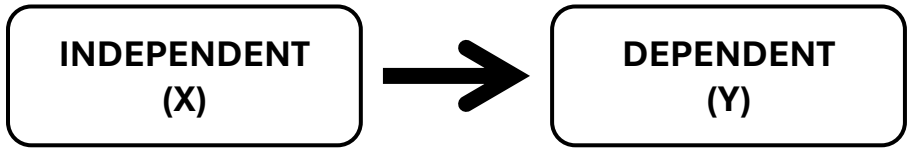
Extraneous Variables

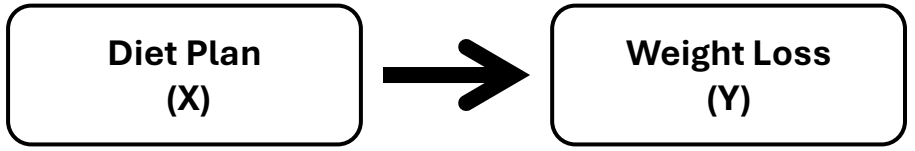
What are Variables?

- Variable = Anything that can change or vary in an experiment or study (E.g.: Age, weight, stress level,…)

- Two main types of variables:
  - **Independent Variable** (X)
    = The one you adjust on purpose in the study
  - **Dependent Variable** (Y)
    = Changes because of the independent variable



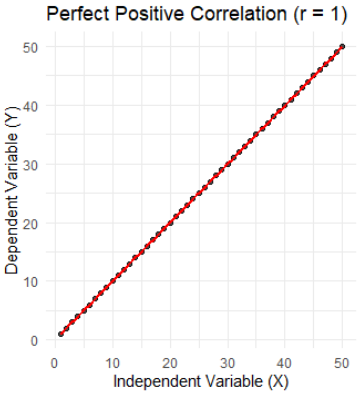
- Example:
  You want to test what the effect of a new diet plan on weight loss is
  - ➔ Independent Variable (X) = Diet plan
  - ➔ Dependent Variable (Y) = Weight loss

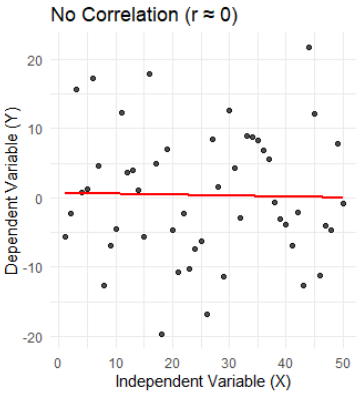


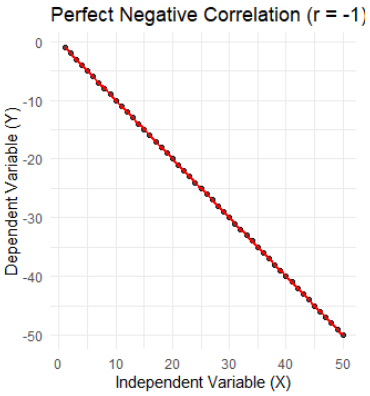
How to measure the effect?

- Simplest way to measure how two variables relate:
  - ➔ Correlation = How strongly are two variables related?
    - Can be between -1 and 1
      - r ≈ -1 → Strong negative relationship
      - r ≈ 0 → Variables aren't systematically related
      - r ≈ 1 → Strong positive relationship

  - ! Correlation ≠ Causation
    - ➔ Correlation only means two things change together
    - ➔ A third variable could be responsible for the effect
    - ➔ Control for extraneous variables





