

COGNOMETER

BACKGROUND OF THE INVENTION

The present invention relates to a cognometer, and more particularly to a portable electronic cognometer including a memory monitor and a concentration monitor.

Repeated testing of memory and concentration is needed to identify declining cognitive function that may require medical evaluation for dementia, delirium, other medical or psychiatric illness, or the cognitive side-effects of medications. Repeated cognitive monitoring is not commonly carried out even in medical settings, let alone at home, due to lack of a device for automated, easily repeated testing.

Easily repeated testing also makes it possible to determine any individual's best (and worst) performance at baseline, so that the individual's memory and concentration in the future can be evaluated by comparison with his or her own previous performance, rather than only by reference to less sensitive general norms obtained from the performance of other more or less similar persons.

Automated testing should provide reliable, rapid, and automatic administration, scoring, and reporting, so that repeated testing can be carried out reliably in precisely the same way as frequently as desired, at home as well as in medical settings. This permits self-testing by the general public, and monitoring of patients with Alzheimer's disease or other cognitive impairment, at home as well as in medical offices, clinics, emergency rooms, hospital wards, psychiatric facilities, or nursing homes.

Tests of memory and concentration should be designed to elicit maximum performance on rigorous but brief and easily repeated tests of sensitive, early, and prominent indicators of cognitive impairment. These tests will be regarded as ecologically valid and appropriate only if they check functions that everyone is expected to be able to perform in ordinary life; for example, everyone is expected to be able to remember a telephone number or copy a sequence of digits. The tests of memory and concentration must require only the simplest of responses, e.g., pressing numbered keys, so that appropriate responses can be obtained from all but the most severely impaired persons. Preferably these tests should be self-paced to compensate for the cognitive slowing often present in aged or cognitively impaired persons. To identify excessive slowing that may be an early indication of impaired cognitive processing, response speed may be measured and reported.

It is essential that such tests measure only the ability in question and not be affected by other considerations. For example, if a person has vision or reading problems which prevent him from seeing or understanding what he does see, his subsequent inability to reproduce a number displayed does not reflect on his memory. Similarly, if he has manual dexterity problems which interfere with his reproducing a displayed number on a keyboard, his failure to key in a number which he was supposed to memorize does not reflect on his memory. Thus it is critical that any cognitive test isolate the cognitive ability being tested and, even if it does not test that ability alone—for other factors always come into play—the test should at least evidence the other factors at play.

Accordingly, it is an object of the present invention to provide a reliable, rapid and automatic administration, scoring and reporting test for self-testing at home or elsewhere.

Another object is to provide such a device which provides for ecologically valid and appropriate testing.

A further object is to provide such a device which effectively isolates for testing the cognitive ability to be tested, even in aged or infirm users.

SUMMARY OF THE INVENTION

It has now been found that the above and related objects of the present invention are obtained in a cognometer comprising a memory monitor and a concentration monitor. The cognometer is an electronic device programmed for repeated, rapid automated assessment and monitoring of both memory and concentration. The cognometer includes means for actuating one of the monitors at a time.

The memory monitor comprises display means, such as a LED or CRT screen, and means for entering data, such as a keyboard. Also provided are means for randomly generating data and displaying the randomly generated data in a common format on the display means, and means for testing the user's comprehension of such randomly generated data. Then, operative only if the user comprehends such randomly generated data, are means for testing the immediate recall by the user of such randomly generated data. Finally, operative only if the user has immediate recall of said such randomly generated data, are means for testing the delayed recall by the user of such randomly generated data.

In a preferred embodiment, the randomly generated data comprises a number comprising a series of digits. The display means displays the series of digits in the common format of a telephone number, preferably a seven-digit number which punctuation intermeditates the third and fourth digits or a ten-digit number in the common format of a long distance telephone number—e.g.

" - - - - - . - - - - - . - - - - - "

or

" (- - - -) - - - - - . - - - - - "

The data entry means comprises a plurality of numbered buttons.

Preferably the means for testing comprehension of the randomly generated data comprises means for displaying such randomly generated data on the display means, means for comparing such randomly generated data with first new data entered by the user on the data entry means while such randomly generated data is displayed on the display means and for displaying correct data in the first new data on the display means in alignment with such randomly generated data displayed. Also included are means, operative only if an error was made, either for clearing the display means of any of the data and then restarting the comprehension test means, or for indicating an error was made on the last datum entered by the user on the data entry means and for providing the user another opportunity to enter the correct datum.

Preferably the means for testing the immediate recall of the randomly generated data comprises means for clearing the display means of any of the data while displaying thereon the common format of the randomly