

Moderation

E0420

Week 12

Interactions

- Multiple variables in regression = additive effect
- Interaction is different from the additive effect
- When relation between X and Y depends on levels of Z
- Moderation is an interaction
- Polynomial terms are interactions (e.g. x^2)

Types of interactions

- By number of variables
 - 2-way interactions
 - 3-way interactions
- By type of variables
 - categorical * categorical
 - categorical * continuous
 - continuous * continuous

Additive effects

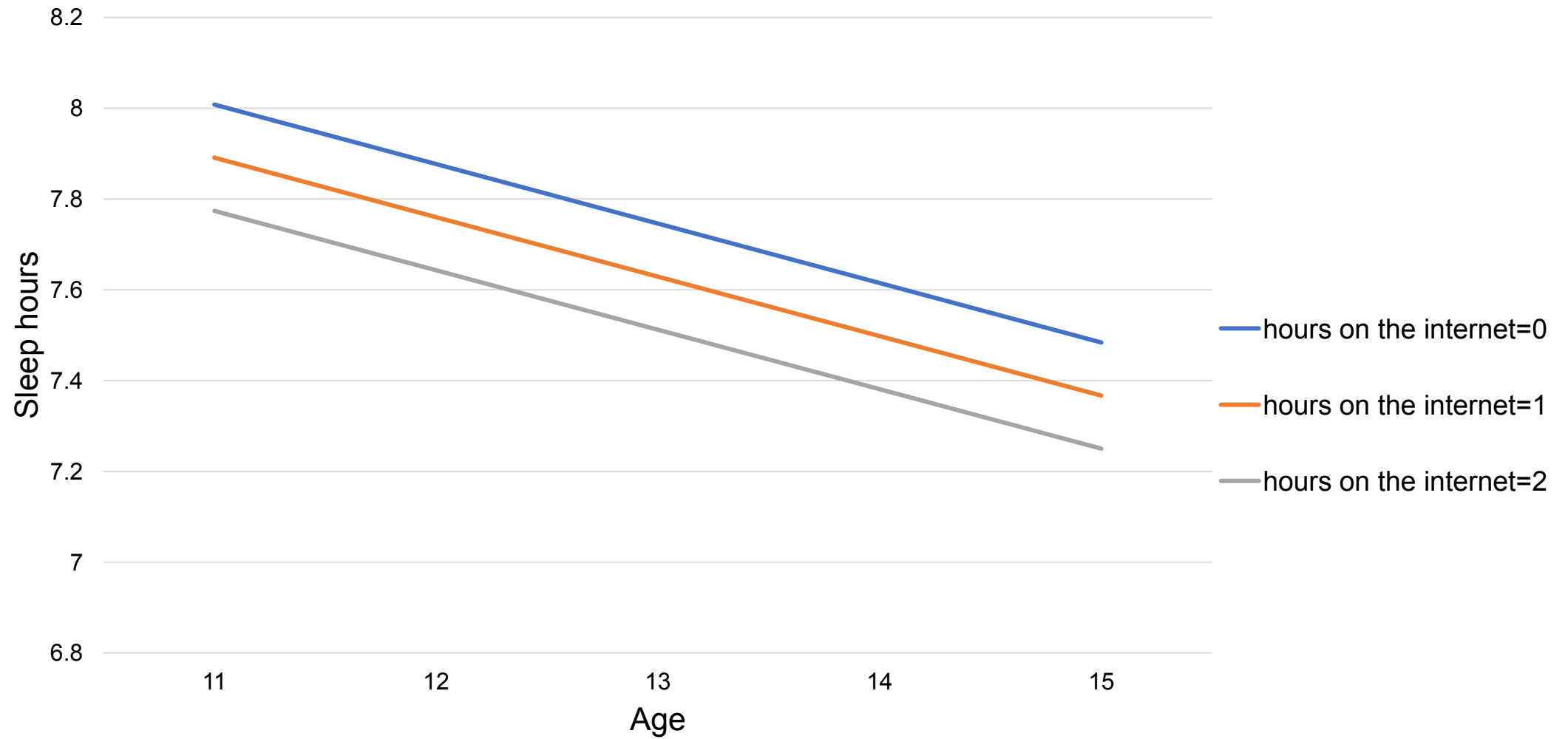
- First-order effects
- For two variables:

