

The background of the slide features three large, overlapping circles in a medium blue color, set against a dark gray background. The circles are arranged horizontally, with the middle circle slightly offset upwards and downwards from the other two, creating a central intersection point. A horizontal white band cuts across the middle of the circles, containing the chapter title.

# Chapter 4: The Design of ERP Experiments Part 1

Clara Rhee



# Strategies for Avoiding Ambiguities in Interpreting ERP Components

# Strategy 1: Focus on a Single Component

- Focus on only one or perhaps two ERP components, trying to keep all other components from varying across conditions
- Operational Definition: **"A source of controlled, observable variability"** (Donchin, Ritter, & McCallum, 1978)
- Conceptual Definition: **"Generated in a given neuroanatomical module when a specific computational operation is performed"** (Luck)
- Precise manipulation that cause only a single computational operation in a single neuroanatomical module to vary across conditions
- "Fishing expedition"
- Factorial experimental design

## Strategy 2: Focus on Large Components

- When possible, it is helpful to study large components
- Relatively insensitive to distortions from the other components

## Strategy 3: Hijack Useful Components from Other Domains

- Use ERP component that is not obviously related to the topic of the experiment
- Examples
  - Language-related N400 to examine the role of attention in perceptual vs. postperceptual processing
  - Use N400 to determine the stage of processing at which a specific visual making operates
  - LRP used to address the nature of perception without awareness

## Strategy 4: Use Well-Studied Experimental Manipulations

- Helpful to examine well-characterized ERP component under conditions that are as similar as possible to conditions in which that component has previously been studied
- Discovery of N400
- Manipulations
  - P3 – target probability
  - N400 – Semantic/associative relatedness
  - N2pc & CDA – Stimulus location
  - LRP – Response hand

# Strategy 5: Use Difference Waves

- Count noun, related to context word (plate ... cup)  
Mass noun, related to context word (rain ... water)  
Count noun, unrelated to context word (sock ... cup)  
Mass noun, unrelated to context word (garbage ... water)
- Difference waves = preceded by semantically related context word – same word preceded by semantically unrelated context word
- Limitations
  - May contain more than one ERP component
  - Sensitive to interaction btw the variable of interest and factor that is varied to create the difference waves

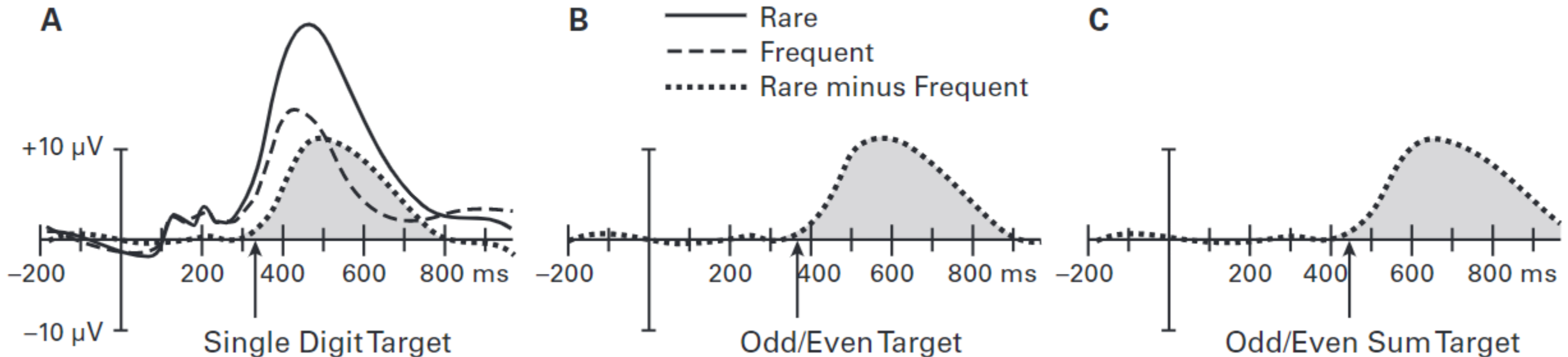
## Strategy 6: Focus on Components That Are Easy to Isolate

- Not just any manipulation or any difference wave will do
- Use one manipulation to isolate the component and then factorially combine this manipulation with another manipulation (how this component varies across conditions)
  - Lateralized readiness potential (LRP)
  - N2pc



## Strategy 7: Use a Component to Study the Processes That precede It

- The occurrence of a difference between conditions logically entails that certain processes must have already occurred
- Manipulation of interest + another manipulation



# Strategy 8: Component-Independent Experimental Designs

- Thorpe, Fize, & Marlot (1996)

