NIH Toolbox
Assessment of Neurological and Behavioral Function

Cognition

Team Leader:
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For more information, please visit www.nihtoolbox.org

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Subdomains

Executive Function: The capacity to plan, organize, and monitor the execution of behaviors that are strategically directed in a goal-oriented manner.

Episodic Memory: Mental processes involved in acquisition, learning, and retrieval of new information.

Language: Mental processes that serve to translate thought into shared symbols (words, gestures) for the purpose of communication.
Subdomains

Processing Speed: The amount of time to process a set amount of information or the amount of information processed within a certain unit of time.

Working Memory: The capacity to 1) process information across a series of tasks and modalities; 2) hold information in a short-term buffer; 3) manipulate the information; and 4) hold the products in the same short-term buffer.

Attention: The allocation of limited capacities to manage an abundance of environmental stimulation; a foundation for other mental processes.

Cognition Team Milestones

- Jan-Apr 07
  - Domain Team Formation
- May 07
  - Initial Proposal - Subdomains
  - Initial Submission - Lit Review
- June 07
  - Finalize subdomains
- July 07
  - Initial instrument review
  - Team meeting
  - Recruit additional experts
  - Reorganize into subdomain teams

- Aug-Oct 07
  - Select/refine instrument list
- Nov 07-March 08
  - Add Reading to Language subdomain
  - Reorganize into development teams
- May-Aug 08
  - Finalize experimental and validation instruments
  - Develop instruments for pretesting
**Development Plan**

- Aug-Sep 08: WebEx, Video training, and On-site training
- Sep-Oct 08: Pre-testing at five sites: (Emory, MN, KMECC, Core, NU) 120 total subjects were administered the battery and 60 subjects re-tested; Age bands included 3-6 yrs., 18-30 yrs., 65-85 yrs.
- Oct-Nov 08: Analysis and evaluation of pre-testing data
- Nov 08: Review and consensus meeting of senior scientists and consultants to refine instruments
- Nov 08 - Jan 09: Revisions to instruments for validation

**Instrument Development**

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**Development Plan**

**TRYOUTS RESULTS**

- Plans for validation:
  - Validation (Spring 09 - 4 months): Analysis/evaluation of validation data;
  - Consensus meeting to finalize battery and hand off for final technology development.
  - A validation sample of 600 individuals will allow comparisons between the new tests and "gold standard measures" commonly used in clinical practice followed by a normative study with approximately 6,000 individuals.
Attention/Executive Function

**CHOICE REACTION TIME “FLANKER TASK”**
- Computer (Rueda, Posner et al., 2004)
- Measure of inhibitory control: focus on a given stimulus while inhibiting attention to stimuli flanking it.
- Stimulus and flankers congruent: CPT type task
- Stimulus and flankers incongruent: requires inhibition

Executive Function

**DIMENSIONAL CHANGE CARD SORT (DCCS)**
- Computer (Zelazo and colleagues, 2003)
- Measures cognitive flexibility.
- Participants must match by shape or color.
- Those who pass the post-switch phase will then complete an adapted form of the task-switching paradigm where the relevant dimension randomly switches (e.g., between “shape” and “color”).

Executive Function

**SELF-ORDERED POINTING**
- Computer (Petrides and Milner, 1982)
- Participants are instructed to point to one item in an array on the first trial.
- On subsequent trials, the location of objects changes and the subject is instructed to point to a different object, never pointing to the same item twice.
- Different numbers of items in the arrays will also be tried out, depending on the age of the participant.
**Episodic Memory**

**Imitation Based Assessment of Memory (IBAM)**
- Working on computer adaptation (Bauer)
- Initially designed for children below 6 years of age; appropriate for use across the lifespan.
- Sequences of related or unrelated pictures of objects or activities are presented in a particular order.
- Recall of temporal information is tested by instructing subjects to reproduce the demonstrated order.
- The same sequence will be repeated 3 times with recall after each presentation (5 minutes).

**Processing Speed**

**Pattern Comparison:**
- (computer administered) Developed after Salthouse
- Requires participants to identify whether a pattern is the same ("yes" or "no") as another pattern
- Requires approximately 4 minutes for children and 7 minutes for adults

**Working Memory**

**List Sorting:**
- (computer administered, Mungas)
- Spanish & English Neuropsychological Assessment Scales (SENAS) working memory task
- Requires sequencing of orally presented stimuli according to size.
- Two conditions:
  - one list condition: order a series of objects from the same category by size.
  - two list condition: rank order items in size from one category then from the second.
TEST ITEMS
(one list)

PUMPKIN

LEMON
BILINGUAL READING RECOGNITION: (Computer)
- Read and pronounce letters and words as accurately and quickly as possible.
- Administration requires approximately 5-7 minutes.
- Not administered for ages 3-4.

VOCABULARY COMPREHENSION: (Computer)
- Words presented auditorily
- Point to one of four pictures depicting the vocabulary item

- cucurbitaceous
- forisfamiliate
- prevarications
- circumlocutory
- imparidigitate
SUMMARY

- Cognition Instruments are being accepted by the intended populations, including pediatric, young adult, older adult
- Feedback is shaping changes in preparation for validation
- Strategy for norming in collaboration with Epi-Biostats team
- Potential projects to spin off from Toolbox

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