

# INTRODUCTION

The *California Computerized Assessment Package* (CALCAP®) allows you to perform standardized assessments of reaction time and speed of information processing.

Computerized assessment techniques facilitate the application of technology and methods developed in experimental cognitive laboratories to the problems of applied clinical assessment. There are several advantages to this approach.

- C The test can be administered by technical level personnel.
- C The computer controls the presentation of complex stimuli to the subject, thus reducing variability in test administration.
- C The computer automatically records subject performance and produces a report in seconds.
- C Subjects find the computerized tasks stimulating, non-threatening, and often report that they enjoy the experience.

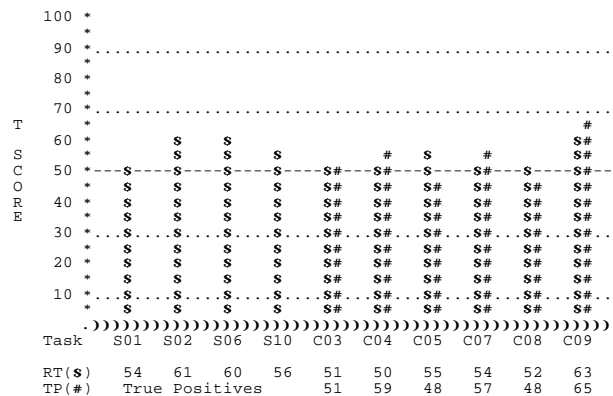
## How It Works

The standard CALCAP task consists of a series of ten Simple and Choice reaction time measures administered by computer. The tasks are designed to be self-explanatory and need only minimal supervision by the examiner. The complete procedure takes approximately 20-25 minutes for administration and scoring. An abbreviated version lasting 8-10 minutes is also included. Stimulus materials are available in English, Spanish or Norwegian.

The individual reaction time measures are designed to assess a number of cognitive domains, including speed of processing (reaction time), language skills, rapid

visual scanning, form discrimination, recognition memory, and divided attention.

The computer scores each task using age- and education-specific norms derived from 641 men ranging in age from 21 to 58 years, with a mean education of 16 years. Final scores are available immediately in tabular and graphical formats.



In addition to reaction time measures, level of performance on each task is assessed by evaluating the numbers of "Hits" and "False Positives." Signal detection theory provides measures of the subject's ability to discriminate between the true signal and distractor items (d') and of the degree to which the subject deviates from the optimal likelihood ratio (beta).

The standard CALCAP program classifies subjects as 'outliers' if they perform two standard deviations or lower on two or more of the tasks. Using these criteria, approximately 10% of subjects are classified as outliers. This baserate of 10% includes individuals with premorbid conditions such as prior head injury, learning disability, pre-existing neurologic conditions, as well as individuals who are simply on the low end of normal functioning.

## Background

The *California Computerized Assessment Package* is modeled after the Continuous Performance Task, a measure of sustained attention and reaction time. Subjects are asked to focus on a display field and respond only to specific visual stimuli.

The CALCAP program presents a broad range of stimulus materials on a computer display, with exposure times precisely controlled by the computer program. Responses to the stimulus also are precisely measured and recorded and include:

- C mean and median reaction times
- C total numbers of true and false positive responses
- C estimates of the signal detection parameters  $d'$  and  $\beta$ .

These measures can be used to assess slowed cognition, focused and divided attention, sustained attention, and rapid visual scanning. It is ideal for longitudinal assessment of cognitive changes due to disease, medications, and cognitive rehabilitation.

## Research

The CALCAP test battery is currently being used to study changes in reaction time and speed of information processing in multiple sclerosis, hyperbaric nitrogen narcosis, HIV infection, dementia, drug abuse and traumatic brain injury.

Findings to date suggest that the CALCAP is a practical and inexpensive screening tool for detecting early cognitive decline. Preliminary data suggest that the CALCAP may eventually prove more sensitive than conventional neuropsychological procedures for detecting cognitive changes over time.

The CALCAP has been used extensively with a sample of 509 HIV negative and 451 HIV positive men who are participating in a longitudinal study of the natural history of AIDS (Miller et al., 1988, 1989a, 1989b, 1991, 1992a, 1992b, 1993).

These subjects were tested using both the CALCAP and a brief conventional neuropsychological screening

procedure consisting of measures of motor speed and attention (Trail-Making, Grooved Pegboard), verbal memory (Rey Auditory Verbal Learning Task), memory span (WAIS-R Digit Span), and verbal fluency.

Subjects were designated as 'outliers' on the conventional neuropsychological screen if they scored two or more standard deviations below the mean on two or more independent measures of cognitive functioning, or if they scored three standard deviations or lower on any one measure.

Using these criteria, the computer program and the conventional neuropsychological screen agreed on outlier status 85% of the time. Further, 60% of individuals identified as outliers by CALCAP at baseline were identified as having equivocal or abnormal clinical neuropsychological or neurological exams on follow-up.

Preliminary longitudinal data suggest even greater specificity and sensitivity for the computerized measures for detecting change over time. In a sample of 101 HIV seronegative and 88 HIV seropositive men, poorer performance on the computerized measures following a 6-month interval was noted in approximately twice as many seropositive (27 men, 30.7%) as seronegative subjects (15 men, 14.9%). By contrast, the conventional neuropsychological measures detected poorer performance by only 21 seropositive (23.9%) and 18 seronegative men (17.8%) after six months.

In a study of 42 patients with mild to moderate AIDS dementia, Worth et al (1993) found that patients with AIDS dementia performed significantly worse than a control group of 33 healthy subjects on all four of the reaction time measures in the Abbreviated CALCAP battery. The two measures of sequential reaction time were found to be the best tasks for discriminating between patients and controls and for discriminating among different levels of severity of dementia.