

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

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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

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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.

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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

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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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Trail Making Test (A & B)

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COVID & Brain Changes?

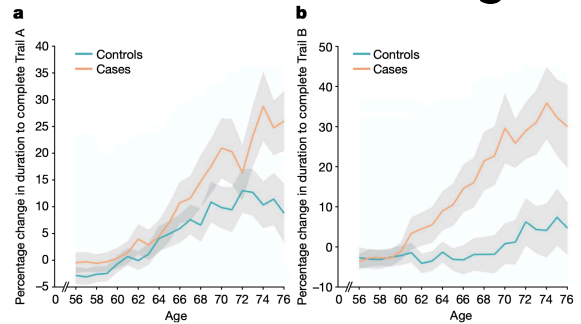


Fig. 3 | Significant longitudinal differences in cognition. a, b, The percentage longitudinal change for SARS-CoV-2-positive cases and controls in the duration to complete trails A (a) and B (b) of the UK Biobank Trail Making Test. The absolute baseline (used to convert longitudinal change into percentage 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

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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

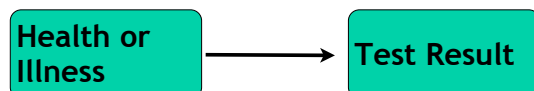
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Demographic Corrections

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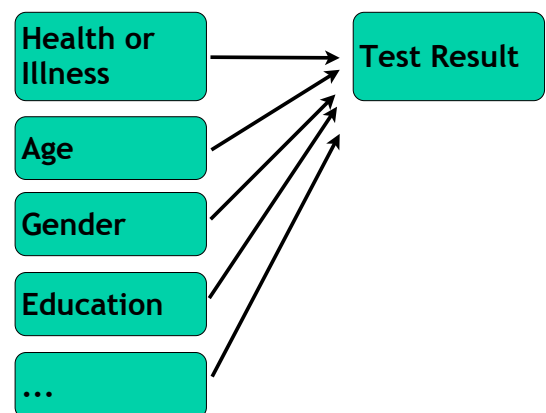
- Normative Data would be simple if there was one definition of "normal"
- Simple model



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Demographic Model

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Common Demographic Covariates¹⁷⁶²

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

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Diehr et al. (1998)¹⁷⁶⁵

- Paced Auditory Serial Addition Test

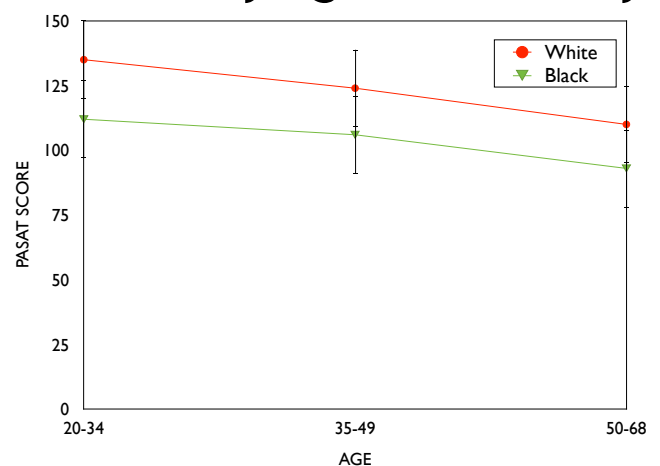
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Diehr et al. (1998) Results¹⁷⁶⁸

- 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 & ethnicity¹⁷⁶⁹



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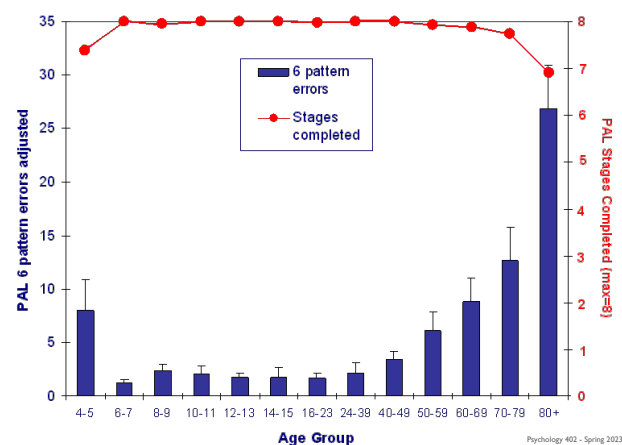
Age - after age 35...¹⁷⁷¹

- 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

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CANTAB Paired Associate Learning¹⁷⁷³

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



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Sociocultural Events in Neuropsychology

- Sports Concussions
- Marijuana Legalization

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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.

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