

# Multilevel analysis of personality: Personality of college majors

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# Outline

- 1 Personality structure at multiple levels
- 2 Data collection using SAPA
- 3 Results
  - Between subjects pooled within majors
  - Between majors
- 4 Discussion
- 5 Supplementary results

## Multilevel analysis can yield surprising results

Although it is well known that the structure within a level does not imply anything about the structure at a different level, this distinction is frequently forgotten.

- 1 Various names for the phenomena:
  - Yule-Simpson paradox (Simpson, 1951; Yule, 1903)
  - The fallacy of ecological correlations (Robinson, 1950)
  - The within group–between group problem (Pedhazur, 1997)
  - Ergodicity (Molenaar, 2004)
- 2 Observed correlations may be decomposed into within group correlations and between group correlations
  - $r_{xy} = \eta_{x_{wg}} * \eta_{y_{wg}} * r_{xy_{wg}} + \eta_{x_{bg}} * \eta_{y_{bg}} * r_{xy_{bg}}$
  - $r_{xy_{wg}}$  is the within group correlation
  - $r_{xy_{bg}}$  is the between group correlation
  - $\eta_{x_{wg}}$  is correlation of the data with the within group values
  - $\eta_{x_{bg}}$  is correlation of the data with the between group values
- 3 We consider several examples of multi-level analysis.

## Method

- 1 Synthetic Aperture Personality Assessment (Revelle, Wilt & Rosenthal, 2010) forms large covariance matrices by sampling items across people
  - $\approx 120/day$  participants are recruited to `test.personality-project.org`
  - Each participant is given 60-70 items
  - Total set of items being analyzed  $> 500$
- 2 Item content being sampled
  - 100 "IPIP" Big 5 items
  - $\approx 200$  other temperamental items
  - 56-80 home brewed ability items
  - 92 Oregon Vocational Interest items (ORVIS)
- 3 Although  $> 240,000$  participants have been run in all, we will report only those data from the last 75,000
- 4 Demographic information included
  - Age, Gender, Level of education, country of residence
  - College major and broad field (if appropriate)
  - Occupation (if appropriate)

## College major as an example of niche selection

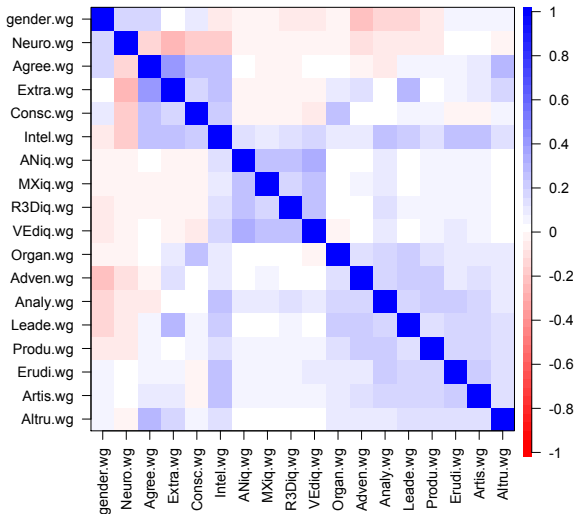
We are analyzing the personality of groups. This is how the composition of groups differ in the average personality characteristics of their members.

- 1 People differ in their temperaments, abilities and interests.
- 2 College majors differ in their social and intellectual challenges.
- 3 We can see this by examining the TAI mean scores for each of 88 majors.
  - 88 majors had more than 100 students
  - Data from students who had not declared majors were deleted.
- 4 Correlations can be found within and between these groups.
- 5 These between group correlations are not between people but of the means of the majors. This leads to the structure of group differences.
- 6 Results displayed as heat maps of correlations

