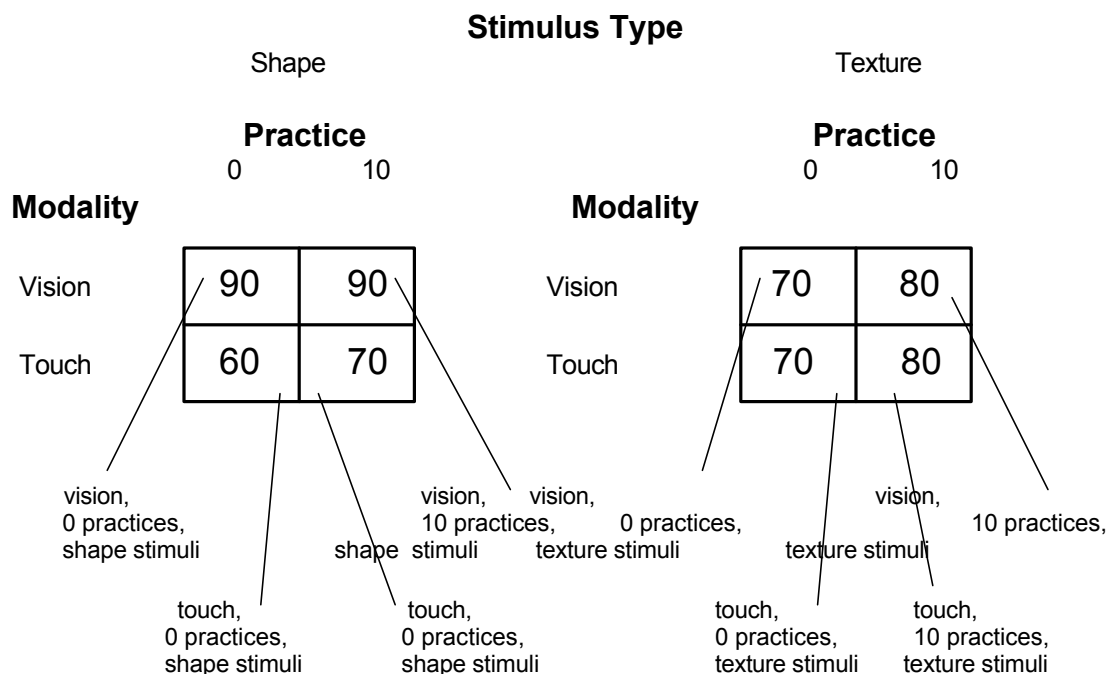


## Example of a 3-way Factorial

The purpose of the design was to examine the individual and joint effects of Stimulus Type (shape vs. Texture stimuli), Modality (vision vs. touch) and Practice (0 vs. 10 practices) upon discrimination performance. The DV is given as %-correct.

### Effects Examined in the Design

- Main effects – the effect of one IV, ignoring the other two IVs (based on comparisons among marginal means that are formed for each condition of the IV, aggregating across levels of the other two IVs).
  - there are three main effects in this design
    - Stimulus Type
    - Modality
    - Practice
- 2-way Interaction Effects – the joint effect of two IVs, ignoring the third IV (based upon comparisons among semi-marginal means that are formed for each joint condition of the two IVs, aggregating across the levels of the third IV)
  - there are three 2-way interactions in this design
    - Stimulus Type x Modality
    - Stimulus Type x Practice
    - Modality x Practice
- 3-way Interaction Effect -- the joint effect of three IVs (based upon comparisons among cell means)
  - there is one 3-way interaction – Stimulus Type x Modality x Practice

