BLOCKS NEXT

FROM RANDOMISATION TO WEEK 4 · 6–8 MINUTES

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REVISIT THE ROOMS

Room	Control	Diet A	Diet B	Diet C
North	2	2	3	1
Central	2	1	1	4
South	2	3	2	1

Seed 123 was balanced overall, but not within rooms.

WHY ROOM MIGHT MATTER

Rooms may differ in:

- temperature or ventilation
- routine or staff access
- light, noise or disturbance
- equipment and measurement conditions

If those differences may affect the response, room is a plausible source of nuisance variation.

RESTRICT THE DRAW

Instead of shuffling all 24 labels together:

- place eight pens in each room group
- provide two labels for each diet in each room
- shuffle those eight labels within that room
- repeat independently for all rooms

The restriction fixes within-room replication; chance still fixes pen positions.

THE R STRUCTURE

```r
library("tibble")
library("dplyr")

pens <- tibble(
  pen_id = sprintf("P%02d", 1:24),
  room = rep(c("North", "Central", "South"), each = 8),
  position = rep(1:8, times = 3)
)

set.seed(123)
allocation_blocked <- pens |>
  group_by(room) |>
  mutate(diet = sample(rep(
    c("Control", "Diet A", "Diet B", "Diet C"), each = 2
  ))) |>
  ungroup()
```

NAME THE DESIGN

Block: a group of experimental units expected to be relatively similar.

Randomised complete block design:

- room is the block
- pen remains the experimental unit
- every block contains all four diet treatments
- treatments are randomised among pens within each block

NOT A FIXED PATTERN

Both arrangements could place two labels per diet in each room:

- randomly shuffle the eight labels within the room
- repeat Control, A, B, C, Control, A, B, C

Only the first is randomised. The second may align treatment with a position pattern and is predictable.

A TRADE-OFF

Blocking is helpful when blocks capture important variation.

It also:

- adds structure to allocation and analysis
- needs enough units for treatment replication within blocks
- can be inefficient if blocks are not informative
- must be planned before looking at outcomes

NEXT CLASS

In the Lego activity, you will:

- build blocked designs physically
- distinguish blocks from treatment factors
- construct factorial treatment combinations
- inspect what can be estimated from each design

For now, remember: **restrict for a stated design reason, then randomise within the restriction.**

SOURCES

Ruxton, Graeme D., and Nick Colegrave. 2016. *Experimental Design for the Life Sciences*. 4th ed. Oxford: Oxford University Press. Chapter 7, sections 7.1–7.4, pp. 101–108. ISBN 978-0-19-871735-5. Publisher page.

R Core Team. 2026. *R: A Language and Environment for Statistical Computing*. Vienna: R Foundation for Statistical Computing. R project.

Wickham, Hadley, et al. 2019. "Welcome to the tidyverse." *Journal of Open Source Software* 4 (43): 1686. doi:10.21105/joss.01686.