Batteries for the Assessment of Cognition in Resource Limited Settings in Children and Adults

SEARCH Research Forum on Neuro AIDS

11/8/06

Defining the importance of cognition in HIV

- How important are cognitive skills (memory, attention, processing speed, language, mental flexibility, etc) in the context of a life-threatening disease?

- HAART significantly increases life expectancy, but a cure has been elusive.
  - People are living longer now with HIV
  - Chronic disease model is relevant for many

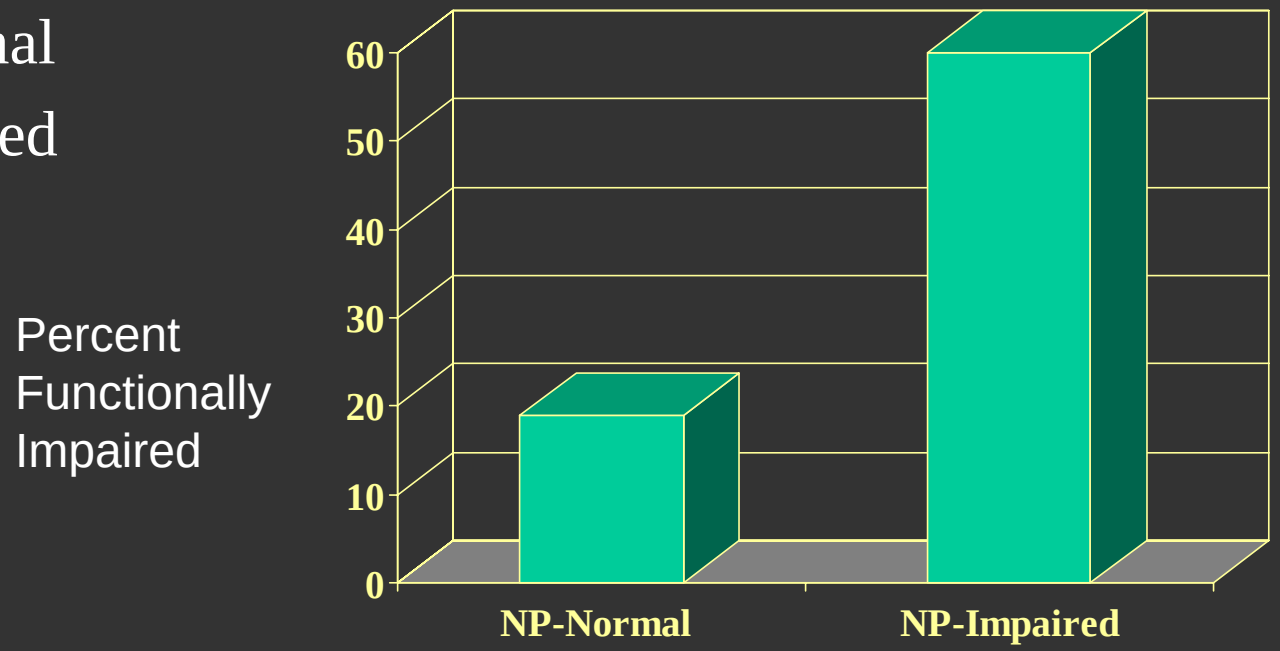
Defining the importance of cognition in HIV

- Cognitive skills in HIV-infected individuals are directly associated with ability to complete ADLs.
  - Financial management
  - Driving
  - Shopping
  - Cooking
  - Medication adherence
  - Employment

Cognition and Financial Management

- Provided blank checks, register, deposit slips and a check to deposit (Heaton et al., 2004).
  - Pay fictitious credit card bills and maintain a specified balance in the account
  - 168 NP - normal

    99 NP- impaired



Driving and Cognition

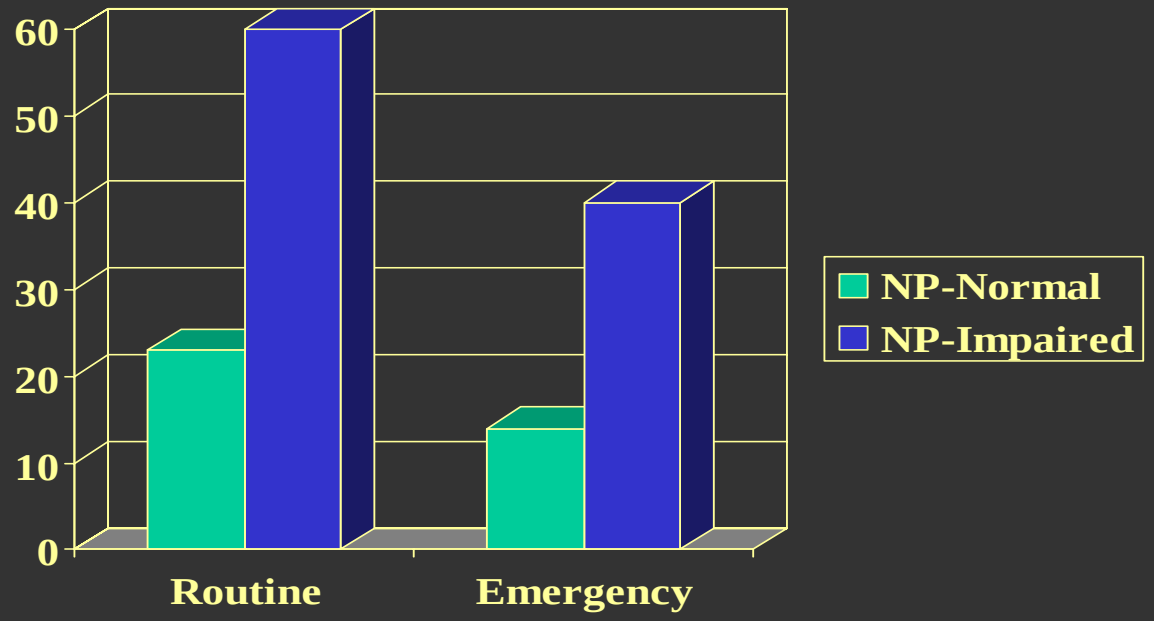
36 NP –normal, and 32 NP-impaired (mild).

