

# Ch. 17: Neuropsychology

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## Neuropsychology

- Definitions
- History
- Goals
- Methods
- State of the art
- Issues
- Demographic Norms
- Careers / Training

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## Clinical Neuropsychology

- Field: Subfield of clinical psychology
- Setting: outpatient and inpatient
- Subjects/Patients: children, adolescents, adults, geriatric
- Methods: Measure function of specific brain areas & systems.
- Measures: Standard tests (IQ tests) as well as specialized test batteries
- Norms: standard, as well as specialized, normative data

1566

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## Goals of NP Assessment

- Diagnosis
  - Clinical
  - Scientific
  - Medico-legal / forensic
- Understanding of neurological basis of disorder
  - Prognosis
  - Treatment plan
    - surgical, pharmacological, psychosocial, remediation
- Track changes over time

1567

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## Neurology v. Neuropsychology

	Neurology	Neuropsychology
Education	MD	PhD
Methods	hands on, informal	hands off, structured
Decisions	clinical judgement	statistics & norms
Focus	motor / sensory	cognitive
Psychosocial	some	much
Treatments	drugs, surgery	rehabilitation, compensation

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## Behavioral tests vs. biological

- Q: What has better reliability/validity to diagnose brain disease? brain imaging vs. neuropsychological tests?
- A: Often, most sensitive test of early dysfunction is a NP test
- Example: Alzheimer's disease shows a very specific pattern of "rapid forgetting" that can be detected by memory testing, long before it shows up on brain imaging scans.
- NP testing is relatively non-invasive, though not particularly inexpensive

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## Behavioral tests vs. biological 2

- Behaviors are mediated by multiple brain systems located throughout the brain.
- Not easily imaged with MRI
- Behavior is what matters. Testing behavior directly can be more accurate.
- Why not both? Imaging shows the damage, NP tests show the effects.

1570

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## Assessment

- Psychological Test
  - administration
  - results
  - interpretation
- Test Battery
  - multiple tests
- Other sources of data
  - Clinical Interview
  - History
  - other records...

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## Neuropsych. Batteries

- Fixed Battery
  - Give all patients same set of tests
  - Increase chance of finding subtle/hidden impairments
  - Excellent statistics and normative data
- Flexible Battery
  - Tailor specific tests to specific patients
  - More like neurology, more hands on
  - Poor statistics, possible to miss hidden issues

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## Fixed Batteries

- Halstead-Reitan
  - WAIS-IV plus additional tests of memory, learning, motor and sensory skills
  - Approx 6 hours to administer
- Luria-Nebraska
  - Luria had a flexible battery based on theory of pluripotentiality (multiple brain systems could compensate to do the same tasks)
  - Test battery improved and standardized at U. Nebraska
  - Approx 24 hours(!) to administer

1573

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## Halstead-Reitan Battery

- Full WAIS IQ Test
- Additional tests:
  - Category test
  - Grooved pegboard
  - Rhythm
  - Speech comprehension
  - Finger tapping
  - Trail making
  - Grip Strength
  - Sensory-perceptual exam
  - ...

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## Category Test



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## Grooved Pegboard



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## Tactual Performance Test

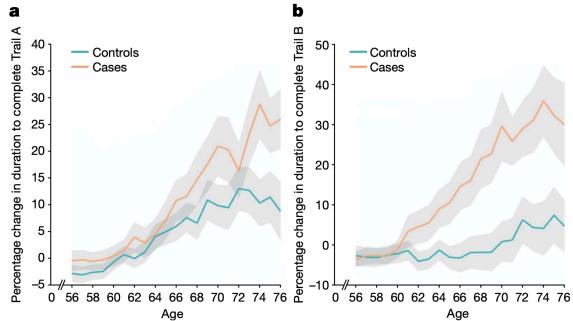


1577

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## Trail Making Test (A & B)

## COVID & Brain Changes?



**Fig. 3 | Significant longitudinal differences in cognition.** a, b, The percentage longitudinal change for SARS-CoV-2-positive cases and controls in the duration to complete trials A (a) and B (b) of the UK Biobank Trail Making Test. The absolute baseline (used to convert longitudinal change into percentage change) was estimated across the 785 participants. These curves were created using a ten-year sliding window across cases and controls (s.e. values are shown in grey).