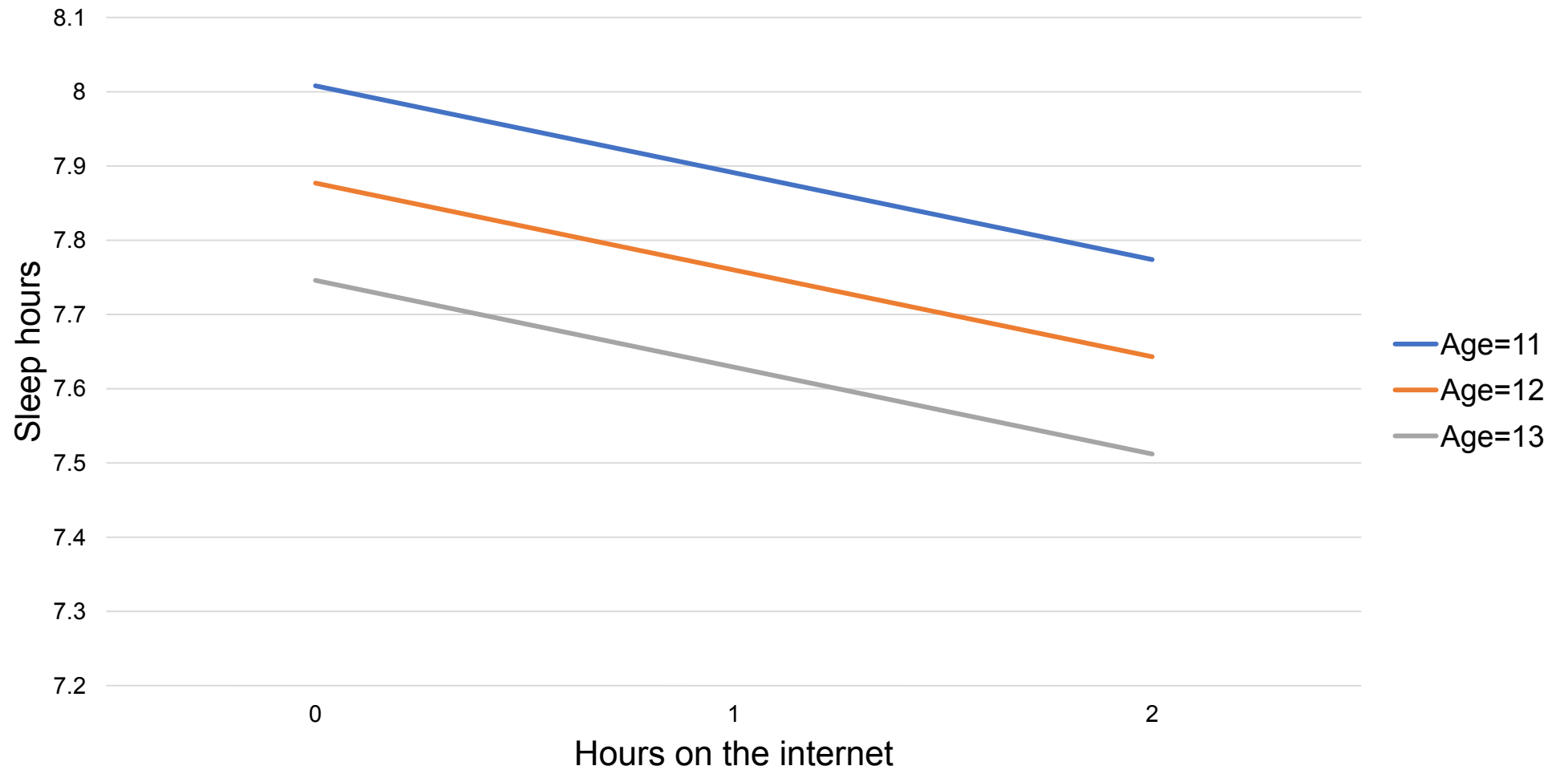
$$\text{Sleep_hrs} = B0 + B1_{\text{Age}} + B2_{\text{hrs_inet}}$$