- PC-based- using a steering wheel, turn signal indicator, accelerator and brake pedal (Marcotte et al. 1999).

- Two tasks
  - Routine driving (maintain 55mph, respond to occasional divided attention demands).
  - Emergency driving (pass cars, stop at lights, follow a curve, avoid accidents).

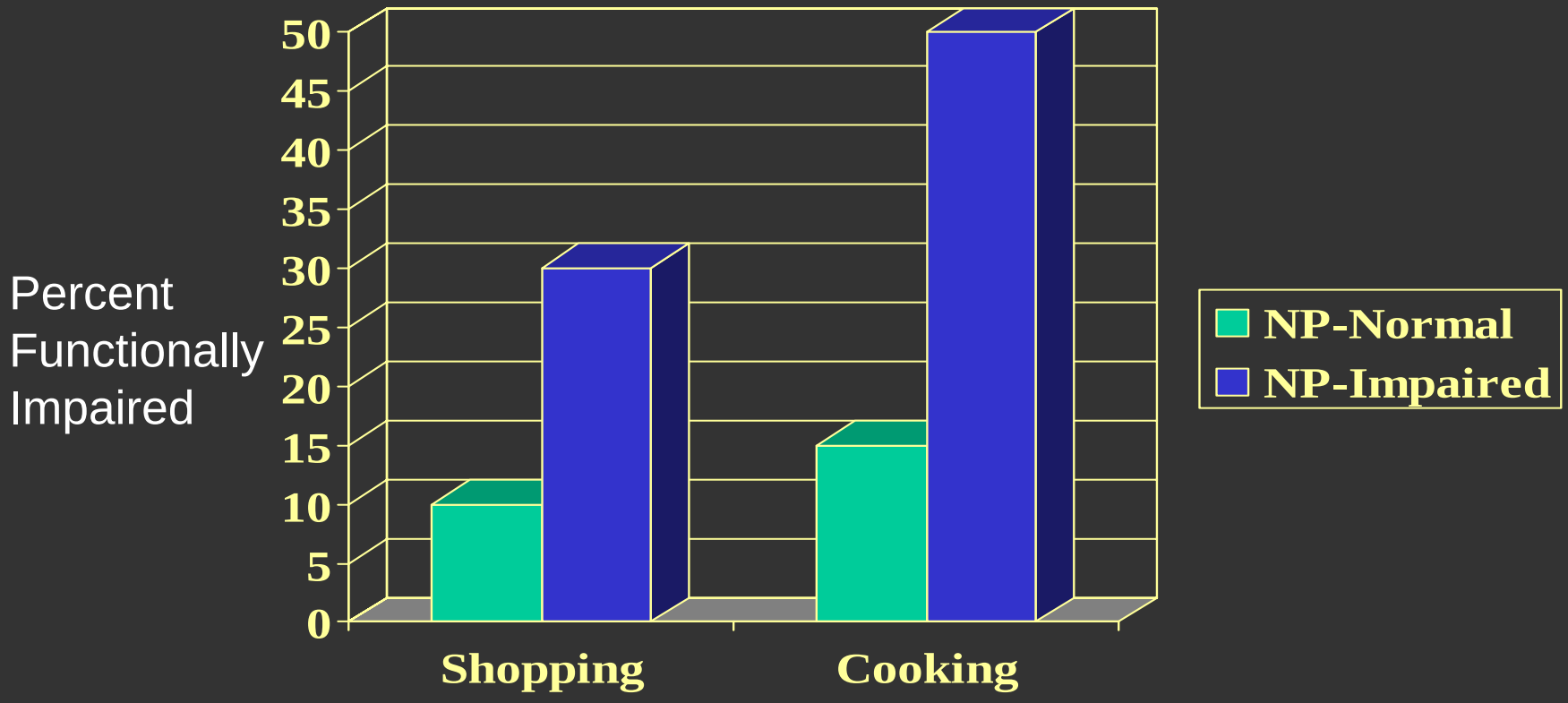
Driving and Cognition

Percent Functionally Impaired



Shopping and Cooking

- Cooking – follow recipes, measure ingredients, etc.



