

experiment sandbox



resource: experimental design 4 the life sciences 4e
@cjlortie

factorial-design challenges

full-factorial experiment
has all levels of all factors
represented/crossed



design matrix thinking



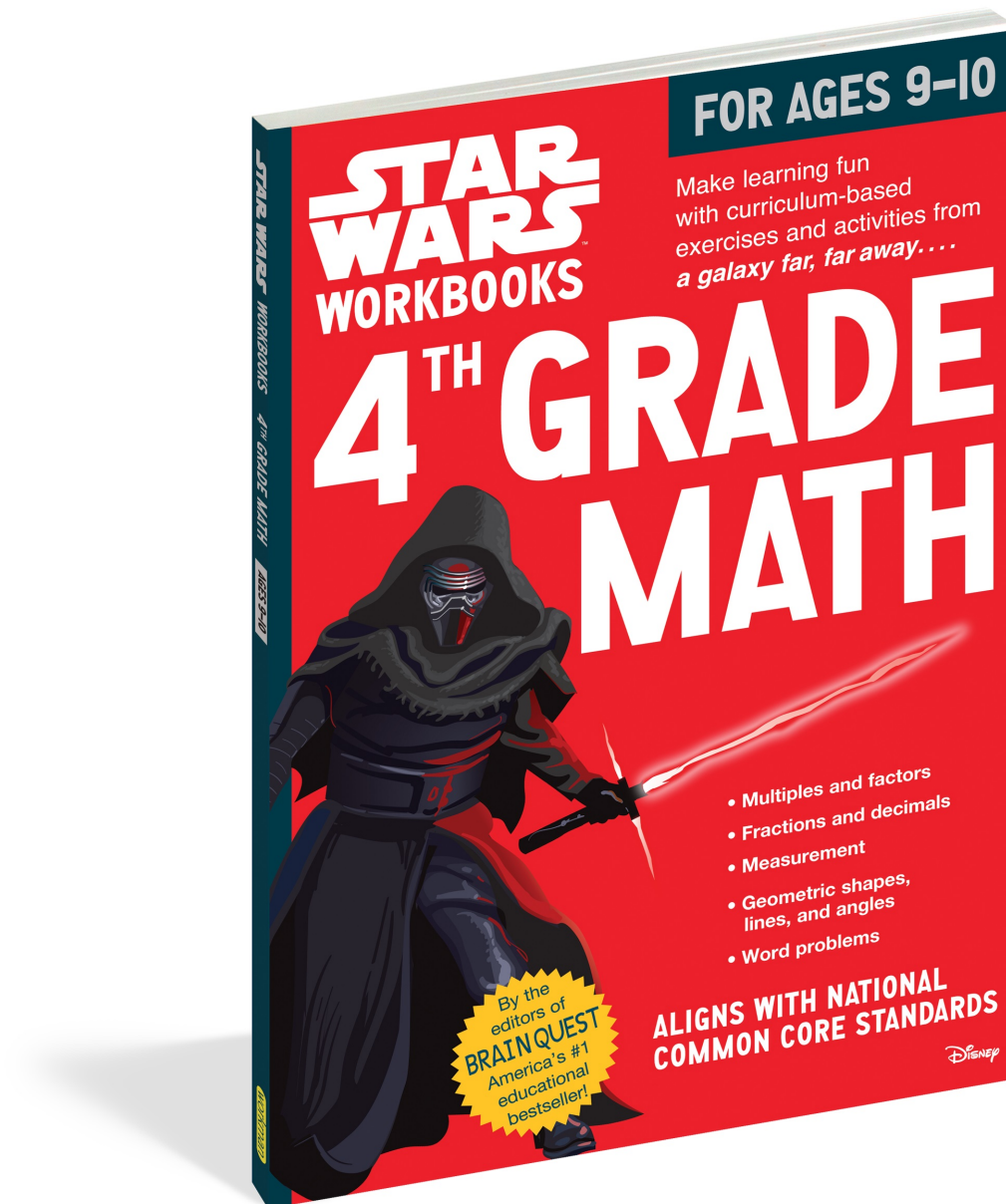
fully orthogonal designs easier to analyze & explain