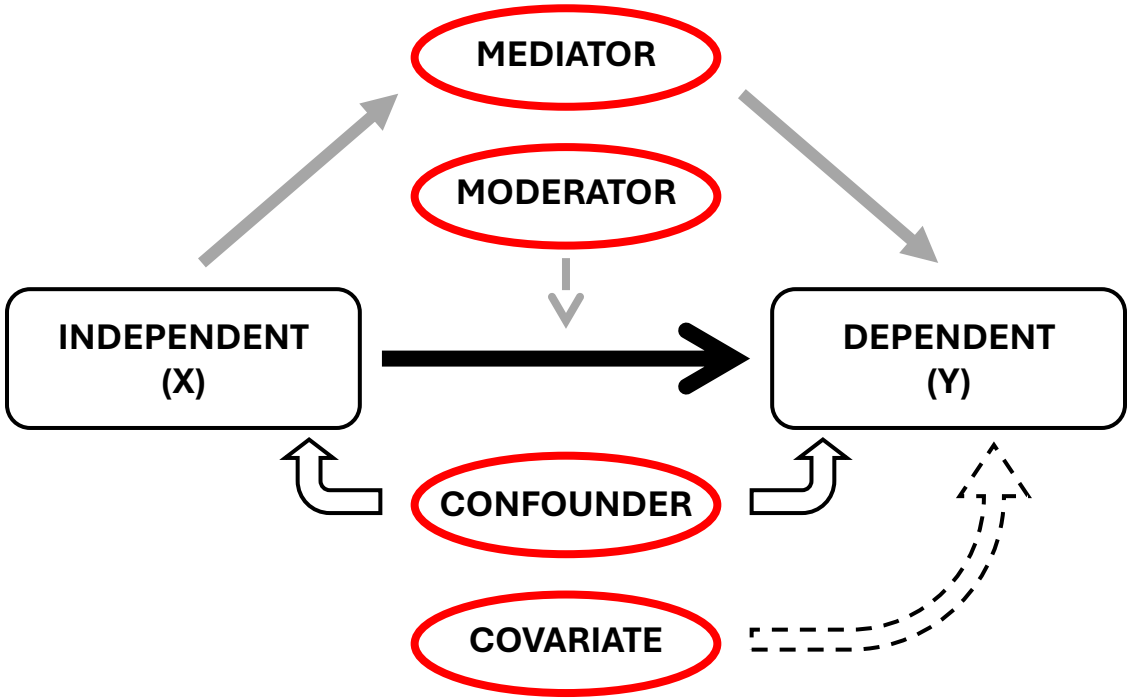


Introduction Extraneous Variables

- Not directly relevant to the research question
- Can affect the outcome or mechanisms of an experiment or study

➔ Potential to lead to incorrect conclusions or biases

- Types of extraneous variables:
  - Mediator
  - Moderator
  - Confounder
  - Covariate

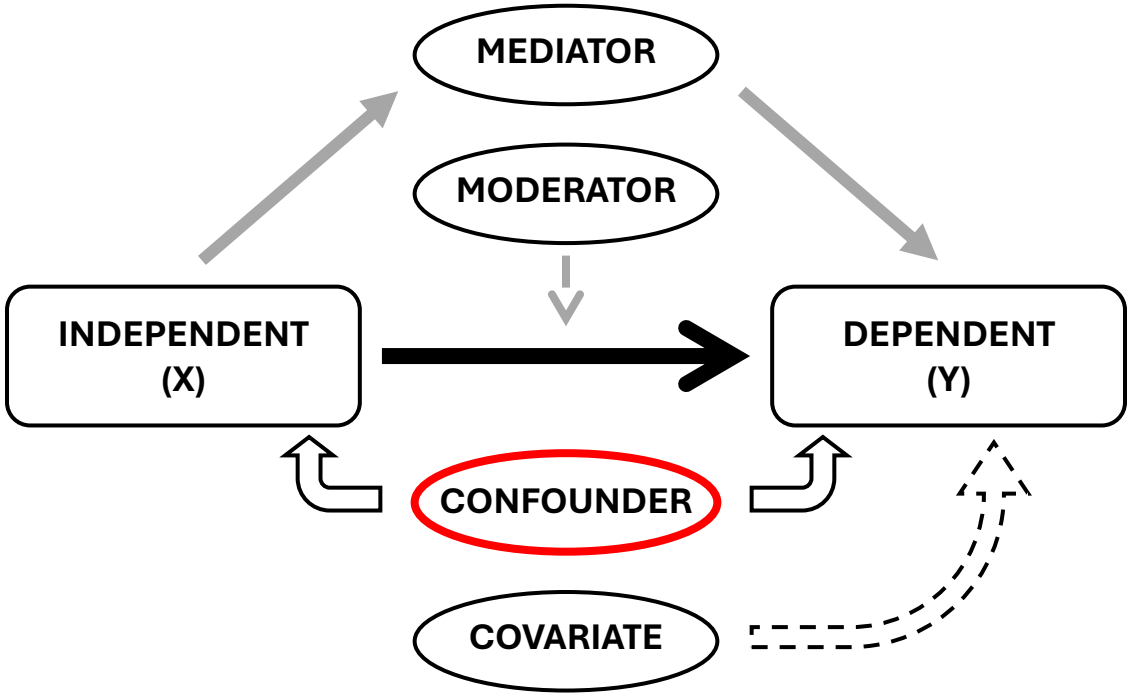


Based on: Field-Fote, E. (2019). Mediators and moderators, confounders and covariates: Exploring the variables that illuminate or obscure the "active ingredients" in neurorehabilitation. *Journal of Neurologic Physical Therapy*, *43*(2), 83-84.