Medication Adherence

- "I forgot" is the most common self-described reason for missing a dose (Hecht, 1999; Chesney et al., 1999; Roberts, 2000).

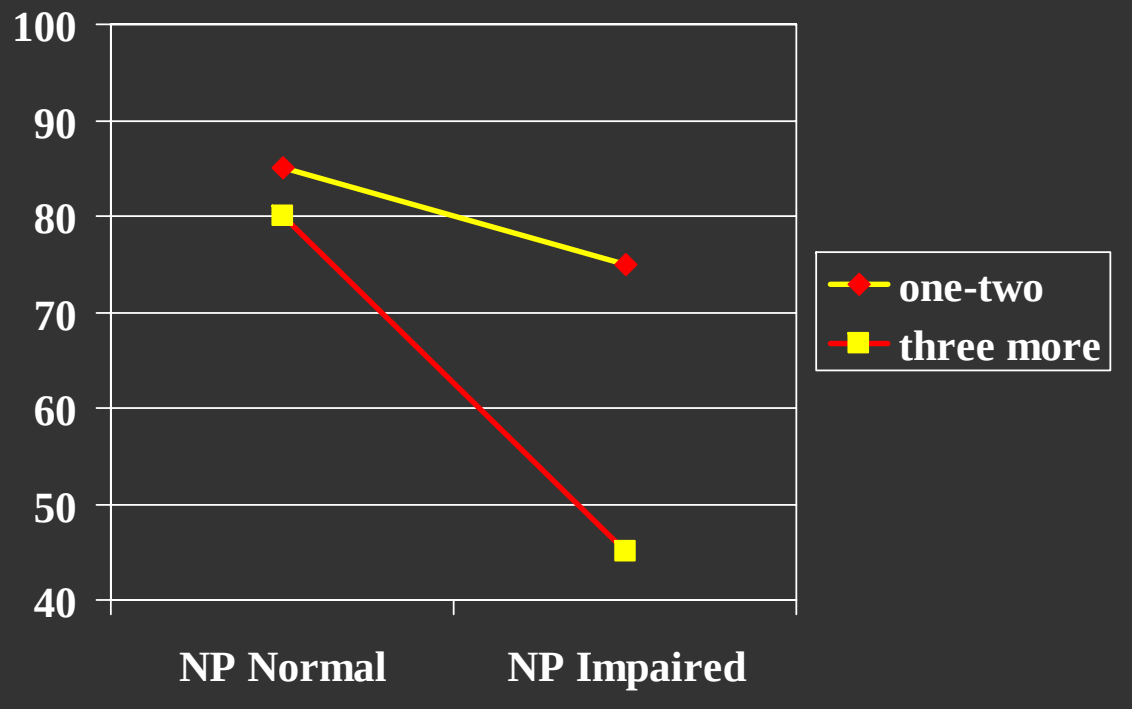
Exacerbated by complexity of regimen and younger age.

-Mems

-4 week interval

Memory dysfunction was the only predictor

Hinkin et al., 2002



Cognition and QOL

- Given the nature of ADL difficulties described, concern regarding QOL becomes critical.
- Our group examined the relationship between cognitive status and QOL in HIV (Osoweicki et al., 2000).
- 36 HIV patients (37y, 11.3e) completed neuropsych tests, POMS, and MQOL-HIV.
- Stepwise regression revealed that cognitive flexibility, information processing speed, and depression were independent predictors of self-rated QOL