main effects AND interaction terms



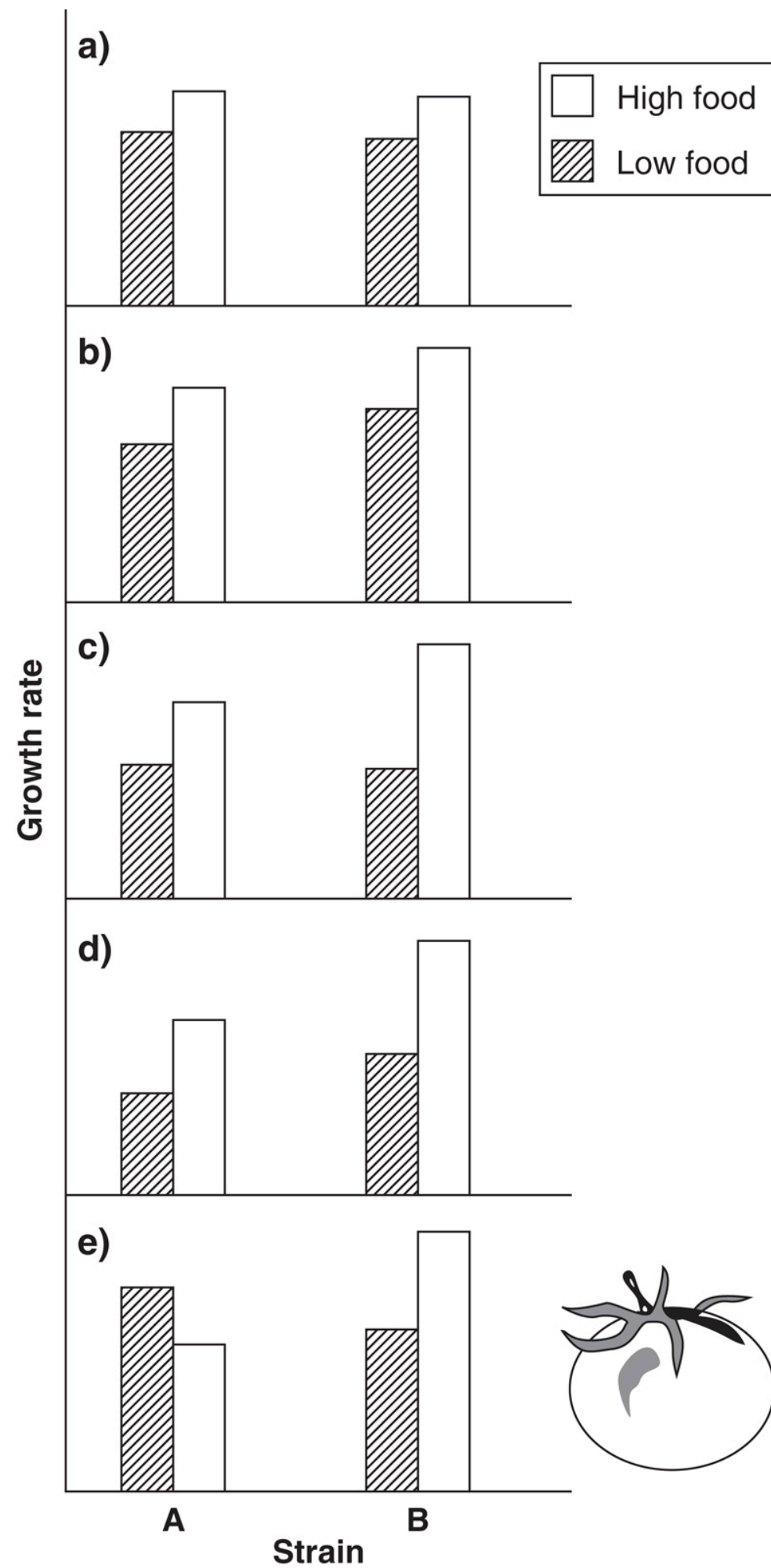
interaction terms are common and
facilitate a more complete understanding of the system

