Lab 10

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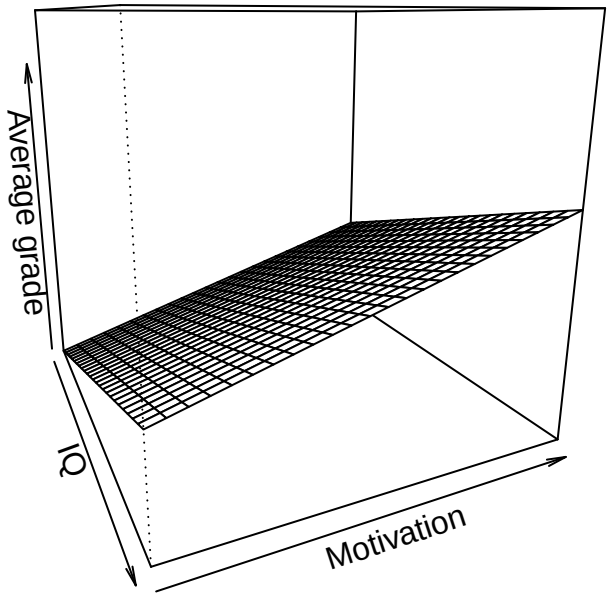
Regression without interactions

$y = \beta_0 + \beta_1 * x + \beta_2 * z$, x=motivation, z=IQ

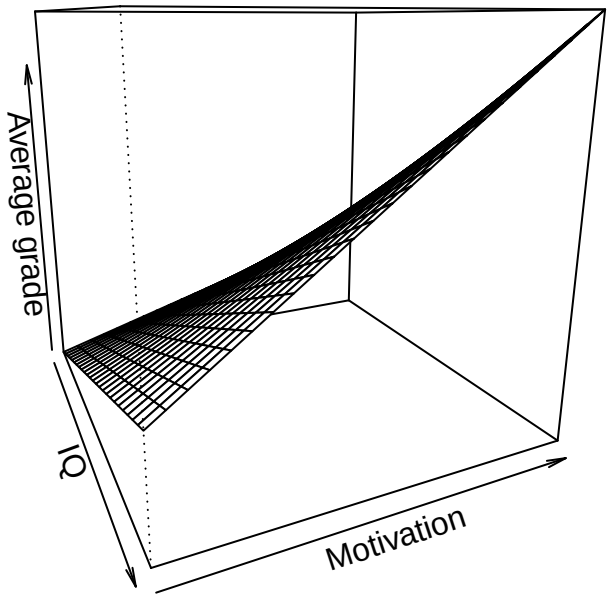


Regression without interaction

- Example: average grade is proportional to a sum of intelligence and motivation level
- Importance of intelligence is the same for those with low and high level of motivation
- Importance of motivation is the same for those with high and low IQ

Regression with interactions

$y = \beta_0 + \beta_1 * x + \beta_2 * z + \beta_3 * xz$, x=motivation, z=IQ

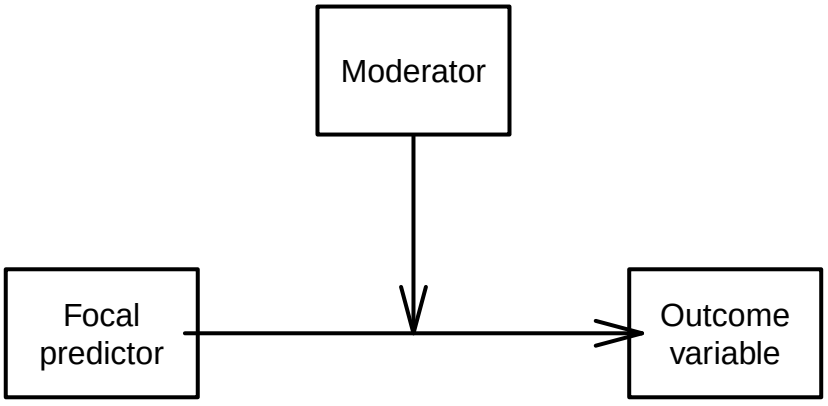


Regression with interactions

- Example: average grade is proportional to a sum of intelligence and motivation level
- But also, for highly intelligent students level of motivation is more important predictor of average grade than for students with low intelligence
- E.g. those with high IQ may be better at selecting important informations from textbooks. Hence, although 2 students - 1 with low IQ and 1 with high IQ - may devote the same amount of time on reading (may have similar motivation), student with high IQ will prepare better for exams

Moderation analysis

- Regression with interaction is commonly called moderation analysis, i.e. we want to check how importance of one of the predictors is influenced by the value of some other predictor