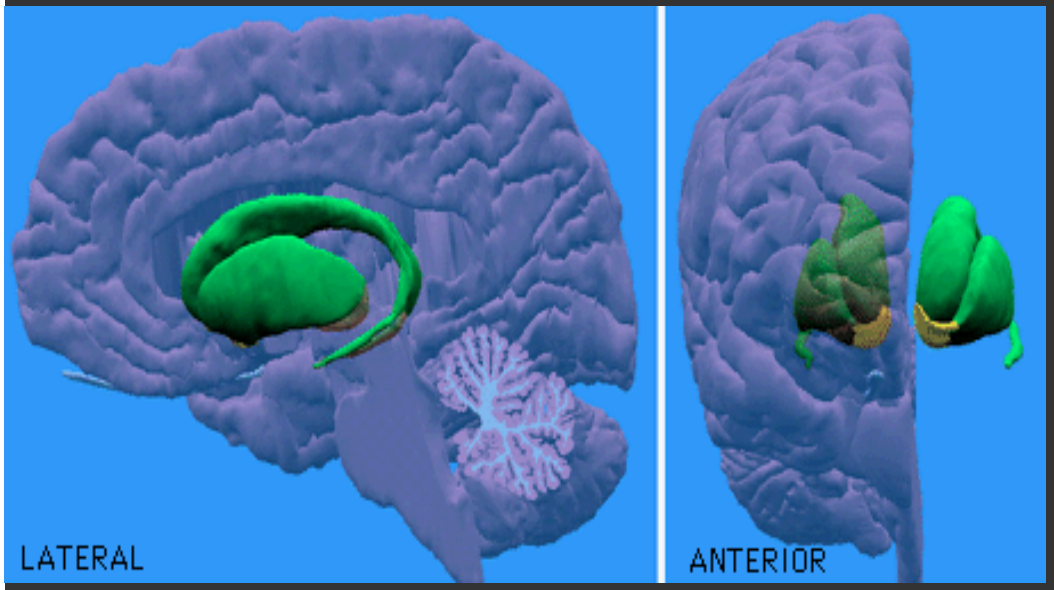
Relevance of Cognition in HIV

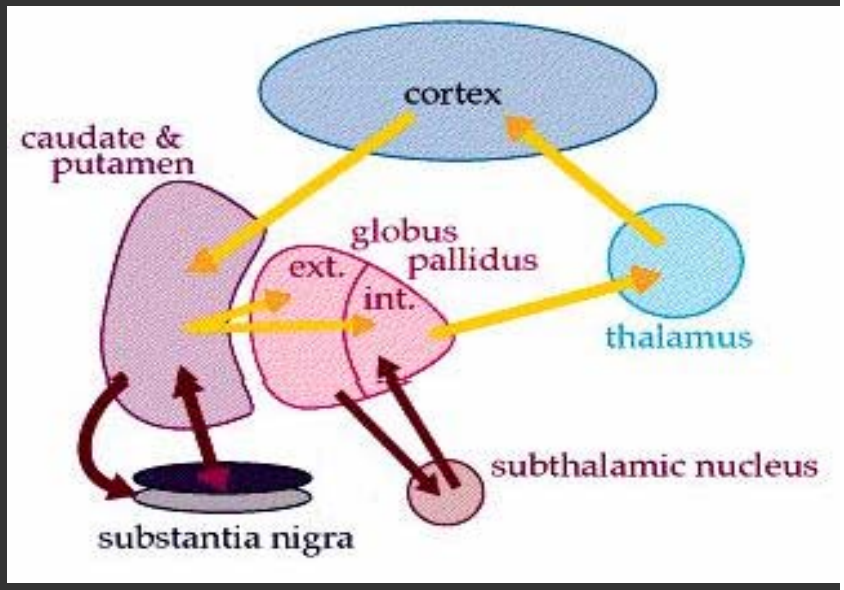
- No question that physical health and mortality are the primary concerns in HIV.

- However, the relationships between cognition and all major ADLs (driving, employment, finances, treatment adherence) argues that cognition is an important aspect of HIV care.

What do we know about cognition in HIV?

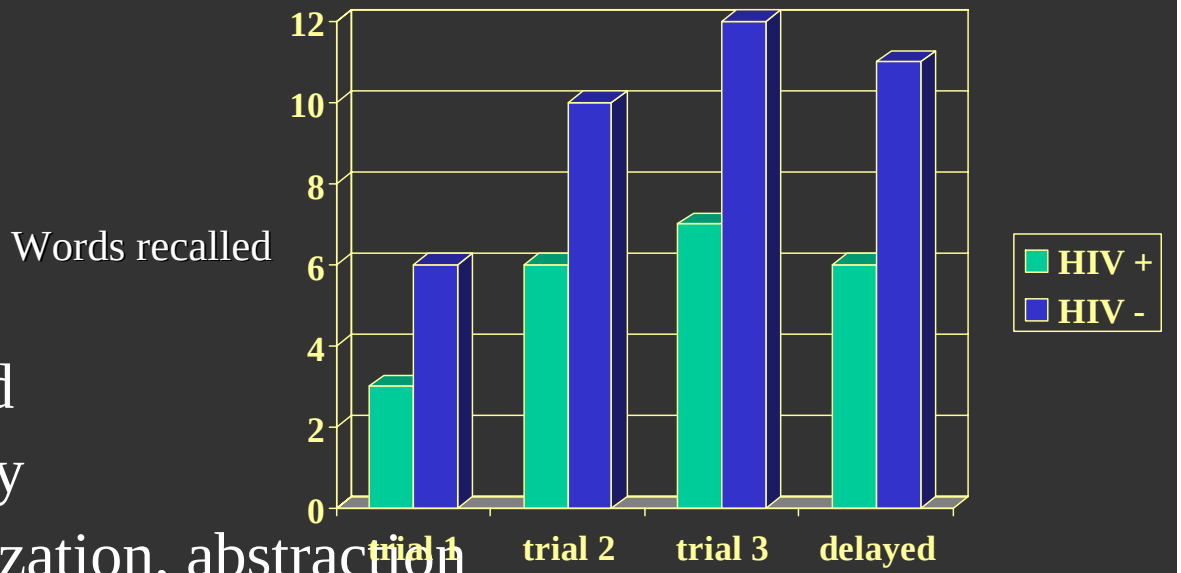
Virus found throughout the brain, but heavy concentration in deep subcortical regions (but Moore et al. AIDS, 2006)





