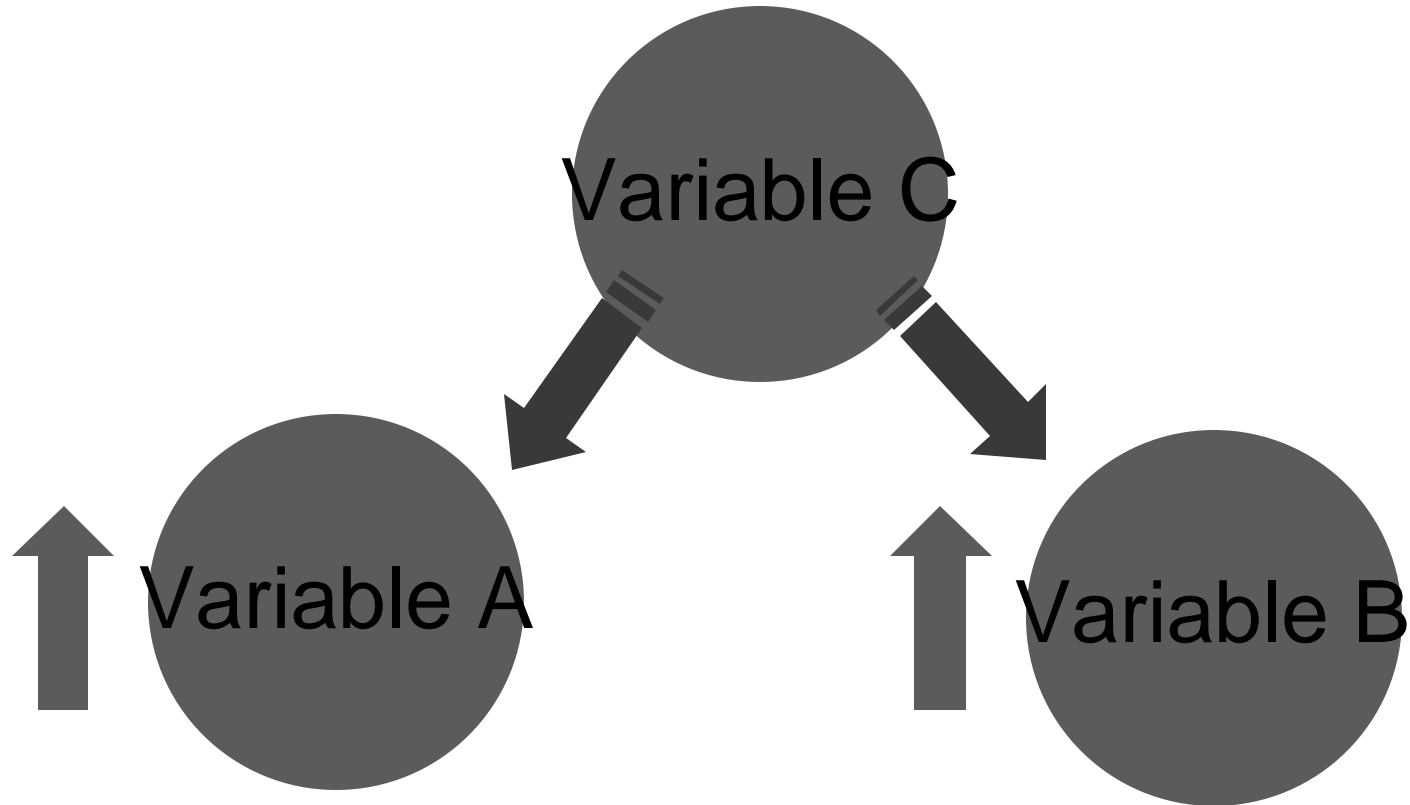
Data analysis for Correlation Research

- **Pearson product-moment**—when you have two interval or ratio scale variables
- **Spearman**—when variables are at least ordinal
- **multiple correlation**—relationship between one variable and a set of variables
- **canonical correlation**—relationship between two sets of variables
- **partial correlation**—correlation of one variable with another after statistically removing the effects of a third variable
- **coefficient of determination**—squared correlation—explains the variability in the first variable (proportion of variance accounted for)
- **spurious correlation**—significant correlation between two variables that is likely due to coincidence, i.e., there is no obvious reason why the two variables should be correlated but they are

Artifacts and Confounding Variables

- confounding occurs when two or more variables (that move together) can explain the results
 - holding a variable constant is best way to avoid confounding
 - the variable of greatest interest is the one that is allowed to vary
- artifact—is any apparent effect of an independent variable that is actually the effect of some other variable (a result of confounding)

Confounding by a Variable



Positive correlation
between A and B is
confounded by C