$$\text{Sleep_hrs} = 9.449 - 0.131_{\text{Age}} - 0.117_{\text{hrs_inet}}$$

Values:

- Age: 10.5 – 21.29
- Hours on internet: 0 – 7





Interaction

- Higher-order effects
- In interaction, the first order effects are conditional (depending on the value of the other IV)
- The conditional association is symmetrical:
$$X \text{ on } Z = Z \text{ on } x$$
- Interaction term is entered into regression along with the X and Z variables
- In hierarchical regression, it is better to use the interaction term as a separate step

- .2 association between depression and social skills when anxiety = 0
- .6 association between anxiety and social skills and when depression = 0
- .4 association between depression and anxiety increases by .4 for every unit increase in the cross-product

Interactions in ANOVA

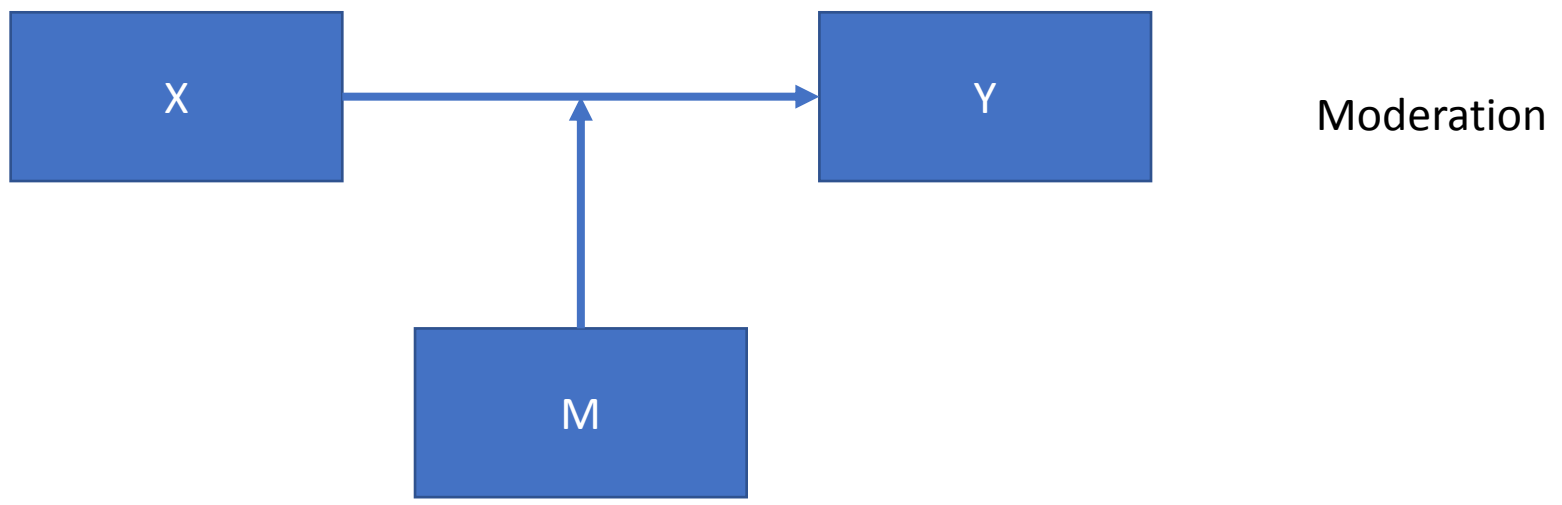
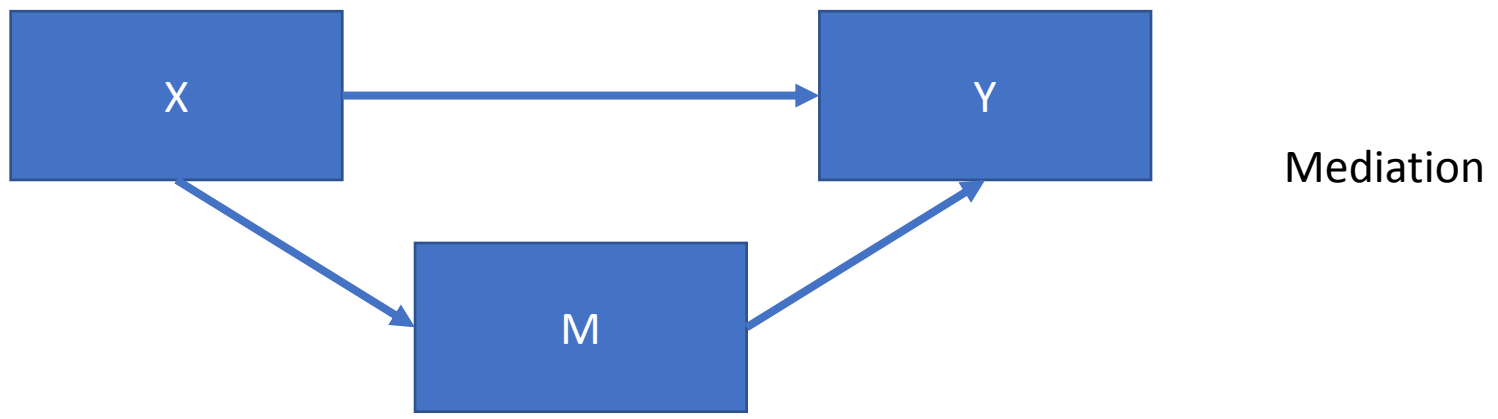
- ANOVA interactions are equal to interactions from regression
- ANOVA can only do interactions with categorical variables
- People used to categorize continuous variables = bad idea
 - Lower power
 - Potentially spurious findings