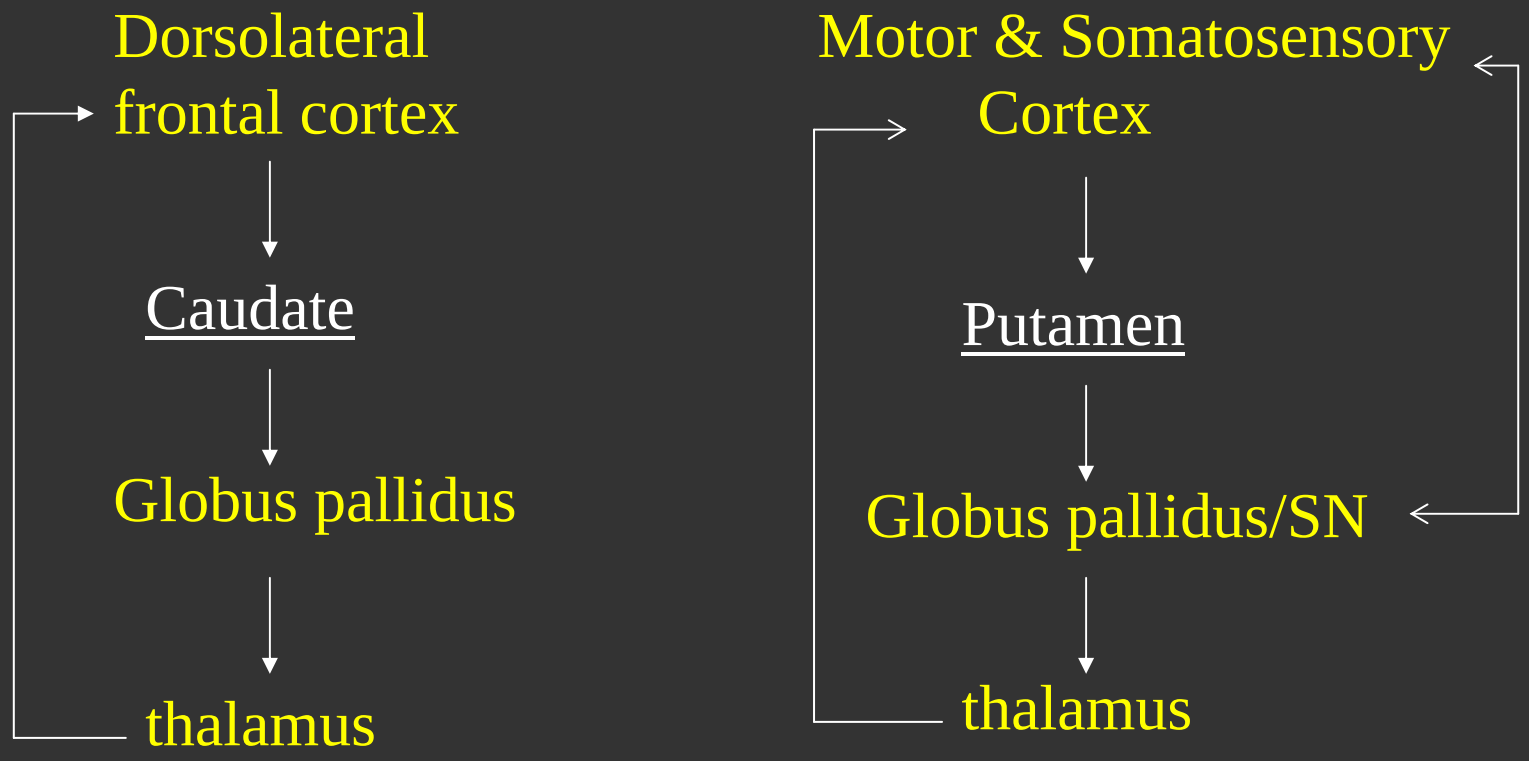
What do we know about cognition in HIV?

- Greatest difficulties on tests of:
  - Verbal and visual learning



  - Processing speed
  - Mental flexibility
  - Planning, organization, abstraction
  - Motor speed
  - In children, delay in gross development and IQ

Cortical-Subcortical Circuits



How does HIV treatment affect cognition?

- ART improves cognitive function (Tozzi et al., Robertson et al.).
  - Significant reduction in dementia within 6 months of therapy.
  - Similar improvements in less severe cognitive difficulties (Cohen et al., 2001).

What do we still need to learn?

- Limited work examining cognitive function associated with HIV in resource limited settings.

- Why have few studies been completed in resource limited settings:
  - Question of whether HIV dementia existed in nonclade B virus (e.g., clade C in India).
  - Fewer standardized cognitive tests (Thailand is an exception)
  - Language vs. nonlanguage and cultural relevance (spatial function and speed)

What are typical cognitive measures

- Verbal learning and memory
  - Modified Hopkins Verbal Learning Test
  - California Verbal Learning Test
- Cognitive flexibility and motor speed
  - Stroop test
  - Trail Making
  - Grooved Pegboard

