Mediators

22 Nov 2011
BUSI275
Dr. Sean Ho

- **HW8** due Thu
- **Please download:**
  21-ExamAnxiety.xls

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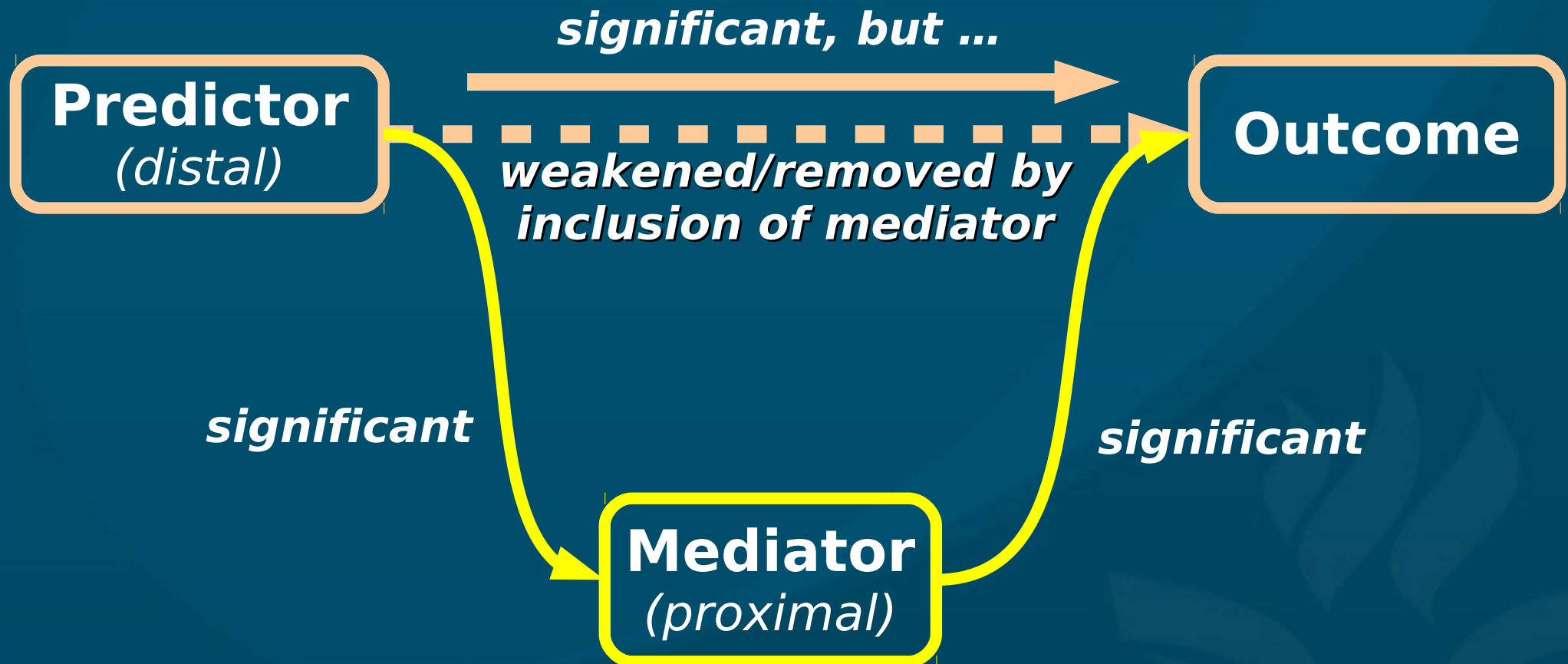WESTERN
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Outline for today

- Mediators
  - Definition and concept
- How to test for mediation
  - Step 1: Main effect
  - Step 2: IV → Med
  - Step 3: Full model
- Interpreting mediation
- Mediation vs. moderation