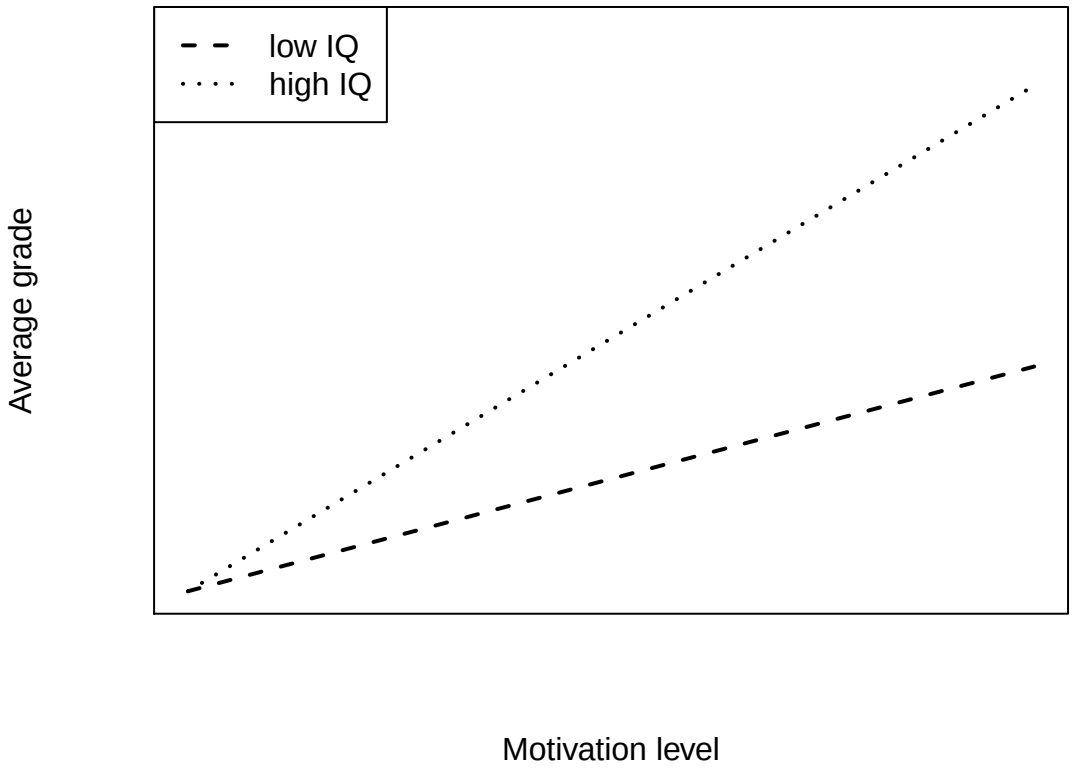


Simple slopes

- Keep in mind that bended plane is a proper representation of regression with interaction

- However, understanding graphical representation of plane is rather hard (especially when it is projected on 2 dimensional sheet of paper)
- Usually, we present relation of focal predictor (e.g. intelligence) with outcome variable for different values of moderator (e.g. motivation)
- We call such regression lines as simple slopes
- Think of simple slopes as slices cut from the plane at different values of moderators

Simple slopes



Computing simple slopes

$y = \beta_0 + \beta_1 * x + \beta_2 * z + \beta_3 * xz$, rearrange

$y = (\beta_0 + \beta_2 * z) + (\beta_1 * x + \beta_3 * xz)$, pull x from 2nd bracket

$y = (\beta_0 + \beta_2 * z) + (\beta_1 + \beta_3 * z)x$

$(\beta_0 + \beta_2 * z)$ - intercept of simple slope

$(\beta_1 + \beta_3 * z)x$ - slope of simple slope

- Note both I and S of y regressed on x (focal predictor), depend on the values of z (moderator)

Computing simple slopes - additional remarks

- Usually in moderation analysis continuous predictors are centered prior to analysis
- I.e. sample mean of a predictor is substracted from a each individual's result
- This is only to help with interpretation of regression output
- Do not center your predictors if value of 0 on a scale of some predictor has some special meaning

Computing simple slopes - additional remarks

- Usually values of $M - 1SD$, M, and $M + 1SD$ (or only $M - 1SD$ and $M + 1SD$) of moderator are selected as points to draw simple slopes
- Sometimes 25th, 50th, and 75th percentile is used

Computing simple slopes - additional remarks

- Categorical variables can be used both as focal predictors and as moderators
- However, some coding scheme have to be used (e.g. dummy coding)

Additional literature

- Complete introduction to moderation analysis is beyond the scope of this course
- If you want to know more about this, Cohen, Cohen, West, & Aiken (blue book) is a classical reference

Computing regression with interactions in SPSS

- Standard SPSS does not include procedures to compute moderation analysis
- This is why computing interaction with standard SPSS requires a lot of additional work and transformations
- Luckily, there exist a macro created by Andrew F. Hayes, that make some things a lot easier - the macro is called PROCESS

PROCESS

- PROCESS is quite powerful tool, it helps with:

1. moderation analysis
2. mediation analysis
3. moderated mediation analysis
4. mediated moderation analysis
5. a lot more

- we will focus on the most basic one - Model 1 for 2-way interaction analysis