The Use of Event-Related Potentials to Study the Development and Decline of Cognitive Function

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Overview of Tutorial

The event-related potential (ERP) technique is one of the most widely used methods for studying neural activity linked to perceptual, motor, and cognitive processes across the lifespan. It is currently the most practical method for studying developmental changes in brain activity in individuals who are not readily tested using other brain imaging techniques such as fMRI. With the recent availability of easy-to-use packaged ERP systems, many cognitive scientists who do not have significant training in electrophysiology are setting up ERP labs. This tutorial is designed to discuss some of the common pitfalls new ERP researchers encounter when collecting, analyzing, and interpreting ERPs, with a special emphasis on issues that arise when studying developmental and adult populations.

The tutorial is an introduction to the ERP technique for beginning and intermediate level ERP researchers and consumers at any stage in their career. The goals of the tutorial are to discuss the appropriate uses of ERPs in the study of cognition across lifespan development and introduce some of the most common problems that need to be recognized and avoided in ERP research. The format of the tutorial will be a series of lectures and discussions on issues pertaining to developmental and adult ERP studies. The tutorial will provide practical advice about designing and interpreting ERP experiments. We will explain the benefits and limitations of some common practices in ERP research.

Participant Background

The tutorial is geared toward graduate students through full professors who are interested in learning more about the ERP technique. The tutorial is appropriate for individuals with a beginning or intermediate level of experience with the ERP technique. Prior experience with ERP data collection and analysis is helpful but not necessary. Participants should have a basic familiarity with literature using the ERP technique.

Topics

Topics to be covered include:

- An introduction to the ERP technique including what ERPs are and where they come from.
- An overview of ERP components and their functional significance in adults, children, and infants.
- Basic principles in recording ERPs.
- Signal averaging, artifact rejection and correction, and the importance and problems with filtering ERP data.
- Experimental design and isolating specific ERP components.
- Common pitfalls in ERP research: Detecting problems when writing or reviewing ERP papers.
- What ERPs can tell us about the development and nature of cognitive processes.

Across all of these topics we will address unique challenges that pertain to testing infant, child, and aging adult populations.

Biography of Instructors

Debra Mills is currently an Associate Professor in Psychology at Emory University. She received her Ph.D. in Psychology from the University of California at San Diego with a post-doc in Cognitive Neuroscience at the Salk Institute for Biological Studies. Her research includes ERP studies of language acquisition and social cognition in typical and atypical infants, children, and adults.

Steve Luck is a Professor in Psychology at the University of California at Davis. He received his Ph.D. from the University of California at San Diego in Neurosciences. He is the author of the book "An Introduction to the Event-Related Potential Technique", (2005) and hosts annual ERP boot camps that are attended by ERP researchers from around the world. For more information about ERP boot camps: http:/erpinfo.org/

Reference

Luck, S. J. (2005). An Introduction to the Event-Related Potential Technique. Cambridge, MA: MIT press.