more than two-way interaction terms
are difficult to interpret



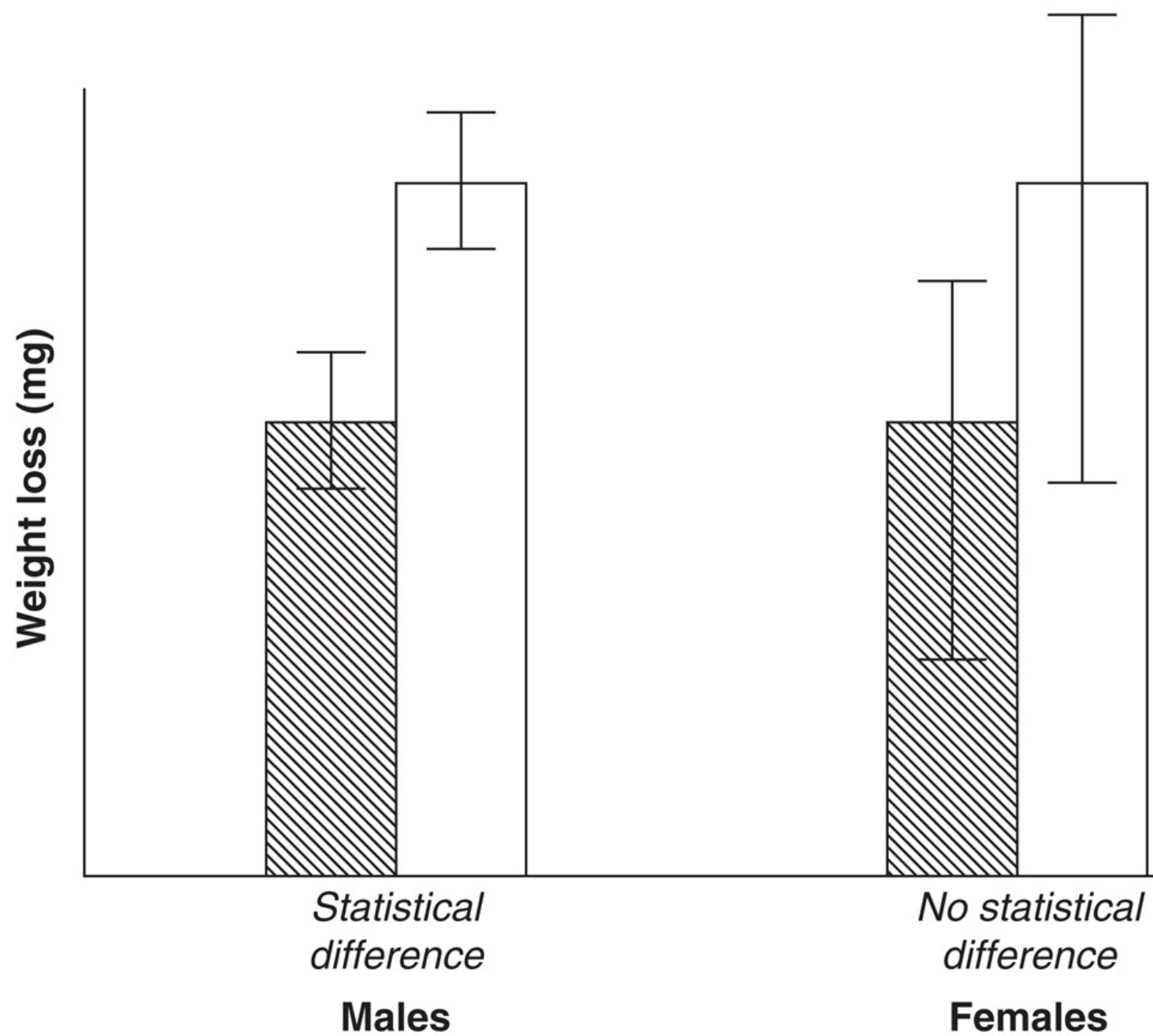
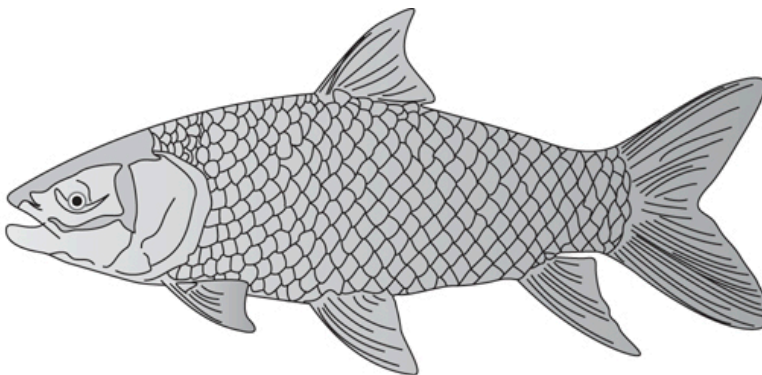
plan for parsimony