Mediators: definition

- A mediator is a "generative mechanism" by which a predictor influences an outcome var:
  - IV has a significant relationship with DV,
  - Med has sig. relationship w/ both IV and DV,
  - But when Med is included in the model, the relationship between IV and DV disappears
- Partial mediation: if the IV-DV relationship is merely weakened rather than disappearing
- Theory should support placing the mediator "between" the IV and DV in some sense
- *(Baron+Kenny definition)*

Mediators: block diagram

Predictor *(distal)*

Outcome

Mediator *(proximal)*

significant, but …

weakened/removed by inclusion of mediator

significant

significant

Examples of mediators

- Predictor: Advertising expenditures
  - Mediator: Consumer reaction to ads
  - Outcome: Consumer demand
- Predictor: Investment in new product research
 - Mediator: new market share
  - Outcome: Sales revenue
-
- … Others?

Testing for mediators

- (0) Are all three vars significantly correlated?
- (1) Is there a relationship to mediate?
  - Run regression without the mediator
- (2) Is there a relationship between IV and Med?
  - Run a simple regression with IV as predictor and Med as outcome: is it significant?
- (3) Back to the original regression model, include the mediator in the model
  - Put Med in same block as IV
  - Keep any other predictors as-is in the model

Example: Exam Anxiety

- Dataset: 21-ExamAnxiety.xls
  - (Toy data from Field, "Discovering Stats")
- RQ: does exam anxiety mediate the relationship between studying time and exam score?
  - IV: time spent studying
  - Med: exam anxiety
  - DV: exam score
- First check if all three are correlated:
  - Data Analysis → Correlation
 - Results: 0.397, -0.709, -0.441

Step 1: Main effect
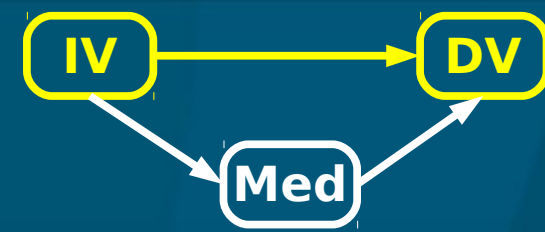
- Next, we check to see if there is a main effect between study time and exam performance
  - If not, then there is no relationship to be mediated!
- Data Analysis → Regression:
  - Y: ExamScore
  - X: StudyTime
  - If we had any other predictors (including other moderators), we'd include them according to their blocks
- Result: $R^2 = .157$, $F(1,101) = 18.9$, $p < .001$
 - Slope: $\beta = .397$, $p < .001$

Step 2: IV → Med
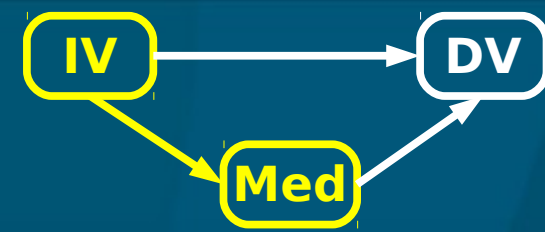
- Now we must evaluate the relationship between the predictor and the mediator:
- Data Analysis → Regression:
  - Y: Anxiety
  - X: StudyTime
  - For this side analysis, we don't need any other variables, just simple regression
- Result: $R^2 = .503$, $F(1,101) = 102.2$, $p < .001$
  - Slope: $\beta = -.709$, $p < .001$

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Step 3: Full model
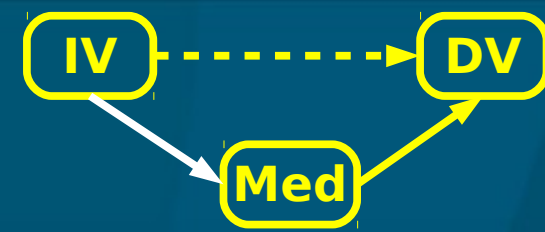
- Run the full regression model, now including the mediator in same block with the predictor:
- Data Analysis → Regression:
    - Y: ExamScore
    - X: StudyTime, Anxiety
    - Any other predictors/moderators would be included according to plan
- Result: $R^2 = .209$, $F(2,100) = 13.2$, $p < .001$
    - Anxiety: $\beta = -.321$, $p = .012$
        - ◆ The mediator is significant
    - StudyTime: $\beta = .169$, $p = .184$
        - ◆ But the predictor is no longer significant

