DEVELOPING AND TESTING STUDY EVALUATION METHODS

Neurodevelopment Group

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Neurodevelopment - background

- Includes multiple dimensions related to cognitive function and behavior
- Impairment can be measured on a continuum
- Extreme impairment can result in classification of a neurodevelopmental disorder
  - Examples: attention deficit hyperactivity disorder (ADHD), autism spectrum disorder (ASD), intellectual disability
Categorized into 4 groups for this process

1. Cognition (general)
2. Attention and behavior (including ADHD-related behavior)
3. Executive function
4. Social cognition and social behavior (including ASD-related behavior)
Example: Cognition

• Examples of domains:
  • general cognition/intelligence
  • visual motor skills
  • memory and learning

• Examples of tests
  • Wechsler Intelligence Scale for Children
  • McCarthy Scales of Children’s Abilities
  • Wide Range Assessment of Memory and Learning
  • Wide Range Assessment of Visual Motor Ability
  • Bayley Scales of Infant Development
Considerations: outcome assessment

• Domain specific

• Continuous vs. disorder

• When exposure/outcome assessed matters

• Description of examiner training, testing conditions, raters
  • Adjustment when necessary
  • Young children: state-related factors
  • Language/culture translation and/or adaptation

• Age appropriate, sufficient floors/ceilings

• Behavior
  • Multi-informant rating scales
  • Rating scales + performance-based tests
Considerations: study population

• Prospective birth cohort essential
  • Direct environmental measures (biomarkers, micro-environmental measures) during prenatal/early life period (most sensitive window)

• Selection procedures (recruitment, eligibility inclusion/exclusion)

• Attrition → longitudinal studies
Considerations: confounding

• Similar to other outcomes
  • Clear, thoughtful approach to selecting confounders
  • Model building strategy
  • Precision considerations
  • Exclusion of variables that are not confounders
  • Discussion of residual confounding

• Variables typically included:
  Child: age at exam, sex
  Parent/household: age, SES (education, income), HOME score, marital status, maternal IQ, mental health
Considerations: data analysis

• Continuous outcome
• Linearity of exposure-outcome association
• Missing data
• Account for repeated measures (longitudinal studies)
• Influential data points
• Effect modification (determined a priori)
  • Sex-specific effects
• Statistical precision represented along with point estimate
Challenges of reviewing epidemiologic studies of neurodevelopment

- Multiple dimensions: clear-cut divisions into non-overlapping categories is challenging*
  - E.g., attention
  - Tests may reflect multiple skills

- A paper should be reviewed in the context of the study in which it is set
  - Particularly longitudinal studies, where the paper represents only a subset of outcomes measured in the study

*White RF. J Epidemiol Community Health 2009
Reflections on process

• Challenging to arrive at a streamlined process for reviewing studies of neurodevelopment
  • Complex outcome
  • Multi-dimensional
  • No gold standard measure

• Difficult to conduct review without a team member with subject matter knowledge

• Other review aspects (bias, confounding) apply broadly to studies of different health outcomes