Stroop Test (inhibition)

red white green brown

green red brown white

white brown green red

red white green brown

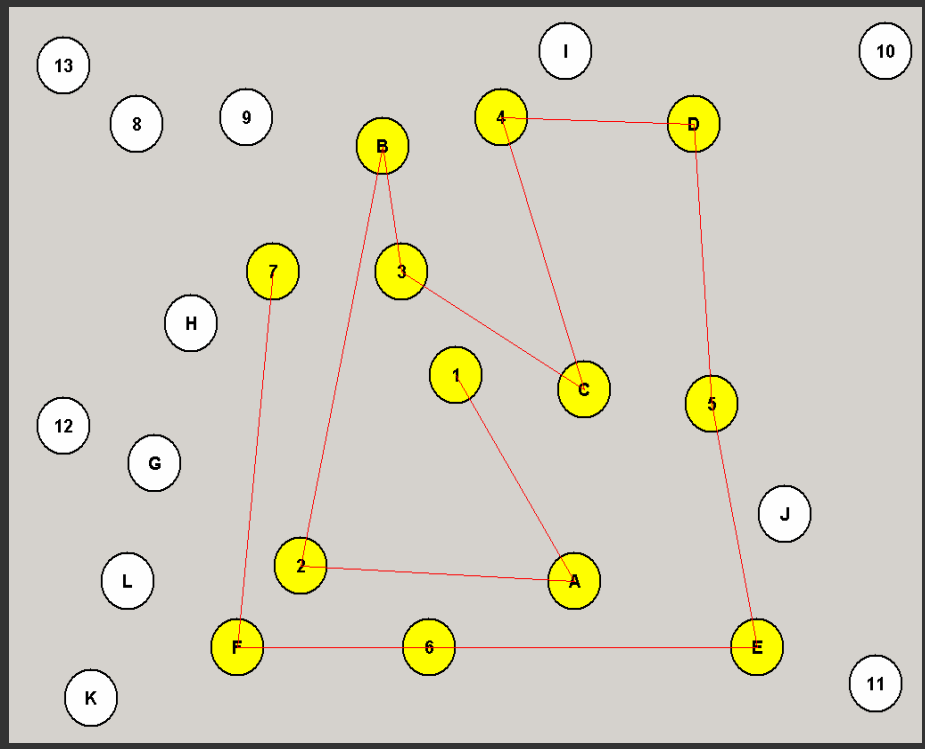
brown green white red

white brown red green

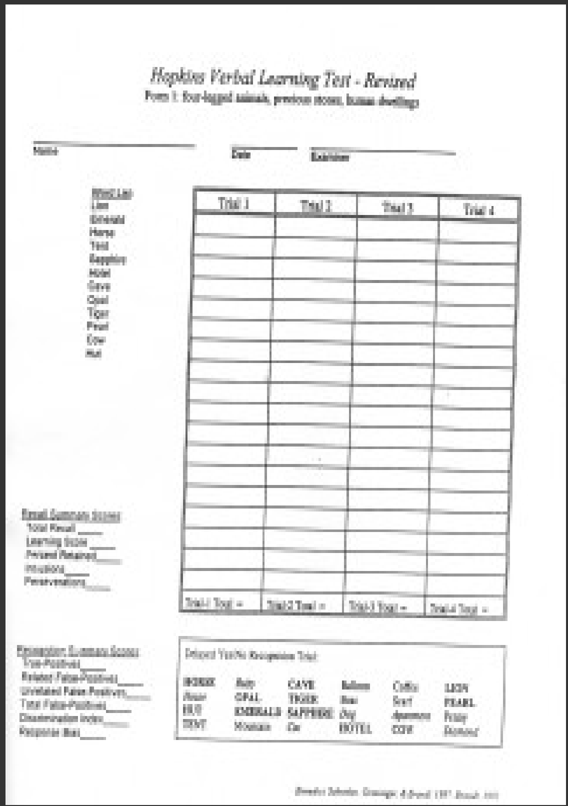
green white brown red

red brown green white

Trail Making (flexibility)



Verbal Memory Test


Hopkins Verbal Learning Test - Revised

Form 1: four-legged animals, precious stones, human dwellings

Name ______ Date ______ Examiner ______

Word List
Lion
Emerald
Horse
Tent
Sapphire
Hotel
Cave
Opal
Tiger
Pearl
Cow
Hut

Trial 1	Trial 2	Trial 3	Trial 4
Trial-1 Total =	Trial-2 Total =	Trial-3 Total =	Trial-4 Total =

Recall Summary Scores
Total Recall ____
Learning Score ____
Percent Retained ____
Intrusions ____
Perseverations ____

Recognition Summary Scores
True-Positives ____
Related False-Positives ____
Unrelated False-Positives ____
Total False-Positives ____
Discrimination Index ____
Response Bias ____