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## Gardner's 8 Intelligences

- logical-mathematical (\*)
- verbal-linguistic (\*)
- spatial (\*)
- musical
- bodily-kinesthetic
- naturalist
- interpersonal
- intrapersonal

1582

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## Limitations of NP Testing

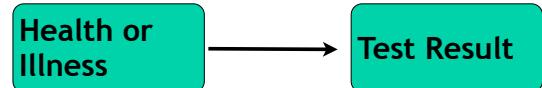
- Most tests predate modern neuroscience
- Lack of pre-test data
  - reliance on normative data
- Lack of international standardization
- Lengthy
  - 2 - 20 hours of testing
- Expensive
- Requires Ph.D. level training

1583

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## Demographic Corrections

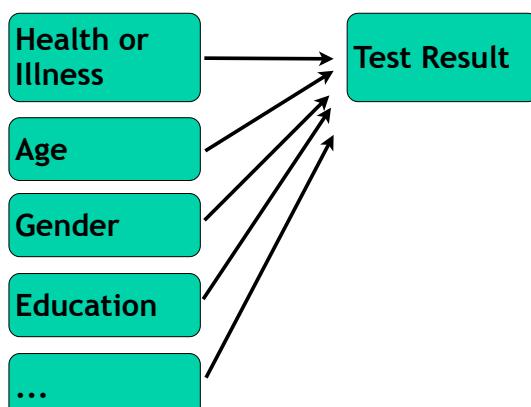
- Normative Data would be simple if there was one definition of “normal”
- Simple model



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## Demographic Model

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## Common Demographic Covariates

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- Race/Ethnicity
- Sex
- Age
- Education
- Language

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ASSESSMENT  
1998, Volume 5, Number 4, 375-387

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89

## THE PACED AUDITORY SERIAL ADDITION TASK (PASAT): NORMS FOR AGE, EDUCATION, AND ETHNICITY

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## Diehr et al. (1998) Results

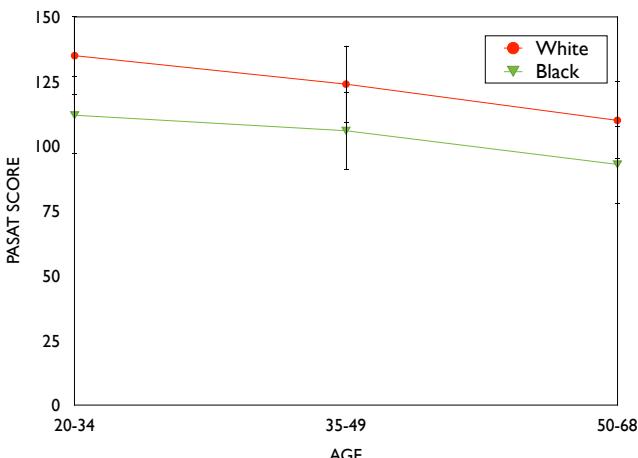
1593

- Statistically and Clinically-significant differences in PASAT test result found for
  - Age
  - Education
  - Ethnicity
- Results not statistically or clinically significant:
  - Gender

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## PASAT by age & ethnicity



1594

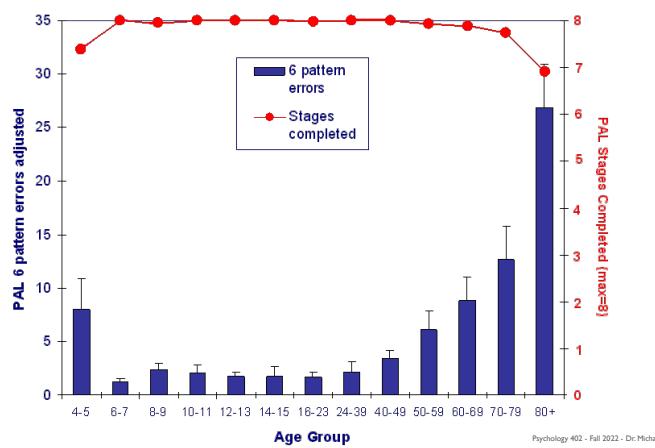
## Age - after age 35...

- Worsens significantly
  - fluid reasoning
  - speed of processing
  - working memory
  - long term memory
- Holds / drops a little
  - Crystallized information
  - semantic memory
- May get better?
  - reasoning
  - vocabulary
  - emotion
  - metacognition

1596

## CANTAB Paired Associate Learning

Paired Associate Learning (errors)– Computerized Task (n=1444)



1598

## Sociocultural Events in Neuropsychology

- Sports Concussions
- Marijuana Legalization

1599

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## Careers in clinical neuropsychology

- Subfield of Clinical Psychology
- Ph.D. (or Psy.D.) with about 2000 hours clinical training
- Internship : 1 year (2000 hours)
- Post-doc : 1+ year (2000+ hours clinical training)
- Employment -- hospital or clinic, sometimes forensic (legal), often joint with Univ.
- Pay -- good, often better than typical clinical psychologist, not as good as MD.

1602

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