

Cognitive Performance in Healthy Volunteers on The Cogtest Computerized Neurocognitive Battery

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Introduction

Deficits in cognition are part of the etiology of several neuropsychological disorders including Alzheimer's Disease (AD). These deficits are often clinically meaningful in that they are related to the degree of difficulty some individuals have with activities of daily living as well as the ability to acquire skills in psychosocial rehabilitation.

Change in cognitive ability could be used as an independent and clinically meaningful target in studies of AD in early and late AD by offering a quantitative basis for assessing how a clinical population deviates from the normal population and how these differences may be affected by treatment. Further in studies with small sample size or increased variability it may be useful in differentiating between the placebo and treatment groups where the ADAS-cog may not show a difference.

Aims

1. To examine age, gender, and practice effects of the Cogtest battery in a group of normal individuals.
2. To examine the test retest reliability of the Cogtest battery in a separate group of normal individuals.

Methods

Data from 200 male and female subjects who participated in a single center, parallel group design study were examined.

Subjects were screened and enrolled if inclusion/exclusion criteria were met.

Urine drug screen administered
Neuropsychological assessments with Cogtest administered
Current medications noted
Family Demographic information obtained

- ❖ To address the first aim, 120 subjects, divided into 6 age cohorts were examined (see Table 1).

Table 1: Study Subjects Aim 1

Group	Age Range (yrs)	Males	Females
1	13-19	10	10
2	20-29	10	10
3	30-39	10	10
4	40-49	10	10
5	50-59	10	10
6	60-69	10	10

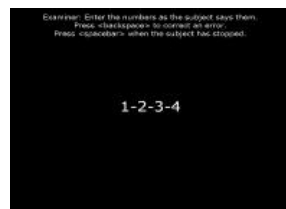
Cogtest battery given 3 times to evaluate learning effects.

- ❖ To address the second aim, 75 subjects, ages 20-60 were studied

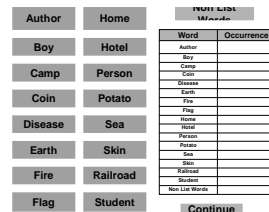
Tested at 0 and 4 weeks (+/- 3 days).
Four alternate forms examined.
Subject assigned 1 of 4 test forms at each session.

Cognitive Assessment

Cogtest provides a customized computerized cognitive test battery (Cogtest, Inc. DE) designed for use with a variety of clinical populations and in clinical trials. The Cogtest platform allows for accurate recording of reaction times and enhanced standardization of administration relative to conventional paper-pencil tests.



Auditory Number Sequencing



Word List Memory



Face memory Test

The Cogtest Battery used in this study included the following tests from the Cogtest Library:

Continuous Performance Test – AX Version
Continuous Performance Test – Identical Pairs Version
Continuous Performance Test - Flanker Version
Strategic Target Detection Test – 4-shape version
Object Working Memory Test
Spatial Working Memory Test
Facial Memory Test (immediate and delayed)
Word List Memory Test (immediate and delayed)
Symbol Digit Substitution
Auditory Digit Span
Set Shifting Test
Go-No Go Test
Auditory Number Sequencing

Statistical Analysis

Repeated measures analysis of variance used to test the effects of gender, age and practice.

The individual endpoints that feed into the composites are standardized using the overall test session means and standard deviations.

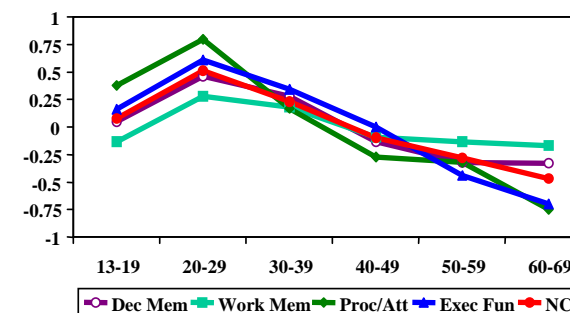
Results

Effects of Age: Significant age effects were observed for many individual tests in Cogtest Battery (See Table 2)

Domain Composite Scores showing age effects (See Figure 1):

Processing & attention ($p \leq .001$)
Executive function ($p \leq .001$)
Neurocognitive composite ($p \leq .001$)

Figure 1. Age Effect on Domain Composite Scores



Practice Effects:

Significant practice effects were observed for many individual tests and for all domain composite scores except executive function (See Tables 3 and 4).

Table 4: Practice Effects

Composite	p value
Declarative memory domain	$\leq .001$
Working memory domain	$\leq .001$
Processing speed & attention domain	$\leq .001$
Executive function domain	$< .05$
Neurocognition Composite Score	$\leq .001$

Test Retest Reliability:

- Significant difference not found on test/retest ($F = .5$)
- Participants did not obtain significantly higher raw scores over time

Table 5: Mean and Standard Deviations at Baseline and Week 4

Test	Baseline	Week 4	r
Set Shifting Test – basal RT	336 ± 65	336 ± 43	0.53
CPT – Flanker (accuracy)	42 ± 4	44 ± 3	0.63
CPT – Flanker (overall RT)	534 ± 62	521 ± 62	0.73
CPT – AX	.9 ± .1	.8 ± .2	0.62
Tapping Speed– left	192 ± 27	194 ± 26	0.81
Tapping Speed Test - right	176 ± 22	177 ± 23	0.79
Face Matching_immediate	79 ± 8	83 ± 10	0.38
Face Matching_delayed	77 ± 10	80 ± 11	0.53
Word List Memory_immediate	47 ± 18	50 ± 14	0.84
Word List Memory_delayed	11 ± 5	12 ± 3	0.82
Object Working Memory dif	7 ± 3	7 ± 4	0.35
Object Working Memory_delayed	15 ± 3	16 ± 2	0.29
Spatial Working Memory_2 sec	28 ± 7	28 ± 10	0.32
Spatial Working Memory_12 sec	47 ± 10	46 ± 13	0.29

Test Retest Stability:

Correlation ranges $r = .38$ (face matching) to $r = .84$ (word list memory)
Overall test retest for battery $= .57$
Exceptions - object and spatial working memory $r = .29$

Conclusion

Cogtest is sensitive to age associated cognitive changes
Age-specific norms should be used in clinical trials.
Cogtest Battery was found to have adequate consistency for test-retest comparison at about 4 weeks.

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Table 2: Age Effects

Test	p value
Auditory Digit Span	$\leq .01$
Auditory Number Sequencing	ns
Symbol Digit Substitution	$\leq .001$
Continuous Performance-AX	$= .15$
CPT – Identical Pairs	$\leq .001$
CPT - Flanker	$= .05$
Spatial Working Memory	$= .09$
Object Working Memory	$= .05$
Word List Memory	$= .12$
Facial Memory	$\leq .05$
Set Shifting	$= .08$
Competing Programs	ns
Go – No Go	$= .06$
Strategic Target Detection	$< .05$

Table 3: Practice Effects

Test	p value
Auditory Digit Span	$\leq .05$
Auditory Number Sequencing	$\leq .05$
Symbol Digit Substitution	$\leq .001$
Continuous Performance-AX	$\leq .001$
CPT – Identical Pairs	$< .05$
CPT - Flanker	ns
Spatial Working Memory	$= .10$
Object Working Memory	$\leq .05$
Word List Memory	$\leq .05$
Facial Memory	$\leq .001$
Set Shifting	$\leq .01$
Competing Programs	ns
Go – No Go	ns
Strategic Target Detection	$\leq .05$