Mediation vs moderation

- Mediation = explains association
- Moderation = conditions the association

- Mediation = a third variable explains the association between the two variables
- Z mediates = Z carries (a part of) an effect between X and Y

- Moderation = a third variables influences the strength of the association between the two variables
 - Z moderates – Z makes the association between X and Y become stronger/weaker



Centering

- As mentioned in the previous lecture, centering is necessary for interaction terms
1. Interpretability (if there is no meaningful 0)
 - Then, the first order coefficient X represents its value when Z = average (and not 0)
 2. To deal with multicollinearity

X	Z	XZ
0	0	0
2	2	4
4	4	16
6	6	36
8	8	64
10	10	100

$r = 0.96$
 $X (M) = 5$
 $X (Z) = 5$

$r = 0.00$
 $X (M) = 0$
 $X (Z) = 0$

Note on centering

- Not needed to center when a meaningful zero or when dichotomous
- No need to center additional IVs in the model that are not part of the interaction term

Plotting the interaction

- Plotting is essential for understanding moderation
- We usually select 2-3 values for the moderator to be plotted
 - Those are the lines you see
- For categorical moderator, it would be the categories
- For continuous moderator, most often it is +/- 1SD of moderator (+mean)

Simple slopes

- The slopes that we plot (conditional) can be tested for significance
- The computation of SE is not that straightforward
- Software can be used to test the simple slopes
 - PROCESS macro
 - Quantpsy.org
- Can obtain CIs and region of significance
 - Johnson-Neyman

Different types of interactions

Positive synergistic

Negative synergistic

Different types of interactions

Antagonistic

Different types of interactions

Curvilinear by linear interaction

3-way interaction

- X^*Z^*W