Exam Anxiety: block diagram
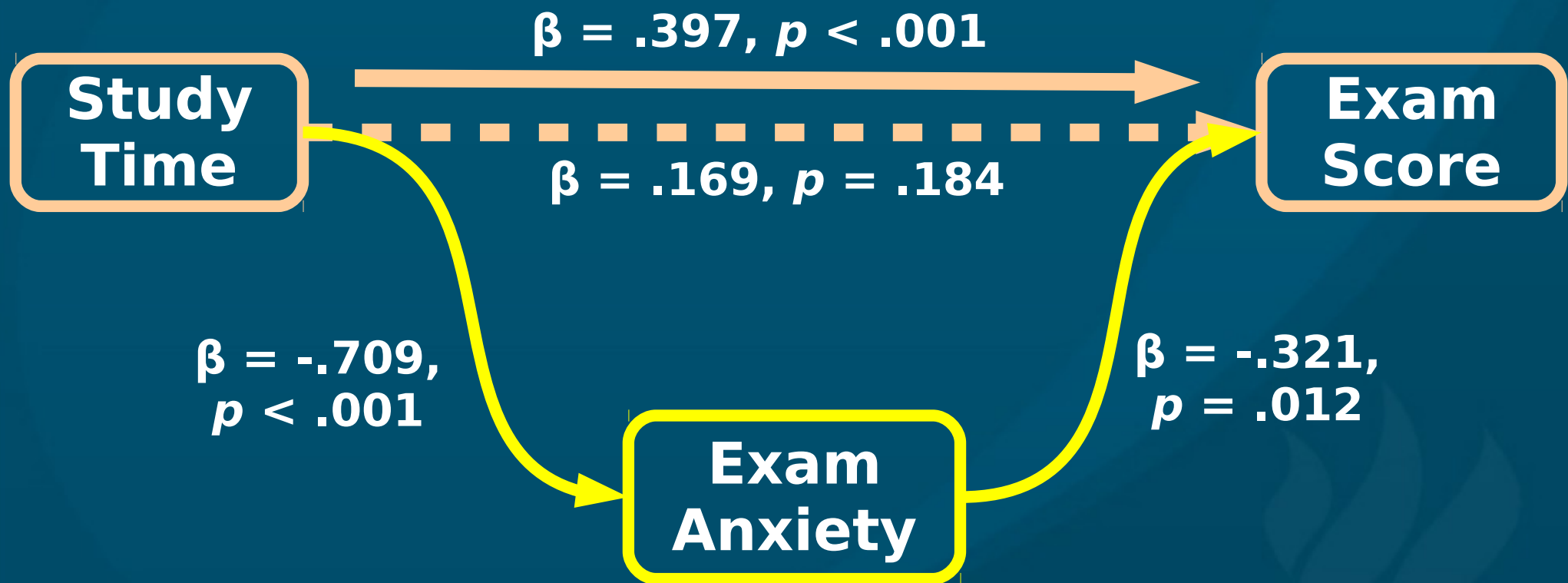
- Study time influences exam performance indirectly, via the mediator of exam anxiety
- Report *p*-values and effect sizes (β, R^2)

Interpreting Mediators

- Conclude that what appeared to be a real relationship between the predictor and outcome is actually an indirect relationship, and due to the mediator variable.

- Report:
  - Relationships (β, R^2) between the predictor and the outcome variable before and after the mediator is entered into the model
  - Relationships between the mediator and predictor, and between mediator and outcome variable (in the final model)

Further reading

- Paul Jose's MedGraph:
  - Tool to visualize the mediation relationship
- Sobel test: significance test for mediation
  - Limited power (overly conservative)
    due to normality assumption
- MacArthur model of moderation+mediation

TODO

- HW8 (ch15,12): due Thu
- Projects:
  - Presentations next week!
  - Email me for time slot if you haven't already