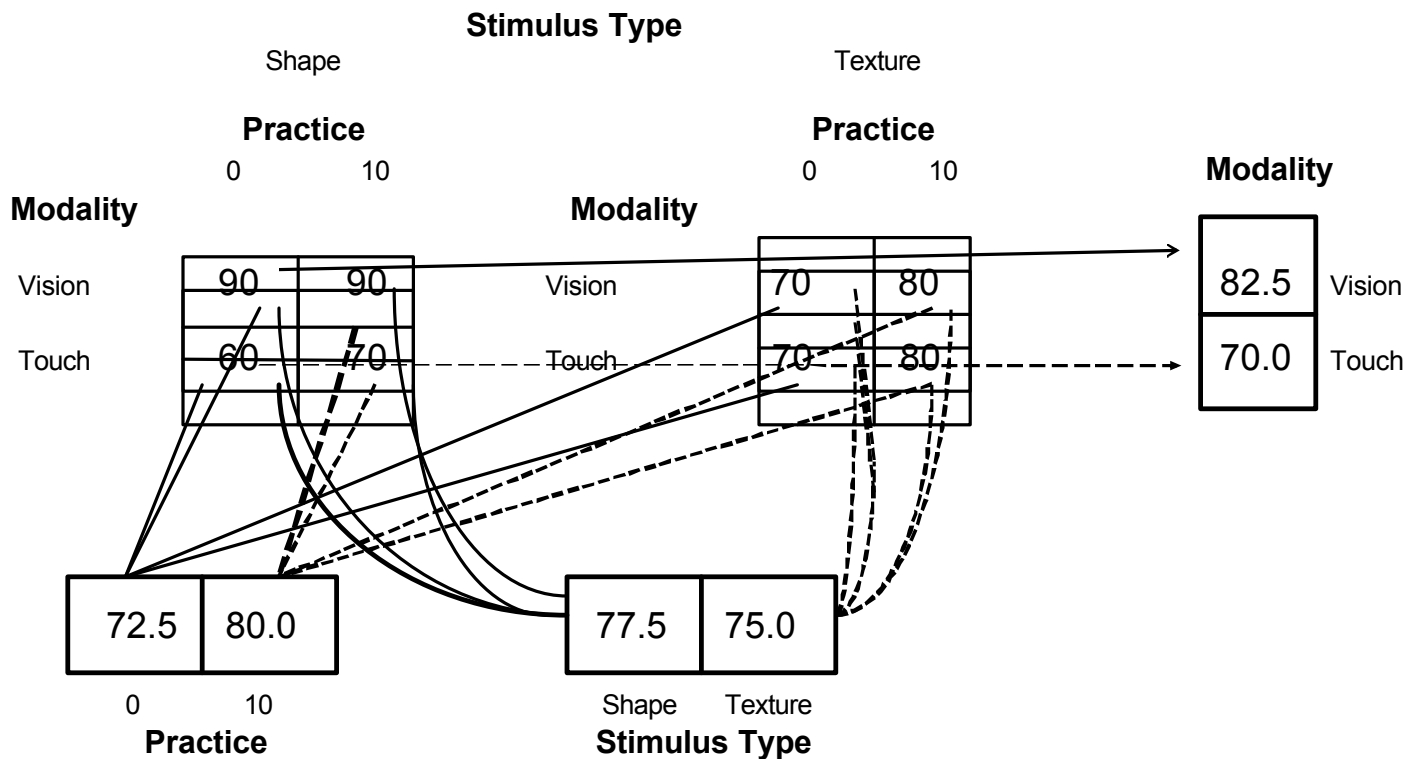


### Stimulus Type x Modality x Practice 3-way Interaction

Notice that this description focuses on practice effects, looking at how they differ for each modality, and how this practice by modality difference differs across types of stimuli.

There is a three way interaction or stimulus type, modality and practice, as they relate to performance. There is no modality by practice effect for texture stimuli, however for shape stimuli the pattern of this interaction is that visual performance is not improved by practice, whereas touch performance is.

