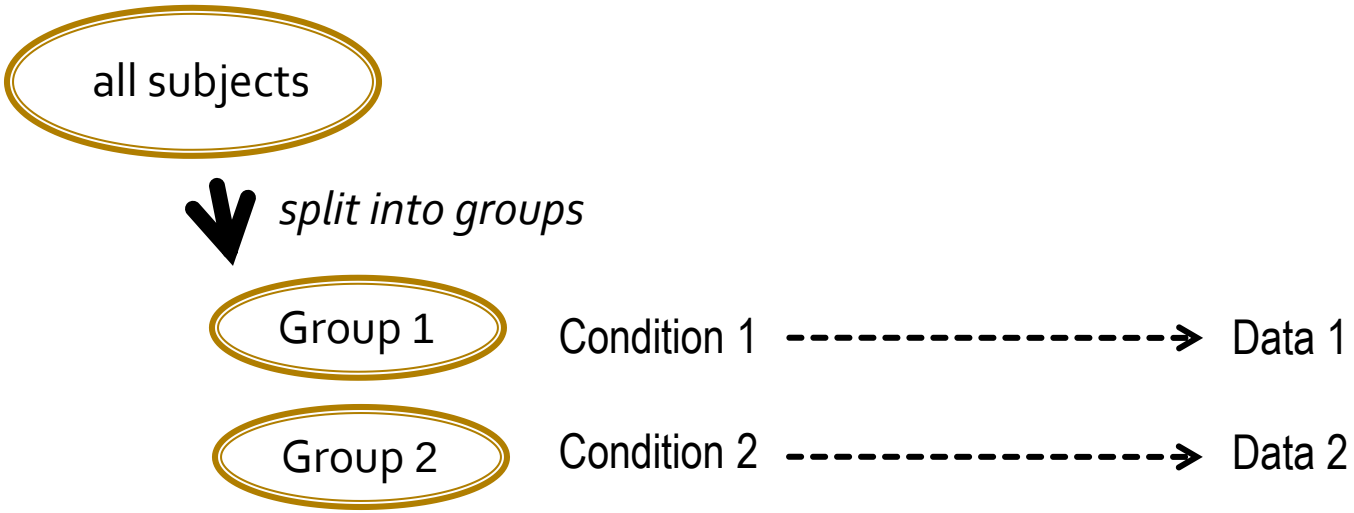
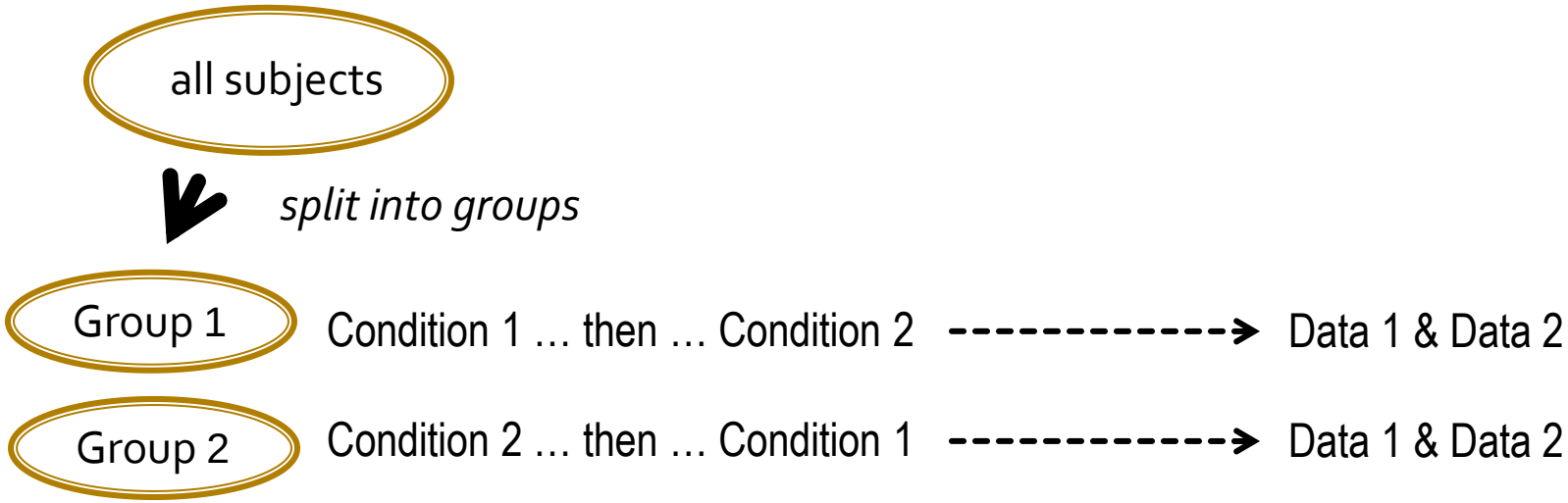
Between-subjects Design



Within-subjects Design



Between- vs Within-Subject Designs

- which potential confound was held constant
  and which was equalized on average?

  between-subjects:
  order held constant at "first" (and only)
  individual differences (hopefully) equalized

  within-subjects:
  individual differences held constant
  order equalized on average

Choosing the Design Type

- factors favoring between-subjects
  - interest in a subject variable (e.g., trait anxiety)
    (technically, this makes it a quasi-experiment)
  - need for a "vanilla" control condition
  - use of a long-lasting manipulation
  - use of a non-repeatable measure
  - strong demand characteristics coupled with a need for naïve subjects
- downside
  - requires many more subjects (to achieve equal power)

Choosing the Design Type

- factors favoring within-subjects
  - interest in a small effect / use of a "noisy" measure
  - heterogeneous subject population
  - very brief experiment
- downsides
  - increased demand characteristics
  - variety of possible carry-over effects

Random Assignment

- function
  to produce "equivalent groups"
  *- i.e., the **means**, across groups, of all EVs are equal*

- procedures
  1) "true" random assignment –

  2) blocked randomization –

  3) pseudo-randomization –

Random Assignment

- effectiveness

  quite high when the groups are large

- consequence of failure

  can be catastrophic – spurious, confound-driven effect

- alternative and/or additional procedures

  1) matching

  2) verification

  3) inclusion of covariates

Random Assignment – advanced tricks

- one common attribute
  you must already know the potential confounds
- 1) matching
  pre-measure the potential confounds
  assign subjects to groups in matched sets
  downside: requires two sessions
- 2) verification
  include measures of the potential confounds
  discard entire dataset if random assignment fails
  downside: possible waste of a lot of time & effort

Random Assignment – advanced tricks

- 3) inclusion of covariates

  include measures of the potential confounds

  (these measures must precede the manipulation)

  use these measures to remove (i.e., "control for") the effects of these variables during the analysis

  downsides: each covariate uses up one degree of freedom and might act as a demand characteristic

Counter-balancing

- function
  to equalize all sequence and order effects

- procedure
  1) complete counter-balancing –

  2) random partial counter-balancing –

  3) Latin square –

Counter-balancing

4) balanced Latin square – Latin square where each condition is also followed by each other condition exactly once

order #1	A	B	C	D
order #2	B	D	A	C
order #3	C	A	D	B
order #4	D	C	B	A

Counter-balancing

- effectiveness

  quite high under most conditions

- consequence of failure

  can be catastrophic – spurious, confound-driven effect

- when does counter-balancing fail?

  when the sequence or order effects are asymmetric
  (often called "asymmetric transfer")

  but, luckily, this can be detected statistically

  and then you switch to a between-subjects design