

Cohen Chapter 16

(Two-Way)  
Mixed

ANOVA

“There are only two mistakes one can make along the road to truth; not going all the way, and not starting.”

Buddha

*Dr. Professor is interested in determining whether the average man wants to express his worries to his wife more (or less) the longer they are married. However, it may depend on at what age the man was when he became married. So Dr. Professor administers the Expression scale at 1 year, 5 years, and 10 years after marriage and, at baseline, finds out the man's age at marriage (categorical with older, middle age, and younger).*

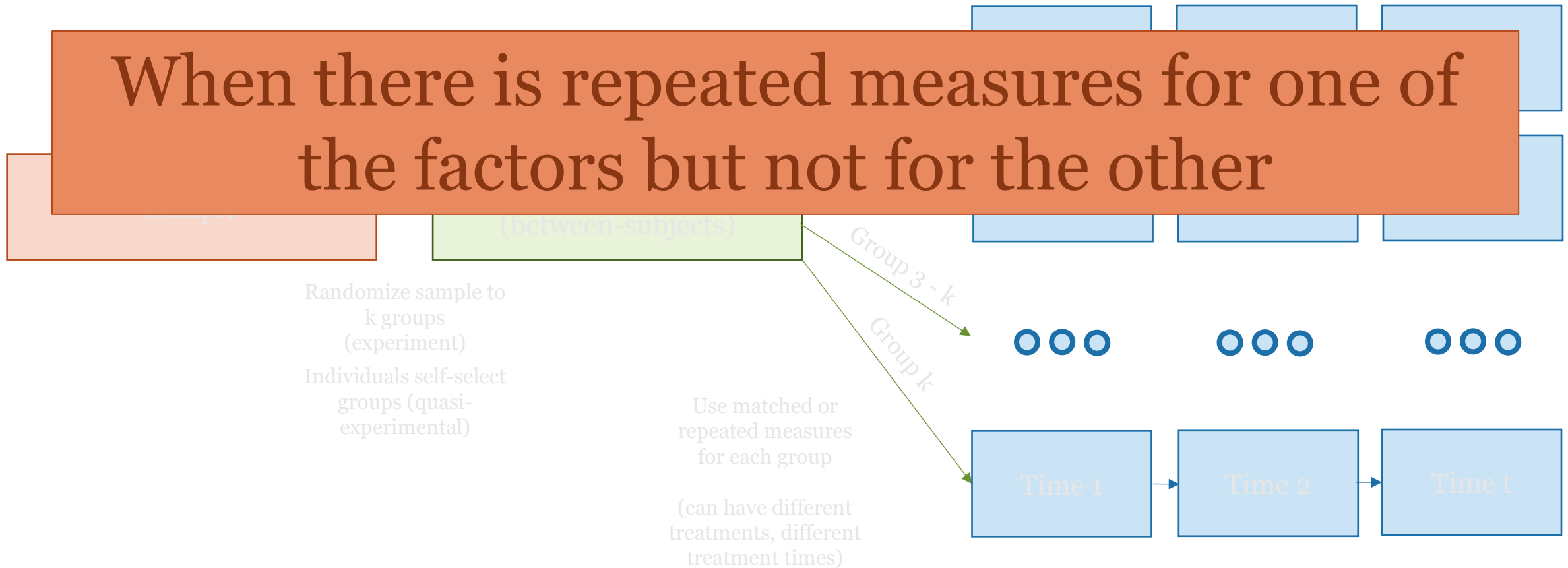
What is the repeated-measures (within-subjects) factor and what are its levels?  
What is the between-subjects factor and its levels?  
What is the outcome variable?

*Dr. Test wishes to compare reaction time differences for the three subtests of the Stroop Test in patients with Parkinson's Disease: Color, Word, and Color Word. Dr. Test believes that any differences may be influenced by the sex of the individual.*

