Introduction to Neuropsychometric Testing

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Types of Studies

Studies in which neuropsychometric tests be applied

Observational (descriptive/analytical)
• Ecological (correlative) - population
• Cross-sectional (prevalence) - individuals
• Case-control (case-ref) - individuals
• Cohort (follow up) – individuals

Experimental studies
• Randomized trials (double blind, etc)- patients
• Field trials – healthy people
• Community trials- community
Longitudinal study design

Cognitive measures

- Clinical findings
- Imaging
- Neuropsych testing
- Genetics/ blood analysis
- Autopsy

Age (Yrs)

0 5 10 15 20 25 30 35 55 60 65 70 75 80

Ageing ctrl MID/AD AD AD+stroke
Cross-section Through the Memory Clinic

SMCI--subjective memory impairment
MCI-mild cognitive impairment
AD-Alzheimer’s disease
VaD-vascular dementia
MIX-“mixed” dementia
FTD-frontal lobe dementia
PPA-primary progressive aphasia
UNS-dementia of unspecified origin

Data from the Geriatric Dept., Huddinge University Hospital, Jönhagen & Wahlund, 2001
Objectives

• Cognitive function tests have been used and developed over several years

• Neuropsychometric batteries may contain several components to test different cognitive abilities, e.g. CANTAB, CAMCOG, ADAS-Cog etc.

• The Mini-Mental State Examination (MMSE)- widely used

• Value of informant questionnaires
Cognition in humans

• Cognitive processes underpin our everyday behaviour

• Cognitive testing is used to describe the process of an individual’s ability to think, solve problems, concentrate, remember and respond

• Disease, injury (damage to brain), drugs or even mood changes can often give rise to problems with cognition
What makes a good cognitive test?

Main issues regarding test quality

• **Test reliability**: a) whether various components of a test measure the same thing i.e. the inconsistency of a test; b) how consistently a test measures skill across time, so called temporal or test-retest reliability.

• **Test validity**: relates to how successfully a test measures what it is designed to assess.
What factors are important?

Factors to consider:

• Where to interview subject- clinic or home
• Duration of test or interview
• Tests need to be simple (in general)
• Training and screening
• Culture and background
Mini-Mental State Examination

- MMSE is a short test which measures general cognitive status including short-term memory (Folstein, et al, 1975)

- MMSE includes tests for orientation (e.g. year, season, etc.), registration, attention and calculation, recall, and language

- MMSE is a 30 points score test. Mildly cognitively impaired subjects can have scores 26 to 21
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Alzheimer’s Disease (AD)

Dementia with Lewy Bodies (DLB)

MMSE 18/30
Orientation 5/10
Short term memory 0/3

MMSE 20/30
Orientation 8/10
Short term memory 2/3
CANTAB Battery

• CANTAB battery involves testing several skills-13 items

• 5 main types of tasks- training and screening, attention and memory, non-strategic learning and memory, sustained attention and frontal/executive

• Full test can be found at: www.bioportfolio.com/cantab/testing
CANTAB Battery

Applications of CANTAB

• Neurodegenerative disorders
• Behavioural disorders
• Drug and alcohol abuse disorders
• Surgical interventions
• Other disorders – MS, HIV-AIDS Complex, phenylketonuria…
CANTAB Battery

Tasks in CANTAB battery

• **Training and screening** - motor screening, big/little circle reaction time
• **Attention and memory** - matching to sample visual search (MTS), delayed matching (DMS), pattern recognition memory (PRM), spatial recognition memory (SRM) and spatial span (SSP)
• **Non-strategic learning and memory** - paired associates learning (PAL)
• **Sustained attention** - rapid visual information processing (RVP)
• **Frontal/Executive** - spatial working memory (SWM), ID/ED (IED), SOC or Tower of London
Some Specific Tests

1) The Boston Naming Test - tests recall

2) The Stick Design Test - tests the subject’s ability to comprehend and motor skills

3) The Animal Fluency Test - fluency
The Clock Drawing Test

- CLOX or an Executive Clock Drawing Task is an interesting way to measure organizational and executive skills (Royall, 1995)

- First ask subject to draw a clock (on back of scoring sheet) and show specific time, e.g. 1:45 (CLOX 1)

- Second try (training) show to draw by placing 12, 6, 3, & 9. Set hands to 1:45 and place arrows (CLOX 2)
AD

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**AD**

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- Orientation 5/10
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**DLB**

- MMSE 20/30
- Orientation 8/10
- Short term memory 2/3
ADAS-Cog is used to test several features of cognition in subjects suspected with dementia

1. First 10 min conversation- travel, weather, exercise, other
2. Word recall task –words shown on card
3. Naming fingers and objects – asked to name
4. Command –make a fist, point ceiling etc
5. Delayed word-recall task –recall previous words
6. Constructional praxis –ability to copy geometric forms
7. Ideational praxis –do something (fold letter)
8. Orientation – person, day, month, year
9. Word-Recognition task
Features below are rated from none = 0; very mild = 1; mild = 2; moderate = 3; moderately severe = 4; severe = 5) that best describe the patient’s capabilities in these features

• Remembering Test instructions
• Spoken Language ability
• Word-Finding difficulty in spontaneous speech
• Comprehension of Spoken Language
• Concentration / Distractibility
Different Components to Testing

Range of measures may be obtained in subjects suspected of disease, eg. Stroke or Dementia or after head trauma

1. Rankin Scale, Barthel Index (Stroke)
2. CDR (Clinical Dementia Rating)
3. ADAS-Cog or C-SID (Neuropsych batteries)
4. The Executive Interview – number letter, word and design fluency
5. CIBI (consists of CIBIS- Impression of Disease Severity and CIBIC-Impression of Change)
6. IADL- Instrumental Activities of Daily Living
Measures of Global Function

Clinician’s Interviewed-based Impression (both CIBIS and CIBIC) tests **global function**

- **General** - relevant history; observation/evaluation

- **Mental/ Cognitive State** - arousal/alertness/attention/concentration; orientation, memory, language/speech, praxis, judgement/problem solving/insight

- **Behaviour** — thought content, hallucinations/delusions/illusions, behaviour/mood, sleep/appetite, neurological/psychomotor activity

- **Activities of Daily Living** — basic and complex, social function
Activities of Daily Living

ADLs seek information on several tasks (Scored from as no impairment = 0; mild impairment = 1; moderate = 2; severe; 3 and not assessable = 4)

1. Ability to use telephone
2. Household tasks
3. Using household appliances
4. Handling money
5. Shopping
6. Food preparation
7. Ability to get around inside and outside the home
8. Hobbies and Leisure activities
9. Handling personal mail
10. Grasping situations or explanations
11. **Basic activities**: Toileting, Feeding, Dressing, Personal hygiene and grooming, Physical ambulation and Bathing
Value of Informants

- Use of appropriate informants including a spouse or relative

- Inform on daily living activities, medical history, perception / orientation, etc

- Examples of questionnaires such as the IQ code (intelligent quotient code) or the détérioration cognitive observée (DECO)
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Summary

• Cognitive function test subject’s ability to think, solve problems, concentrate, remember and respond

• Neuropsychometric batteries comprise several components including MMSE

• Specific batteries - CANTAB

• Importance of informants
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