interaction terms
can include
both
changes
in magnitude
and
in sign





interaction terms can also include the collapse of differences



check all levels of all factors

different designs decide
the questions you can explore





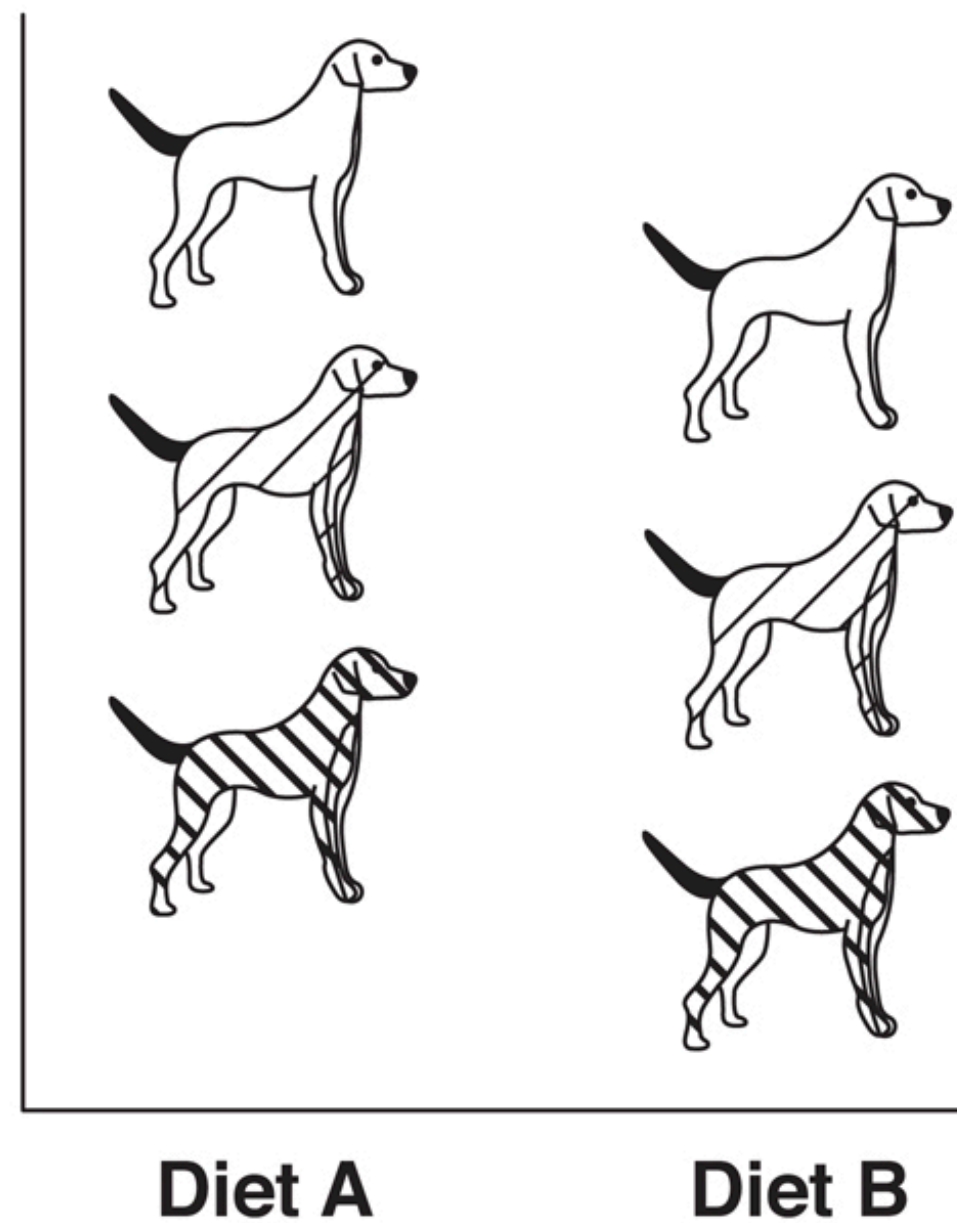
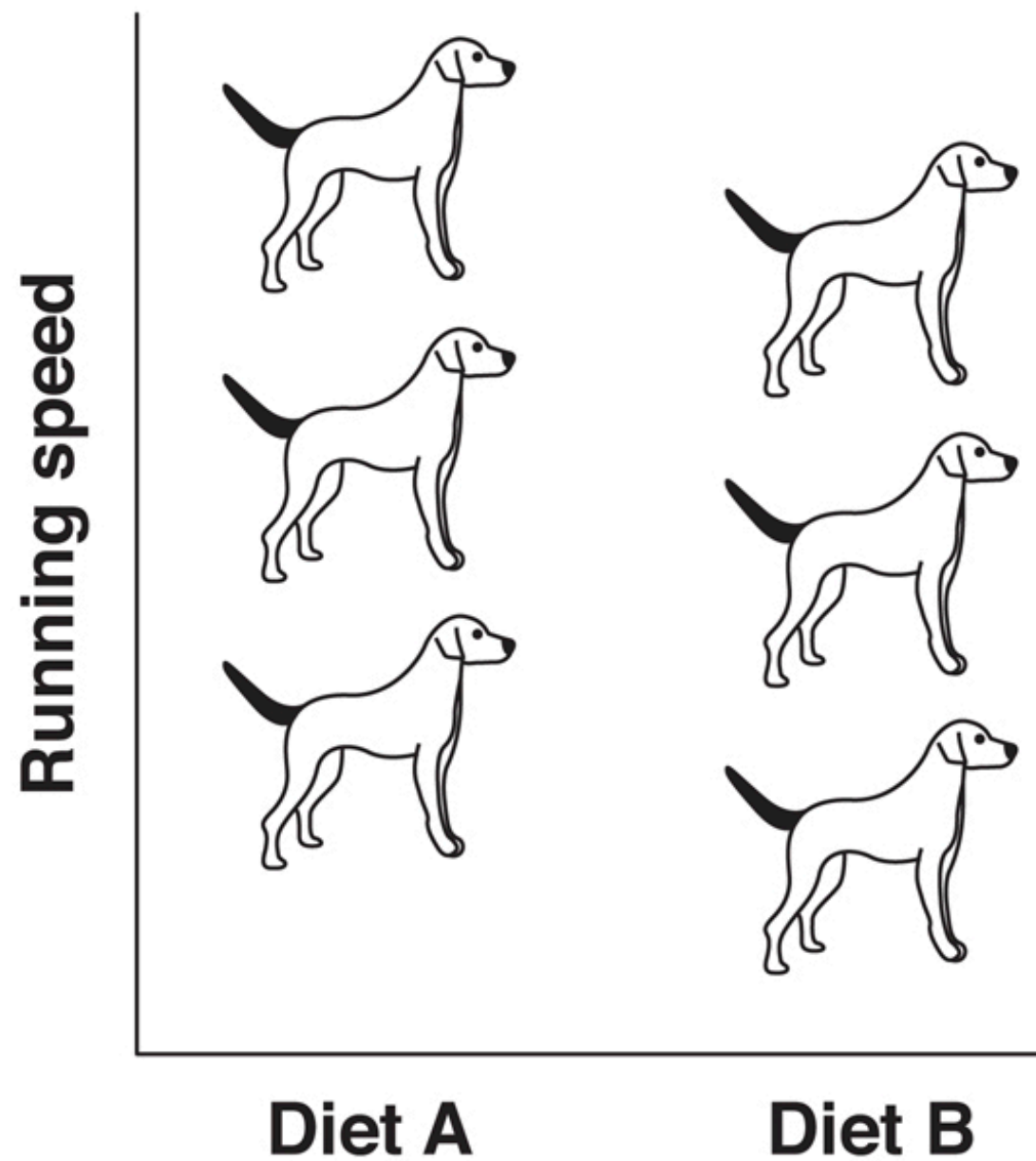
Fertilizer

