

Factorial Hypotheses

- Some review & practice
- Identifying main effect and interaction RH:
- Explicit factorial RH:
- “Blending” interaction and main effect RH:
- Implied RH: involved in programmatic research

Review #1-- interaction

Task Difficulty	Task Presentation	
	Paper	Computer
Easy	90	70
Hard	40	60

1) Put in a $<$, $>$ or $=$ to indicate the pattern of the simple effect of Task Presentation for Easy Tasks

2) Put in a $<$, $>$ or $=$ to indicate the pattern of the simple effect of Task Presentation for Hard Tasks

3) Is there an interaction? Is the simple effect of Task Presentation the same for Easy and for Hard Tasks ???

4) Write-up the pattern of the interaction...

Review #1-- 1st main effects

Task Difficulty	Task Presentation	
	Paper	Computer
Easy	90	70
Hard	40	60

1) Compute the marginal means for Task Presentation.

2) Put in a $<$, $>$ or $=$ to indicate the pattern of the main effect of Task Presentation

3) Is there a main effect of Task Presentation ???

4) Is the pattern of the main effect of Task Presentation descriptive or potentially misleading (is the pattern of the main effect of Task Presentation the same as the patterns of the simple main effects of Task Presentations for Easy and Hard Tasks ?

5) Write-up the main effect

Review #1-- 2nd main effects

1) Compute the marginal means for Task Difficulty

Task Difficulty	Task Presentation	
	Paper	Computer
Easy	90	70
Hard	40	60

2) Put in a $<$, $>$ or $=$ to indicate the pattern of the main effect of Task Difficulty

3) Is there a main effect of Task Difficulty ???

4) Is the pattern of the main effect of Task Difficulty descriptive or potentially misleading (is the pattern of the main effect of Task Difficulty the same as the patterns of the simple main effects of Task Difficulty for Computer and Paper Presentations ?

5) Write-up the main effect



RH: for Factorial Designs

Research hypotheses for factorial designs may include

- RH: for main effects
 - involve the effects of one IV, while ignoring the other IV
 - tested by comparing the appropriate marginal means
- RH: for interactions
 - usually expressed as “different differences” -- differences between a set of simple effects
 - tested by comparing the results of the appropriate set of simple effects
 - That’s the hard part -- determining which set of simple effects gives the most direct test of the interaction RH:

Is each an Interaction or a Main Effects RH:??? (Hint – read them in pairs!)

Males tend to outperform females on standardized math tests.

Males tend to outperform females on standardized math tests, however the difference decreases with age.

Improvement during therapy for depression occurs faster for those receiving cognitive-behavioral therapy than for those receiving traditional psychodynamic therapy.

Therapy for depression is generally effective.

Young girls and boys have similar overall skill levels.

Young girls have better verbal skills than motor skills, however young boys have better motor skills than verbal skills.



Sometimes the Interaction RH: is explicitly stated

- when that happens, one set of SEs will provide a direct test of the RH: (the other won't)

Here's an example:

Easy tasks will be performed equally well using paper or computer presentation, however, hard tasks will be performed better using computer presentation than paper.

Task Diff.	Presentation	
	Comp	Paper
Easy	=	
Hard	>	

This is most directly tested by inspecting the simple effect of paper vs. computer presentation for easy tasks, and comparing it to the simple effect of paper vs. computer for hard tasks.

Your Turn – “Draw the boxes” & use <, > or = to depict the interaction.
Tell which set of SEs you will use!

Young boys will rate playing with an electronic toy higher than playing with a puzzle, whereas young girls will have no difference in ratings given to the two types of toys. (DV = toy rating)

Gender	Type of Toy	
	Elec.	Puzzle
Boys		
Girls		

Type of Evidence	Rater	
	Judge	Lawyer
Confession		
Witness		

Judges will rate confessions as more useful than eyewitness testimony, whereas Lawyers will rate eyewitness testimony as more useful than confessions. (DV = usefulness rating)



Sometimes the set of SEs to use is “inferred” ...

Often one of the IVs in the study was used in previous research, and the other is “new”.

- In this case, we will usually examine the simple effect of the “old” variable, at each level of the “new” variable
- this approach gives us a clear picture of the replication and generalization of the “old” IV's effect.

e.g., Previously I demonstrated that computer presentations lead to better learning of statistical designs than does using a conventional lecture. I would like to know if the same is true for teaching writing.

Let's take this “apart” to determine which set of SEs to use to examine the pattern of the interaction...

Previously I demonstrated that computer presentations lead to better learning of statistical designs than does using a conventional lecture. I would like to know if the same is true for teaching writing.

Here's the design and result of the earlier study about learning stats.

Type of Instruction	
Comp	Lecture
	>

Here's the design of the study being planned.

Topic	Type of Instruction	
	Comp	Lecture
Stats		
Writing		

What cells are a replication of the earlier study?

So, which set of SEs will allow us to check if we got the replication, and then go on to see if we get the same results with the new topic?

Yep, SE of Type of Instruction, for each Topic ...

Your Turn – “Draw the boxes” & use <, > or = to depict the interaction.

#1 I have previously demonstrated that rats learn Y-mazes faster than do hamsters. I wonder if the same is true for radial mazes? (DV = time to complete maze)

Species	Maze	
	Y	Radial
Rat		
Hamster		

Topic	Major	
	Psych	Soc
Statistics		
Ethics		

#2 I've discovered that Psyc and Soc majors learn statistics about equally well. My next research project will also compare these types of students on how well they learn research ethics. (DV = % correct on exam)

Sometimes the RH: about the interaction and one of the main effects are “combined”

- this is particularly likely when the expected interaction pattern is of the > vs. > type

Here's an example...

Group therapy tends to work better than individual therapy, although this effect is larger for patients with social anxiety than with agoraphobia.

Anxiety	Type of Therapy	
	Group	Indiv.
Social		>
Agora.		>

Int. RH:

Main effect RH:

So, we would examine the interaction by looking at the SEs of Type of Therapy for each type of Anxiety.

Your Turn – “Draw the boxes” & use <, > or = to depict the interaction.
 Tell which set of SEs you will use!

Young girls have better verbal skills than motor skills, however the difference gets smaller with age (DV = skill score)

Age	Type of Skill	
	Verbal	Motor
4 yrs		
9 yrs		

Type of Evidence	Rater	
	Judge	Jurors
Confession		
Witness		

Confession is considered more convincing than eyewitness testimony. This preference is stronger for jurors than for judges.
 DV = convincingness rating)