

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