Pesticide

Control

1-factor design with 3 levels of the factor (type of cultivation).

This can answer the questions:



avoid **split-plot** designs
unless real-world
limitations prevail

Full randomization

C	B
C	A
A	B

B	A
A	A
A	C

A	C
C	C
B	A

B	B
B	B
A	A

C	B
A	B
C	C

A	C
C	B
C	B

1	2	3
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Ploughing types

A	B	C
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Pesticide types

Split plot

A	B
C	A
B	C

A	C
A	B
B	C

B	C
C	A
A	B

B	B
A	A
C	C

C	B
A	C
B	A

C	A
B	B
A	C



SUDOKU!

CAREFULLY CUT OUT THE COUNTERS AND THE GRID. PLACE THE COUNTERS ON THE GRID SO THAT DARTH VADER, THE STORMTROOPER, C3PO AND R2D2 ONLY APPEAR ONCE IN EACH ROW AND COLUMN.

DECouPE SOIGNEUSEMENT LES PERSONNAGES ET LA GRILLE. PLACE LES PERSONNAGES SUR LE JEU AFIN QUE DARTH VADER, STORMTROOPER, C3PO ET R2D2 N'APPARAISSENT QU'UNE FOIS SUR UNE LIGNE ET UNE COLONNE.



Some examples of Latin square designs

3 x 3

3	A	B	C
2	B	C	A
1	C	A	B
	1	2	3

4 x 4

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

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

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

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

The first blocking factor (A) is represented by the columns and the second blocking factor (B) by the rows of these tables.

The treatment levels of factor C are represented by capital letters in the tables. Note the symmetry of these designs: each row is a complete block and each column is a complete block.

superb **short-cut** to reduce replication

BUT

each factor must have **same number of levels**

AND

one cannot test for **interaction terms**

consider the type of data you will collect
with a given design decision

