

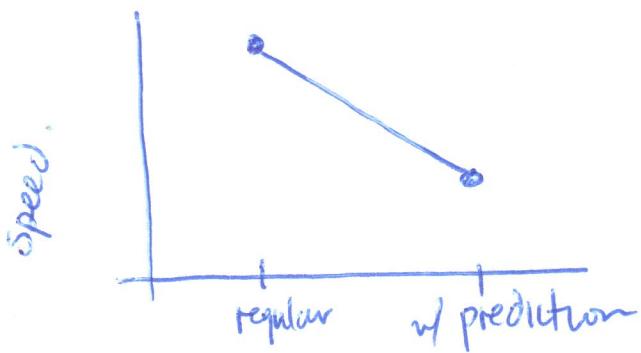
Interaction Effects:

y

- These happen in factorial designs when two (or more) variables we control have some combined effect — an effect that cannot be simply explained by one factor or another.
- Note: combined effect may be positive or negative.
- sugar + esp milk in coffee; smoking & asbestos.

Simple experiment: ~~keyboards~~ per

typing speed given regular Qwerty vs. Qwerty w/ prediction



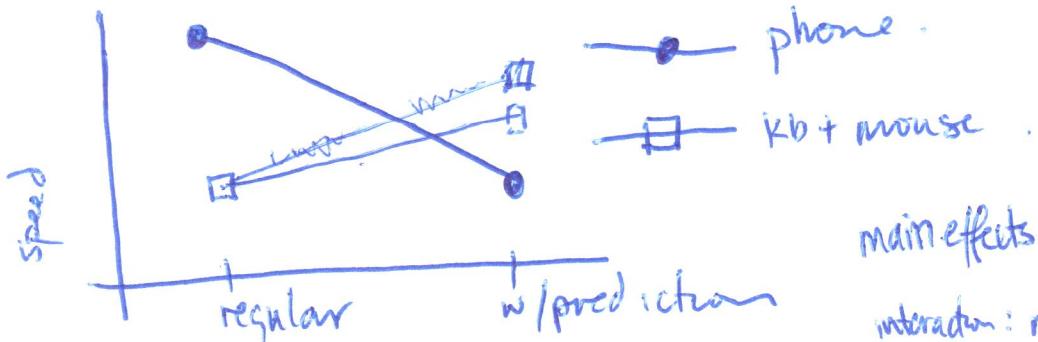
More complex:

typing speed w/ regular vs. w/ prediction

w/ phone X.

w/ phone vs. w/ keyboard + mouse.

⇒ "2x2 factorial design"

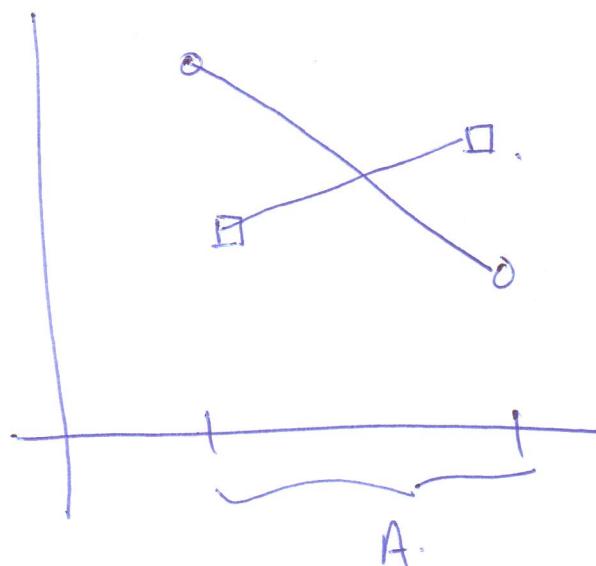


main effects: regular > w/predict
phone > kb.

interaction: non-parallel.

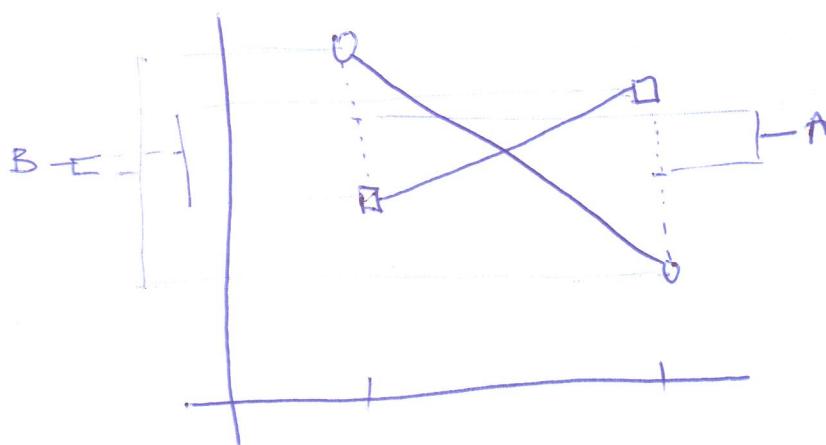
READING INTERACTION EFFECTS

1.5 /



B.
A.

2 levels of factor A
2 levels of factor B.



~~Interact~~

AxB = are lines parallel?

A:

B:

Read main effect for A:

are the averages at each level a_1 & a_2 equal?

If not \Rightarrow main effect

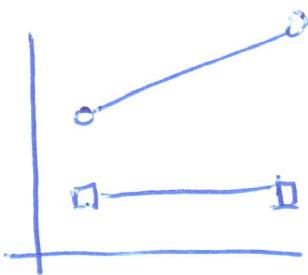
Read main effect for B

are the averages at each level b_1 & b_2 equal?