Confounder

- Correlates with or casually related to the independent variable(s) (X)
- Casually related to the dependent variable (Y)

- Can lead to spurious associations
  - ➔ Effect between X and Y might be caused by confounder



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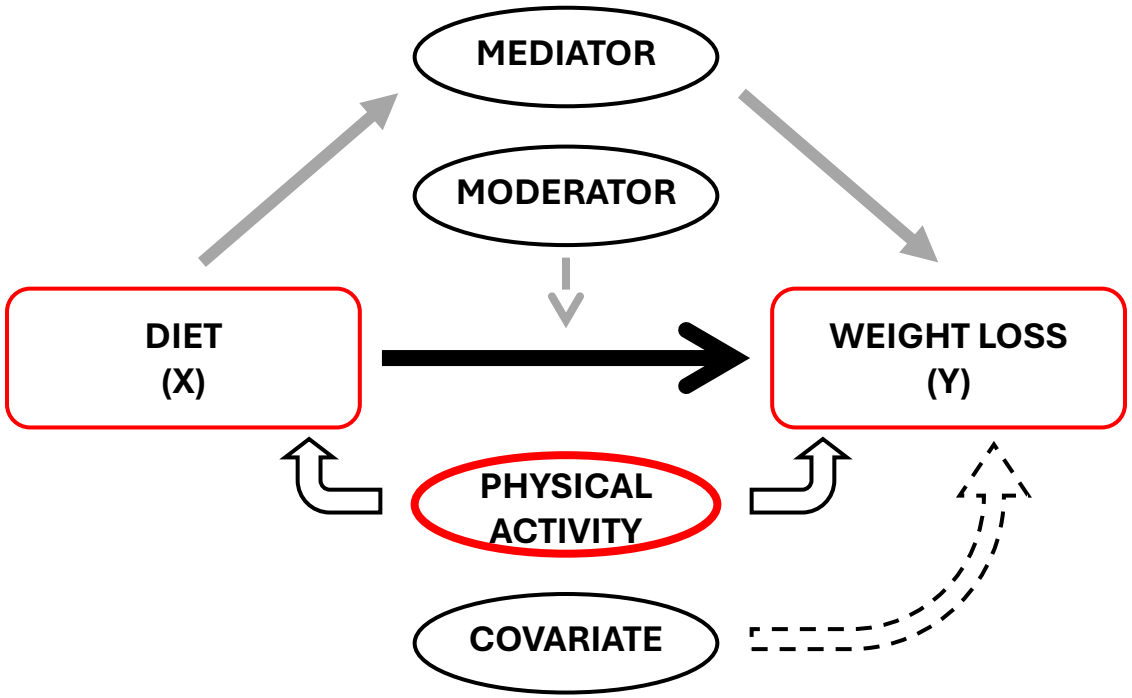
Confounder - Example

Research Question: *What is the effect of a new diet plan on weight loss?*

Hypothesis: *The new diet plan will lead to significant weight loss compared to no diet plan, after controlling for physical activity levels.*

- People with high physical activity might…
  - … adhere better to the diet plan.
  - … lose more weight.



