

Latin squares

EXPERIMENTAL DESIGN IN R



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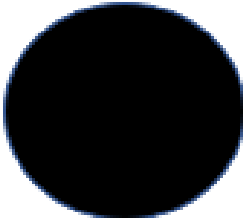




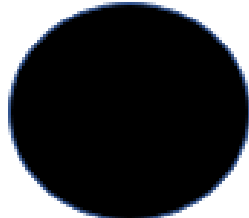




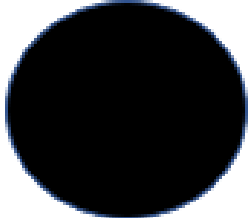
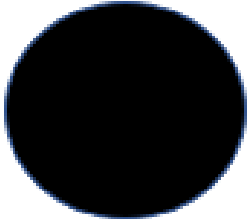



Latin squares

- Two blocking factors (instead of one)
- All factors must have the **same number of levels**
- Key assumption: the treatment and two blocking factors do **not** interact
- Analyze like a RCBD

Latin square diagram

B	A	C	D
D	C	A	B
C	B	D	A
A	D	B	C

Why is it a Latin square?

Intro to NYC scores

- `nyc_scores` is an NYC open dataset
 - Downloaded from Kaggle
- Includes:
 - All accredited NYC high schools
 - SAT scores (Reading, Writing, and Math)
 - 2014-2015 school year

Let's practice!
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Graeco-Latin squares

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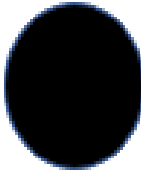
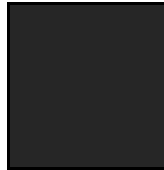




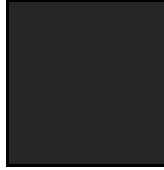
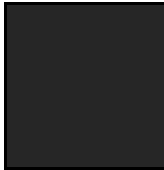







Graeco-Latin squares

- Three blocking factors
- All factors must have the **same number of levels**
- Key assumption: the treatment and three blocking factors do **not** interact
- Analyze like a RCDB

Graeco-Latin squares

C α	A δ	B β	D γ
A β	C γ	D α	B δ
B γ	D β	C δ	A α
D δ	B α	A γ	C β

GLS - explanation

 α	 δ	 β	 γ
 β	 γ	 α	 δ
 γ	 β	 δ	 α
 δ	 α	 γ	 β

Let's practice!
EXPERIMENTAL DESIGN IN R

Factorial experiments

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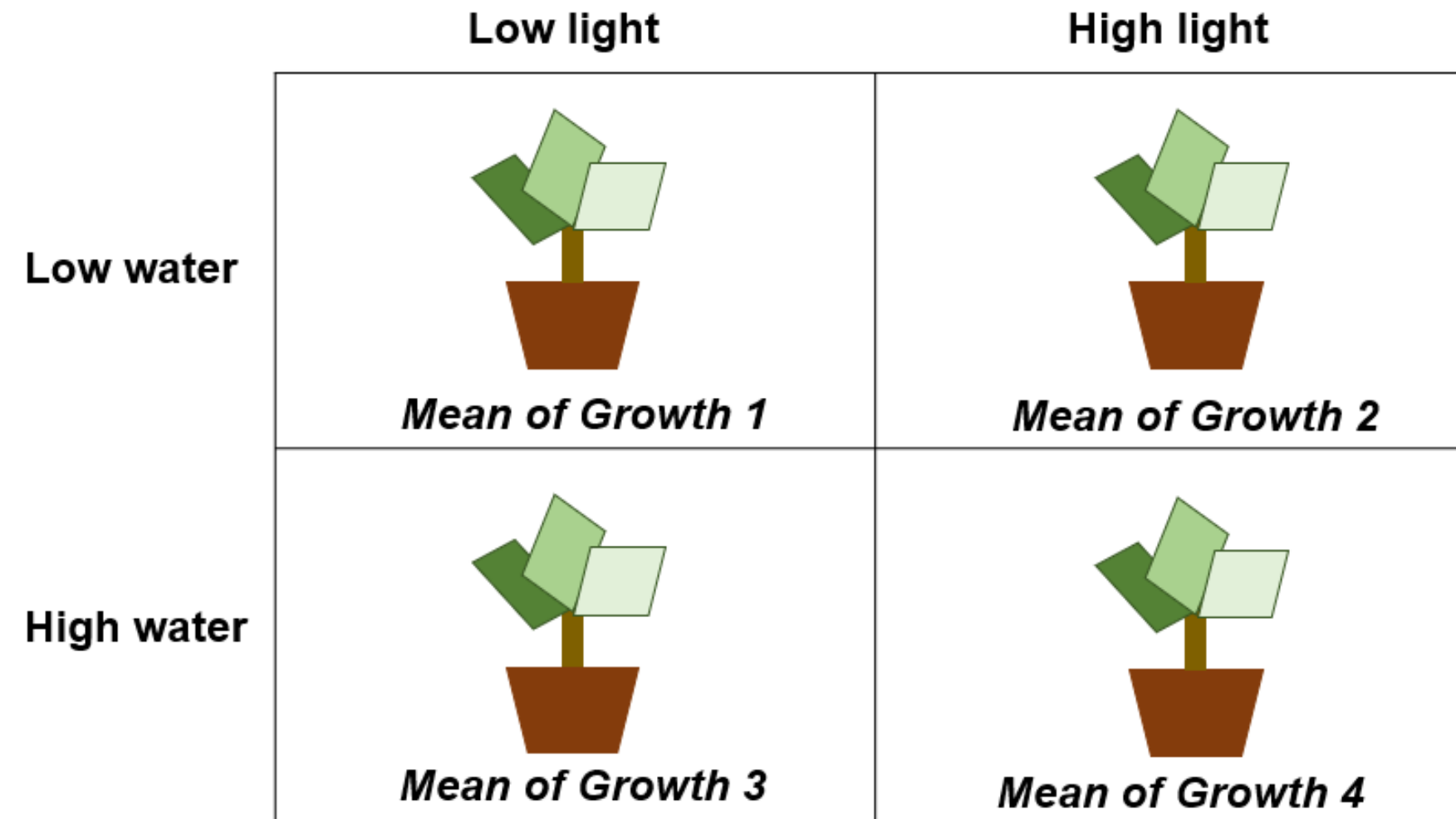


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Factorial designs

- 2 or more factor variables are combined and crossed
- All of the possible interactions between levels of factors are considered as effects on the outcome
 - Example: high/low water and high/low sunlight's effect on plant growth.

Factorial example



2^k factorial experiments

- 2^k factorial experiments involve k factor variables with 2 levels
- It results in 2^k number of combinations of effects to test
- Analyzed with a linear model and ANOVA
- Also use `TukeyHSD()` to determine which combinations are significantly different

Let's practice!
EXPERIMENTAL DESIGN IN R

What's next in experimental design?

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What's next?

- Other factorial designs (besides 2^k)
 - including fractional factorial designs
- Experiments with random factors
- Nested designs
- Split plot designs
- Lattice designs

Go forth and design experiments!

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