Delayed Yes/No Recognition Trial

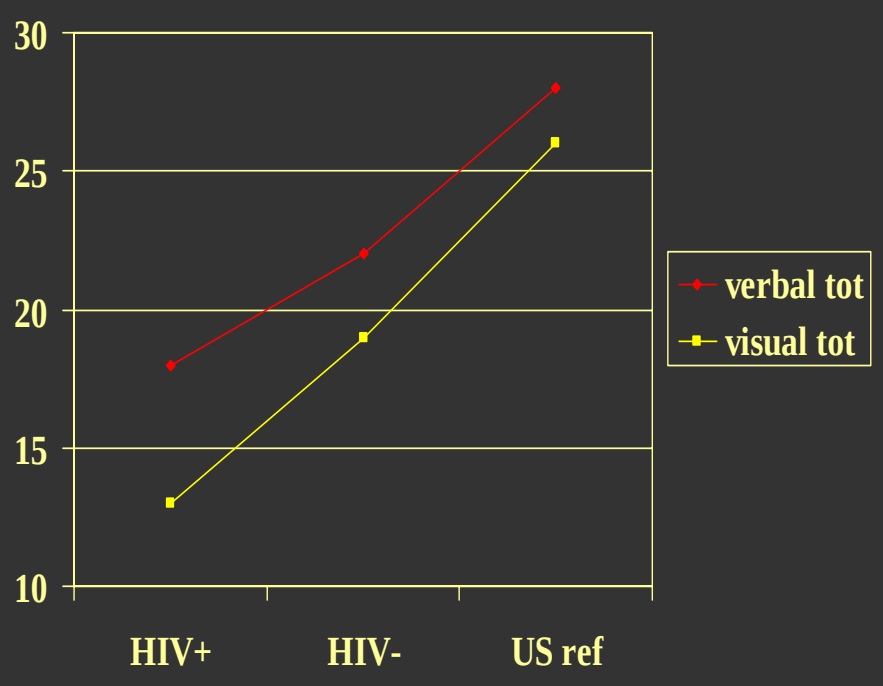
HORSE	Ruby	CAVE	Balloon	Coffee	LION
House	OPAL	TIGER	Boat	Scarf	PEARL
HUT	EMERALD	SAPPHIRE	Dog	Apartment	Friday
TENT	Mountain	Cat	HOTEL	COW	Diamond

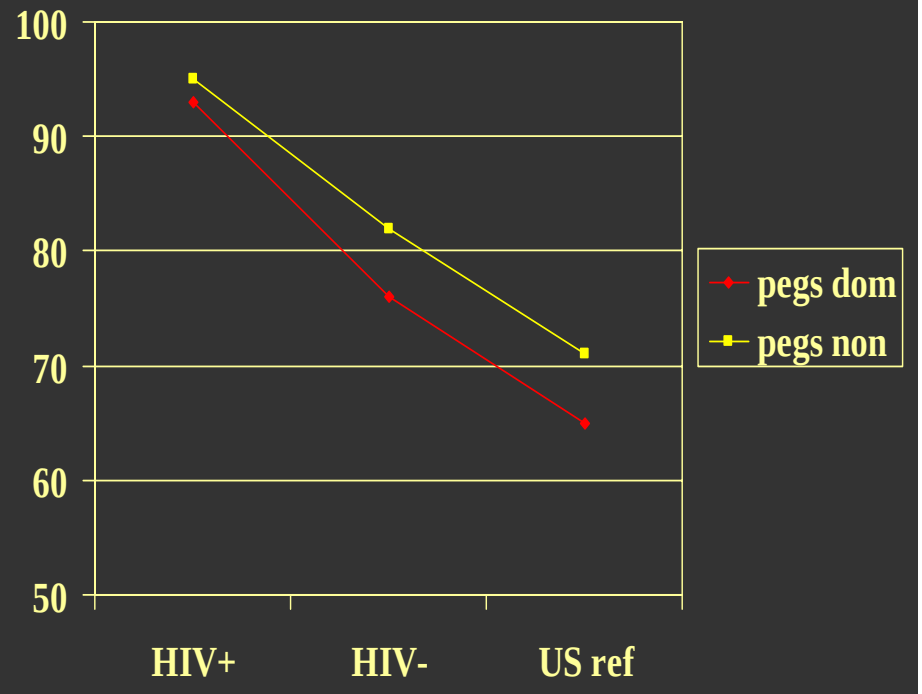
Pegs

Between-group contrasts on cognitive measures

Measure	Visual Memory total	Visual Memory delay	Verbal Memory total	Verbal Memory delay	Pegs nondom	Pegs dom
HIV+	13.2	5.3	18.3	6.7	95.7	93.3
N = 23	(9.0)	(3.3)	(4.8)	(1.8)	(23.7)	(48.4)
HIV-	19.4	8.0	22.3	8.4	82.3	76.0
N = 27	(7.4)	(2.9)	(5.1)	(2.0)	(14.4)	(23.7)
US	26.9	10.1	28.04	10.5	71.3	65.3
norms	(4.64)	(1.6)	(4.4)	(1.5)	(12.2)	(8.5)