### Constructing Marginal Means to Examine Main Effects



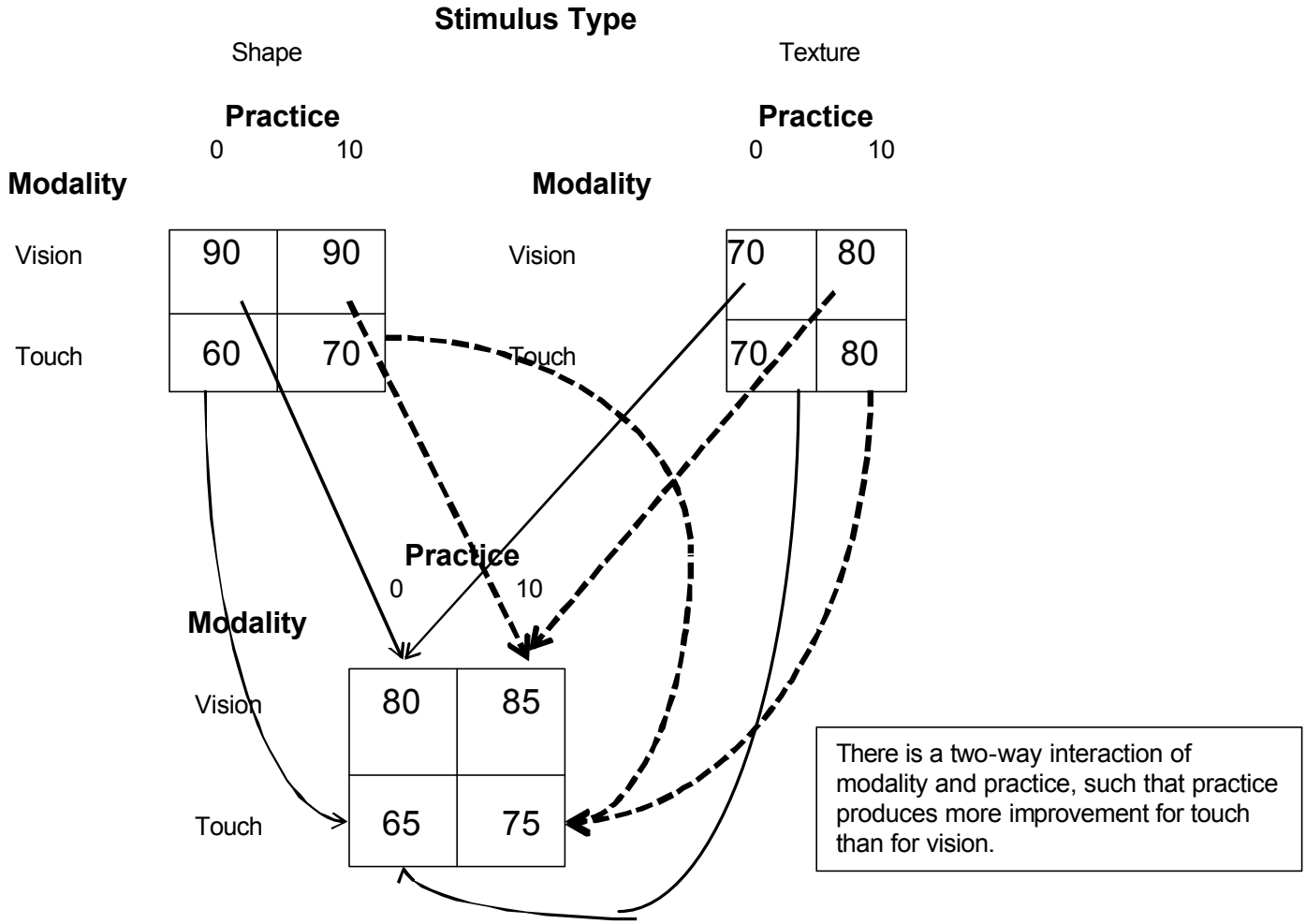
### Key

Main Effect of Modality	Vision	—————	vs. Touch	- - - - ->
Main Effect of Practice	0	—————	vs. 10	- - - - -
M E of Stimulus Type	Shape	⤵	vs. Texture	-