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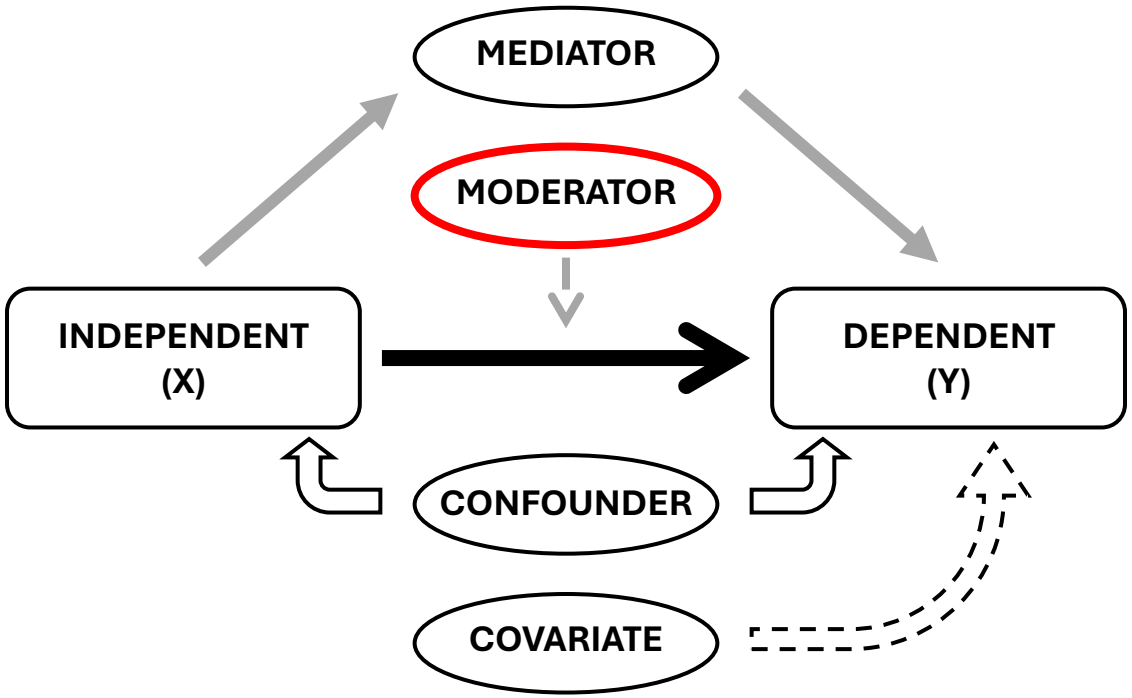
Moderator

- Influence the strength or direction of the relationship between the independent (X) and dependent (Y) variable

- Helps to understand the effect better regarding:
  - Under what conditions?
  - For whom?



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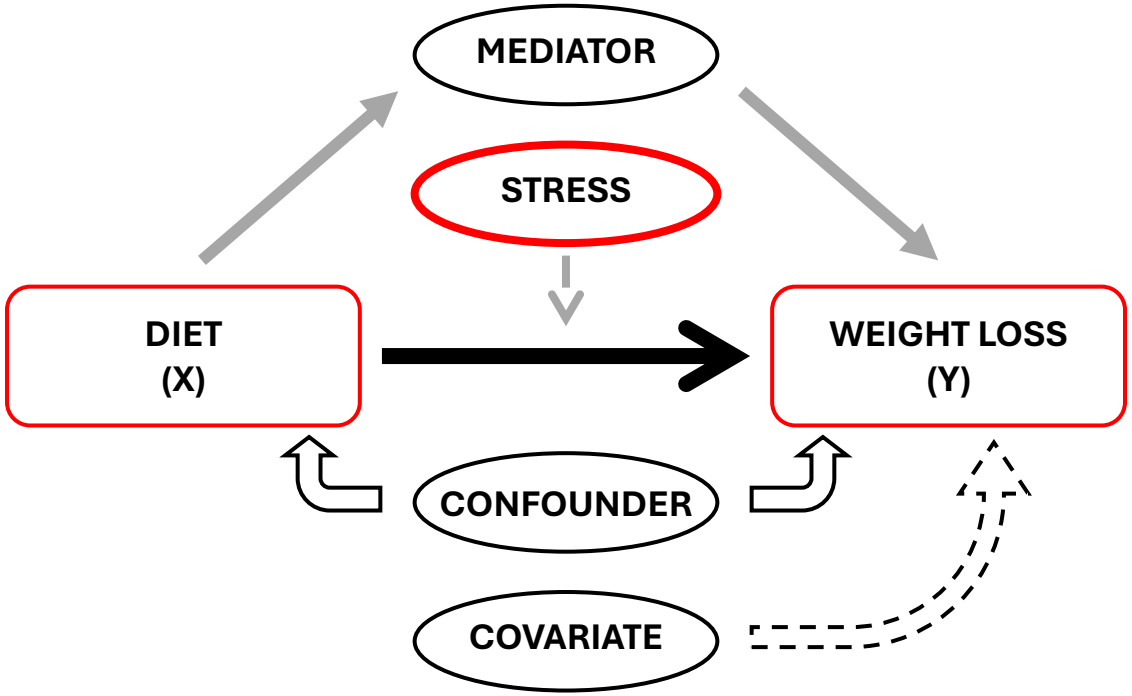
Moderator - Example

Research Question: *What is the effect of a new diet plan on weight loss?*

Hypothesis: *The effectiveness of the new diet plan on weight loss will vary depending on the individual's stress levels.*

- Stress might influence the effectiveness of a diet plan

➔ Stress can influence eating behaviors and metabolism



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After completing all self-explanations, this part of the study is concluded.

Please inform your instructor when you have finished.