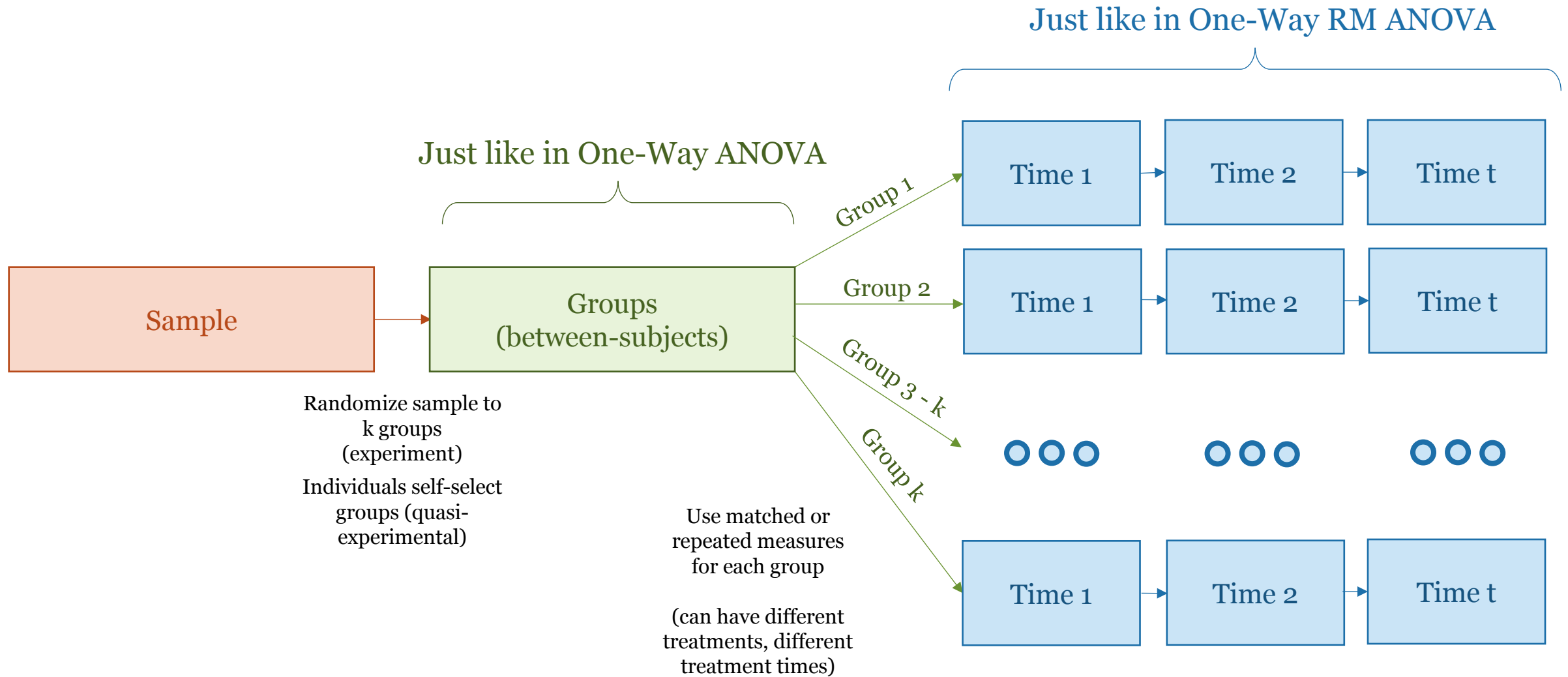
What is the repeated-measures factor and what are its levels?  
What is the between-subjects factor and its levels?  
What is the outcome variable?

# The Design of Mixed ANOVA

When there is repeated measures for one of the factors but not for the other



# The Design of Mixed ANOVA



# Analyzing the Between-Subjects Variability


- **Simple RM design:**

- We assess the general pattern across time
- We ignore the subject-to-subject variability (it is assumed to just be error)

- **Mixed Design:**

- We assess the general pattern across time and assess the subject-to-subject differences
- Some of the subject-to-subject variability is due to the difference in the levels of the between-subjects factor.

# Analyzing the Within-Subjects Variability

- We already have seen the calculation of an  $F$  ratio for the main effect of the repeated measures when we analyzed the one-way RM ANOVA
    - This  $F$  can now be recalculated to take into account the separation of subjects into subgroups (between-subjects factor), which decreases the error term.
    - *The numerator of  $F_{RM}$  won't change*
    - **The denominator will change**
      - Most of the  $S \times RM$  interaction is really due to a **group  $\times$  condition interaction**, which should be removed from the total  $S \times RM$  interaction.
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# Assumptions

- Normality

- Scores for each condition should be sampled from a normally distributed population

- Homogeneity of Variance

- Each population should have the same error variance

- Sphericity

- Same as before (essentially all individuals have similar patterns of change across conditions/time) but after accounting for any between-subjects factors



# Example of Mixed ANOVA