### Checking for "descriptive" vs. "potentially misleading" main effects

- for the main effect of **Practice** ( $0 < 10$ ) to be descriptive, the effect of practice must be the same at each of the four combinations of modality and stimulus, let's check
  - for vision with shape stimuli  $90 = 90$  not consistent with the main effect ← tells ME is misleading
  - for touch with shape stimuli  $60 < 70$  consistent with the main effect
  - for vision with texture stim  $70 < 80$  consistent with the main effect
  - for touch with texture stim  $70 < 80$  consistent with the main effect
- the main effect of **Stimulus Type** is  $77.5 > 75$  -- is this descriptive?
  - for vision with 5 practices
  - for vision with 10 practices
  - for touch with 5 practices
  - for touch with 10 practices
- the main effect of **Modality** is  $82.5 > 70$  -- is this descriptive? (what do we check)
  - 
  - 
  - 
  -

## Constructing Semi-Marginal Means to Examine 2-way Interactions (1st of 3)



### Modality x Practice 2-way Interaction

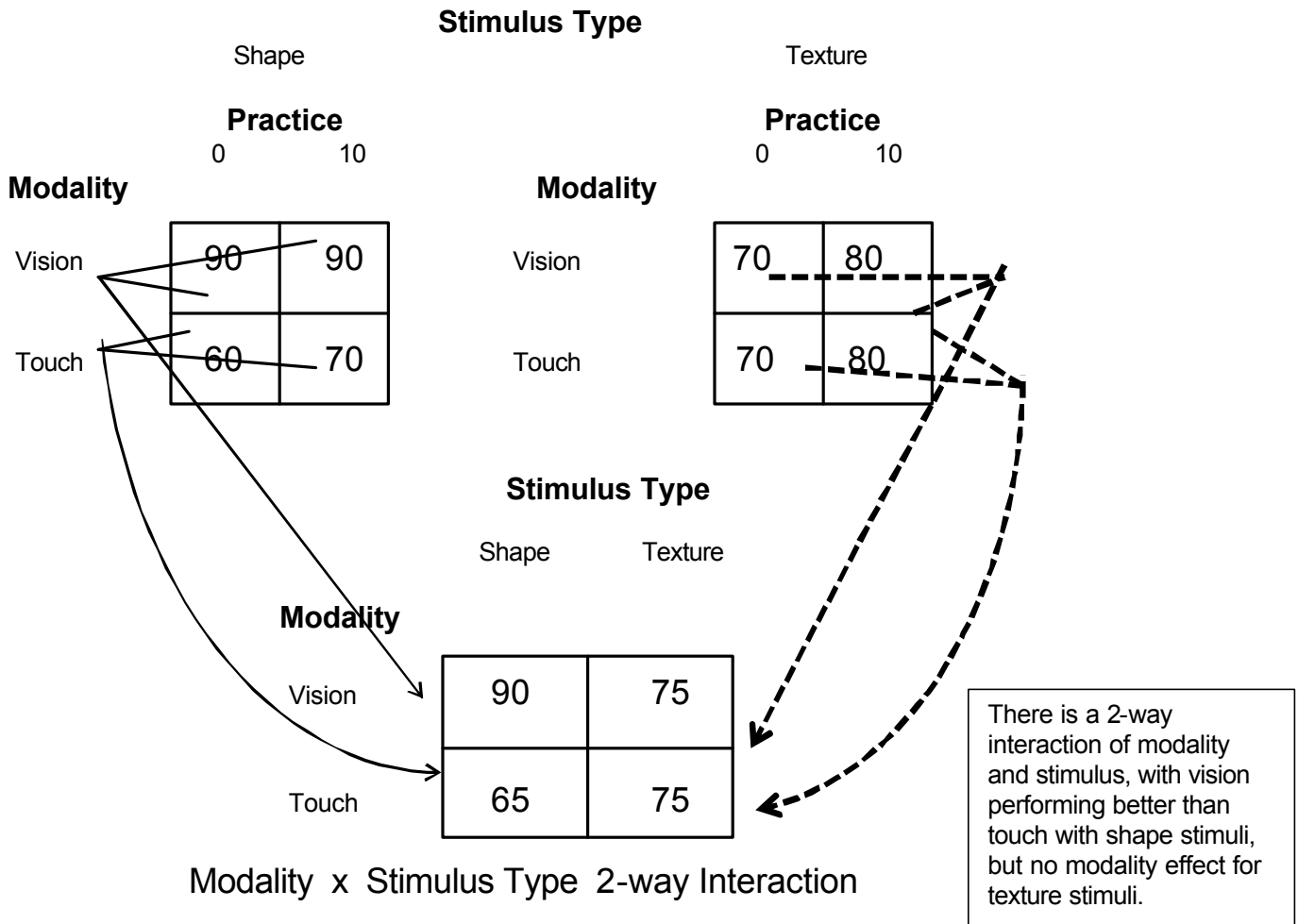
#### Key

Vision with 0 Practices	—————
Vision with 10 Practices	- - - - -
Touch with 0 Practices	—————
Touch with 10 Practices	- - - - -

### Checking for "descriptive" vs. "potentially misleading" 2-way interactions

For the modality by practice interaction described above to be descriptive, it must be the same for both shape and texture stimuli. Notice that there is no simple 2-way of practice X modality for texture stimuli. Also, while there is a simple 2-way of practice X modality for shape stimuli, it doesn't have the same pattern as the overall practice X modality interaction. So, this 2-way interaction is definitely misleading; the pattern of the practice X modality interaction **depends upon** the type of stimulus being used.