Between subjects pooled within majors

# Structure of TAI within college majors is the standard structure

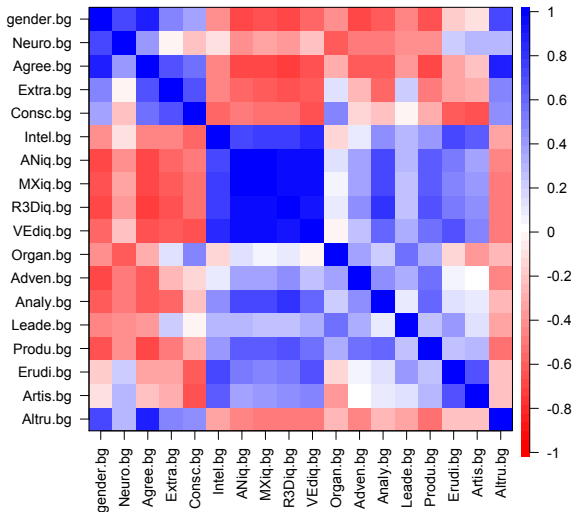
### Within group correlations of TAI



Between majors

# Structure of TAI between college majors is very different

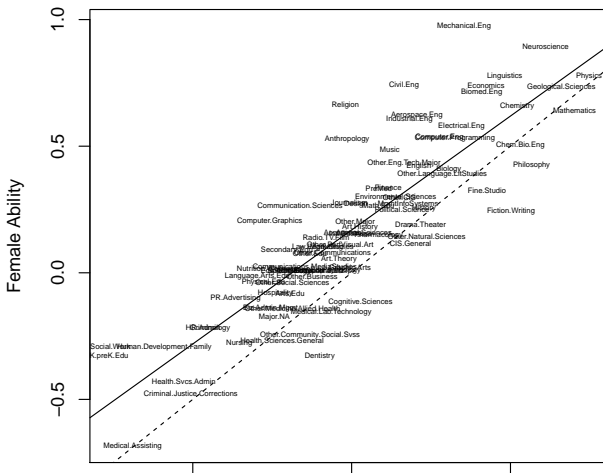
### Between group correlations of TAI



Between majors

# Majors ordered by male and female ability correlate .86 and females > males 76/89 majors

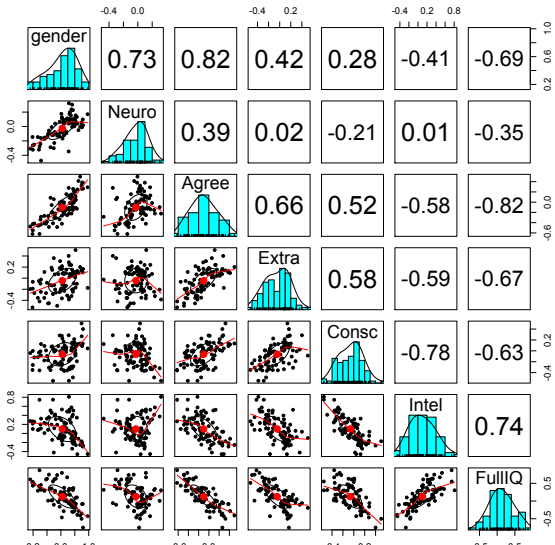
## Majors by male and female ability





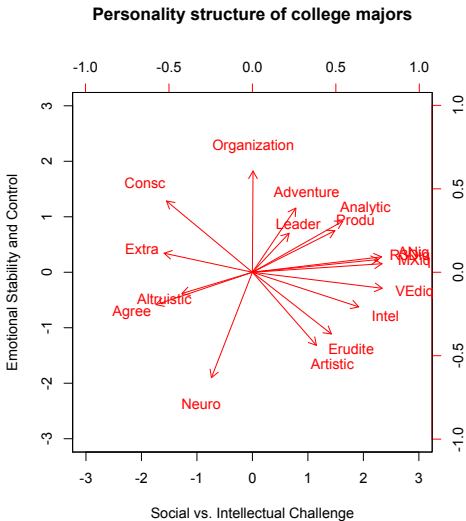