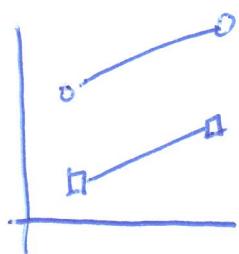
If not \Rightarrow main effect

Read interaction effect

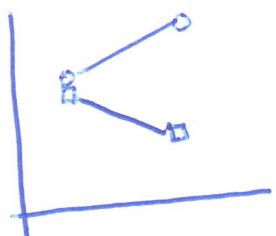
are lines parallel?
If not \Rightarrow interaction effect



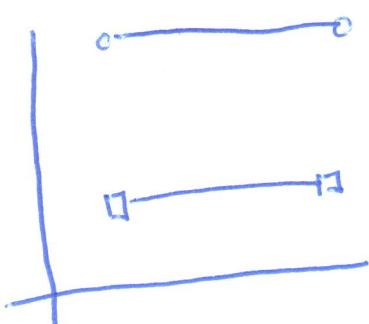
both main effects +
interaction .



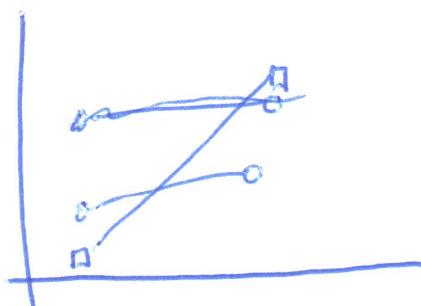
both main effects ,
no interaction .



~~both main effect~~,
one main effect ,
interaction .

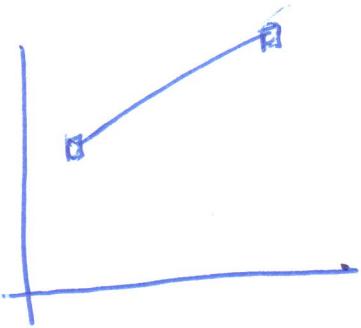


one main effect
no interaction

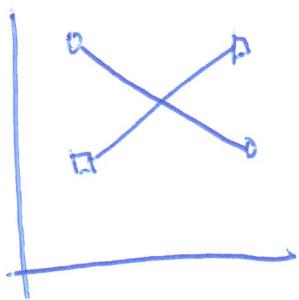


one main
no interaction .

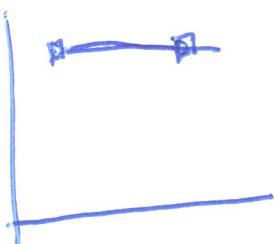
3/



one main
no int



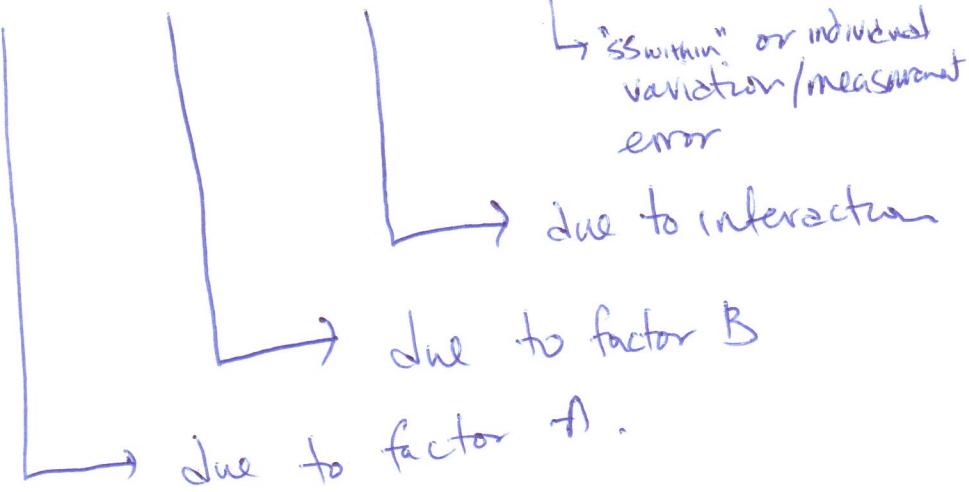
interaction,
no mains



no mains,
no interactions

In practice, we simply account for this with a brand new term: SS_{AB} .

$$SS_{\text{total}} = SS_A + SS_B + SS_{AB} + SS_{\text{error}}$$



How to calculate these terms: there are a number of different "types". In practice, we use Type III. Calculation is not meant to do by hand, I'll skip it.

"Lengths of worms".

The diagram shows the decomposition of "worm length" into several components. On the left, a drawing of a worm is labeled "worm length". To its right is an equals sign followed by a series of terms separated by plus signs. The first term is a wavy line labeled "default length". The second term is a wavy line with a vertical arrow labeled "amount of water". The third term is a wavy line with a vertical arrow labeled "quality of earth". The fourth term is a wavy line with a vertical arrow labeled "Interaction". The fifth term is a wavy line with a vertical arrow labeled "error". Above the first term is a bracket labeled "Lengths of worms". Above the last term is a bracket labeled "draw first".

$$\text{worm length} = \text{default length} + \text{amount of water} + \text{quality of earth} + \text{Interaction} + \text{error}$$