# Constructing Semi-Marginal Means to Examine 2-way Interactions (2<sup>nd</sup> of 3)



## Key

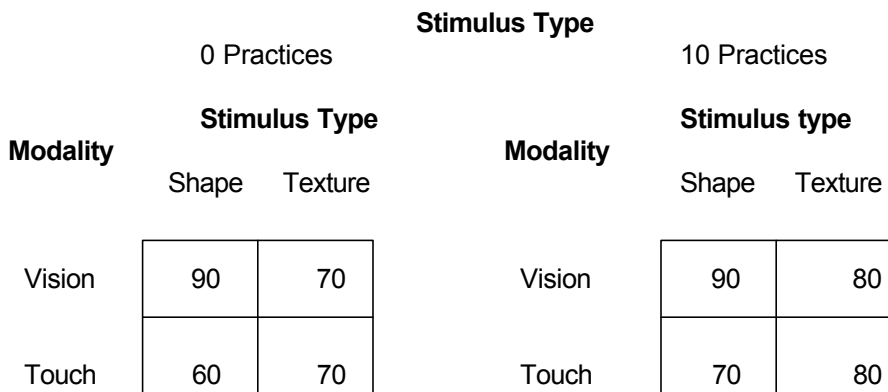
Vision with Shape Stimuli —————

Touch with Shape Stimuli —————

Vision with Texture Stimuli - - - - -

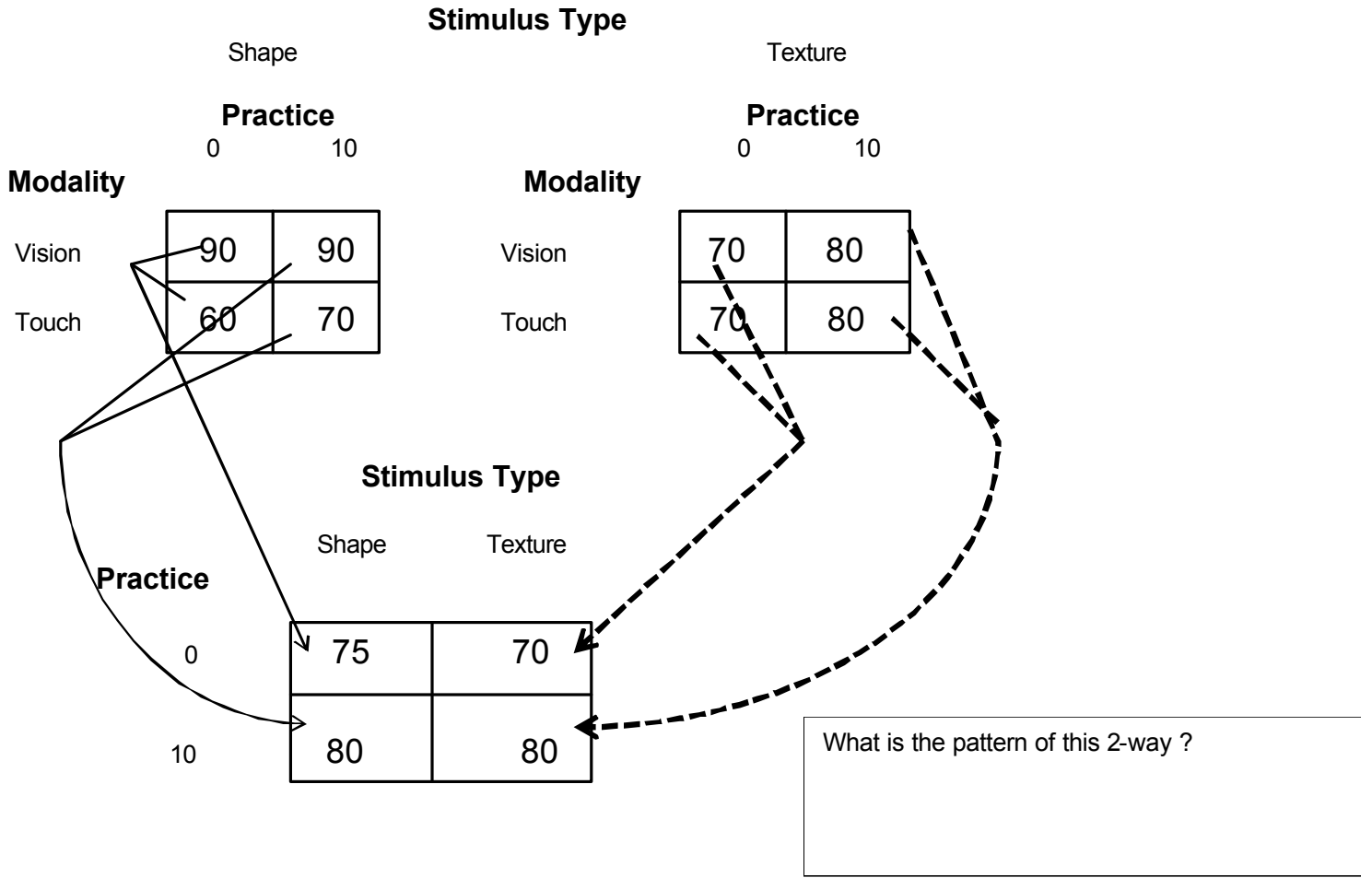
Touch with Texture Stimuli - - - - -

For the modality X stimulus interaction specified above to be "descriptive", there must be the same pattern of this 2-way interaction each amount of practice. To check this more easily, we can re-arrange the cell means ...



You can see that the basic pattern of the 2-way is the same as each of the simple 2-ways, so the overall 2-way interaction of Modality X Stimulus Type is descriptive.

# Constructing Semi-Marginal Means to Examine 2-way Interactions (3rd of 3)



Practice x Stimulus Type 2-way Interaction

## Key

- Shape Stimuli with 0 Practices ———
- Texture Stimuli with 0 Practices - - - - -
- Shape Stimuli with 10 Practices ~~~~~
- Texture Stimuli with 10 Practices - - - - -

For the Practice X Stimulus Type you just described to "be descriptive" it must have the same pattern for both vision and touch. Fill in the boxes below with the correct cell means, and determine whether this overall 2-way interaction is descriptive of potentially misleading.

		Modality			
		Vision		Touch	
		Stimulus Type		Stimulus Type	
Practice	Shape	Texture	Practice	Shape	Texture
0			0		
10			10		

Well ???