Between majors

# Scatter plot and unweighted between group correlations for ability and Big 5 Temperament (gender = % women in major)



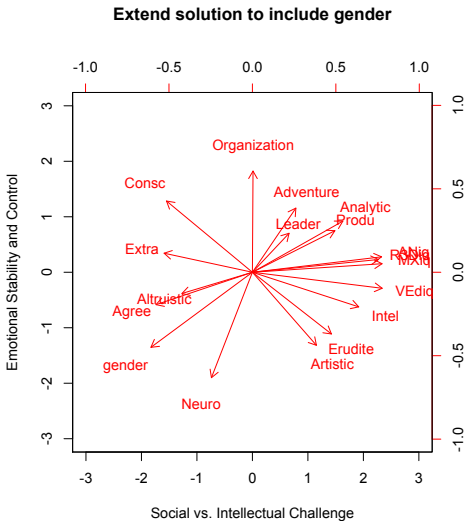
Between majors

# Factor structure of TAI based upon mean scores of college majors



Between majors

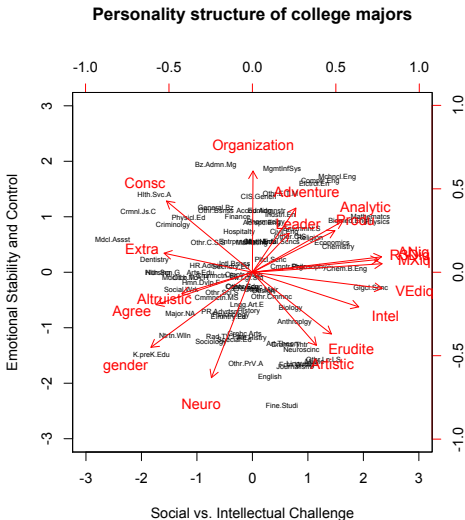
# Extend the solution to include percent females in each major





Between majors

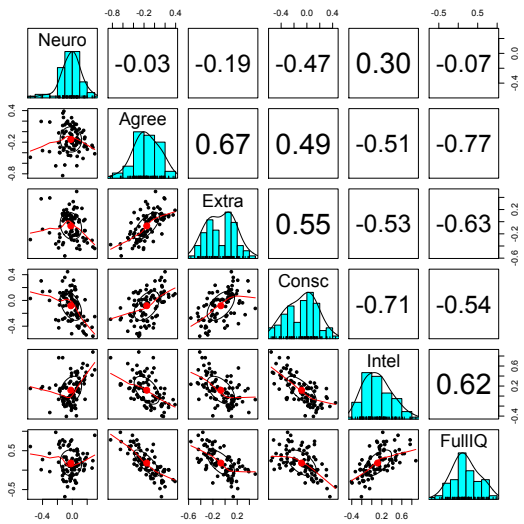
# A biplot of TAI and college majors locates majors in two space