Between-group contrasts

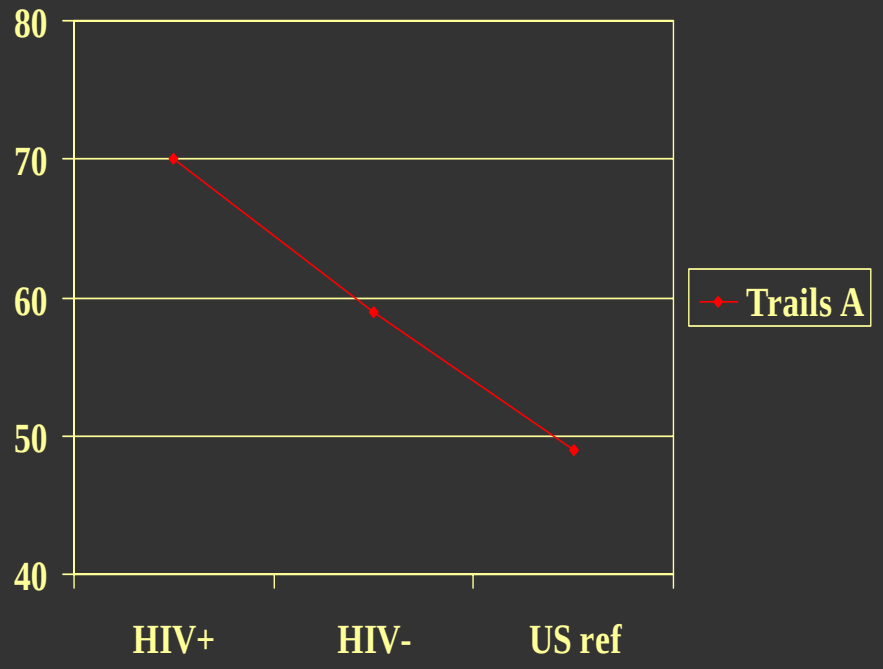


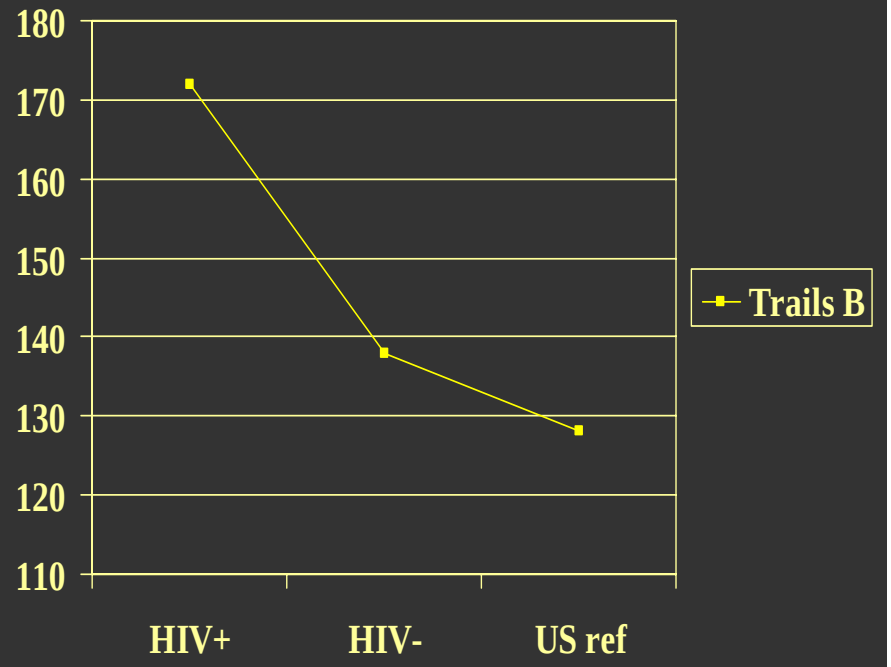


Between-group contrasts on cognitive measures

Measure	Stroop Trial 3	Trail Making A Time to completion	Trail Making B Time to completion
HIV+ N = 23	23.7 (8.1)	70.5 (21.3)	172.1 (65.0)
HIV- N = 27	25.3 (9.0)	59.3 (20.5)	138.0 (51.0)
US norms	N/A	49.3 (30.3)	128.5 (45.1)

Between-group contrasts





Summary of our Studies in Resource Limited Settings

Can we effectively translate cognitive tests for administration?

Yes

Is speed of processing sensitive to HIV effects in a cross-cultural population?

Yes

Can we test memory in this cohort, and if so, is verbal or visual memory most appropriate?

Yes – both memory tests were successful

How are we Approaching Project PREDICT?

- Initial considerations:
  - Brevity of battery (approx 20 min – learning and memory)
  - Need for tests sensitive to HIV
  - Administration by psychologists and non-psychologists
  - Cultural appropriateness (language, speed constructs)
    - For both Thailand and Cambodia
      - Bayley

How are we Approaching Project PREDICT?

Test	Cognitive Domain
Purdue Pegboard	Fine motor speed and dexterity
Color Trails	Psychomotor speed, cognitive flexibility
Beery VMI	Visuomotor skills, spatial skills, motor development

How are we Approaching Project PREDICT?

- Advantages of this battery
  - Brief
  - Sensitive
  - Opportunities for administration
  - Alternate forms (Color Trails)
  - Limited language translation concerns
  - Well-known cross cultural acceptance

How are we Approaching Project PREDICT?

- Possible additional considerations
  - Overall IQ and development
  - Attention
  - Verbal memory
  - Executive function
  - Information processing speed

  - Balance time demands, training, staffing, and availability of tests at sites