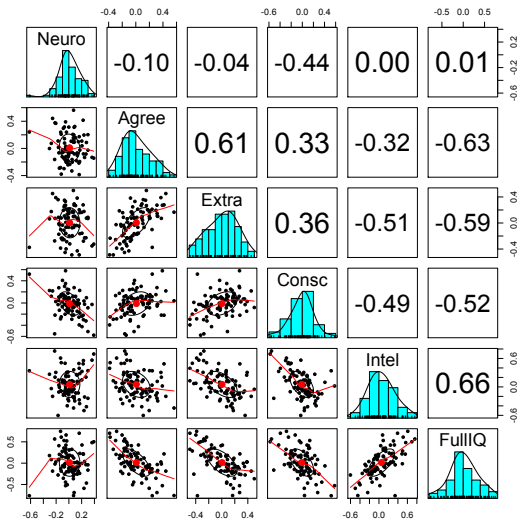
Talk time = 50% talk, 50% discussion

# Questions and Discussion?

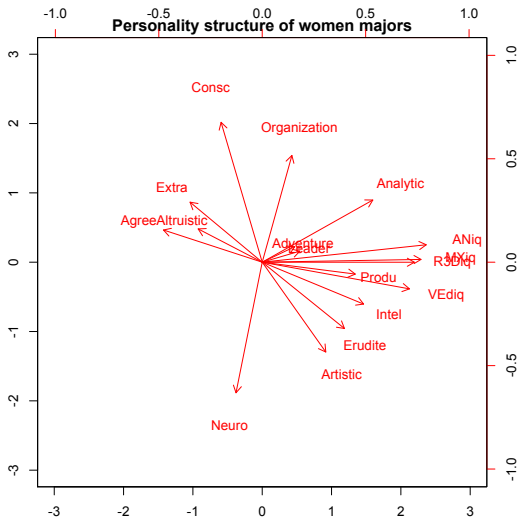
# The unweighted Temperament and Ability relationship between majors within women



# The unweighted Temperament and Ability relationship between majors within men

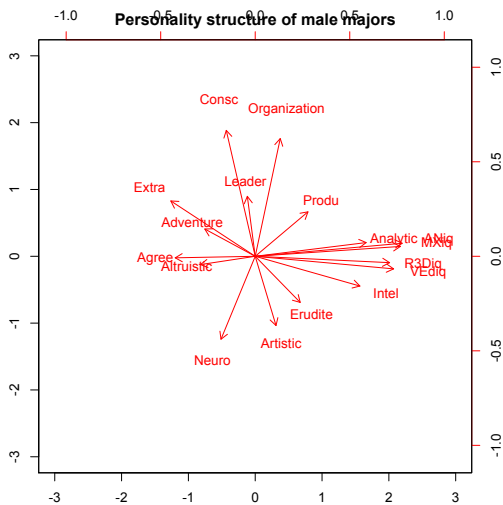


## The TAI structure between majors within women





## The TAI structure between majors within men

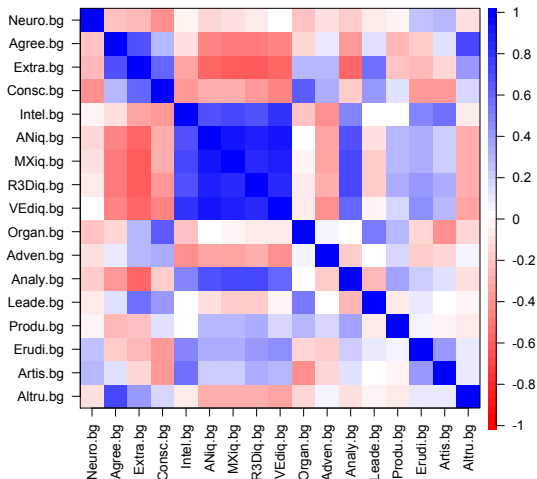






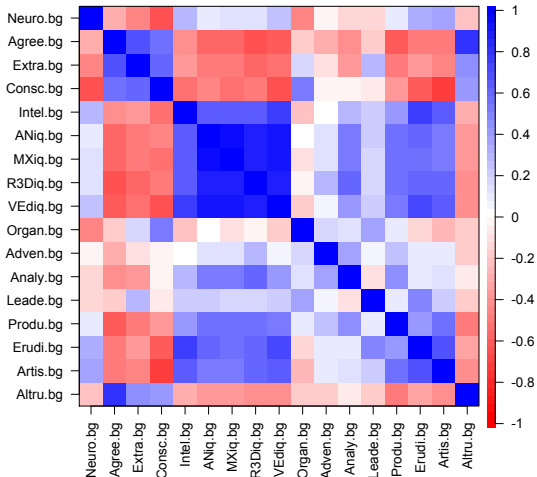
# Heat map of the the TAI structure between majors within men

Male -- Between group correlations



# Heat map of the the TAI structure between majors within women

Female -- Between group correlations



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