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A Discussion of Cognitive Screening Instruments and Executive Functions

By [Kim Warchol](#) | [0 Comments](#)



Purpose of Utilizing a Cognitive Screening Instrument

Early identification of cognitive impairment is very important. And yet a large cross-sectional study of primary care physicians' charts found that in 65% of cases of dementia, there was no diagnosis mentioned in the chart. Therefore it becomes imperative that a therapist and/or facility have a method and procedure to proactively identify cognitive impairment as we cannot rely on the physicians to make an early diagnosis or the patient to self-report.

Benefits of early identification include:

1. Early introduction of cholinesterase inhibitors such as Aricept which may slow the progression of the disease
2. Identification and provision of the "just-right match" of cognitive ability to living environment and caregiver support
3. Maximize function, safety, and emotional well-being

There are several instruments available to screen for cognitive impairment. I will provide a brief review below of three tools.

Review of Common Screening Instruments

MMSE (Mini Mental State Exam - Folstein 1975)

One of the most widely used tools is the MMSE. The MMSE is primarily designed to test global cognitive function. This tool consists of 30 items comprising subscales assessing orientation, word registration, attention (via a serial sevens or spelling task), word recall, and language. Additionally, a figure copy exercise is included to examine visuospatial abilities.

It can be used to screen for cognitive impairment, to estimate the severity of cognitive impairment at a given point in time, to follow the course of cognitive changes in an individual over time, and to document an individual's response to treatment. It is used most often to evaluate older adults for delirium or dementia. Since its creation in 1975, the MMSE has been validated and extensively used in both clinical practice and research.

A patient's score on the MMSE must be interpreted according to his or her age and educational level. Whereas the median score is 29 for persons 18–24 years of age, it is 25 for those who are 80 or older. The median score is 22 for persons with a fourth-grade education or less; 26 for those who completed the eighth grade; and 29 for those who completed high school or college.

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The maximum score is 30. A score of 23 or lower is indicative of cognitive impairment. As a rule, scores of 20 or lower indicate delirium, dementia, **schizophrenia**, or a mood disorder. The MMSE takes only 5–10 minutes to administer and is therefore practical to use repeatedly and routinely.

Since the publication of the MMSE, research has suggested that patients with “cortical” dementia such as Alzheimer’s disease display differential impairment on tests of memory and language; whereas patients with “subcortical dementia,” such as Vascular Dementia associated with periventricular and deep white matter alteration, produce greater impairment on tests of executive control and motor/visuoconstruction. However, despite the popularity of the MMSE, relatively few studies have examined its clinical utility beyond the use of the summary score to identify individuals with dementia.

PROS:

Quick and easy to administer. The test is widely utilized and therefore well-known by many including physicians, insurance agencies, nursing, therapy, etc. A wide body of research to support its validity.

CONS:

The instrument relies heavily on verbal response and reading and writing. Therefore, patients that are hearing and visually impaired, intubated, have low English literacy, or those with other communication disorders may perform poorly even when cognitively intact.

It has been suggested to have culture, gender, and educational bias that may impact scoring.

Executive cognitive dysfunction is typically the first area of cognitive impairment and these problems can precede the memory disturbances of dementia. People with executive cognitive dysfunction can have a normal MMSE score but still have severe functional limitations.

Clock Drawing Test (CDT)

The clock drawing test takes only 2 minutes to administer and assesses cognitive or visuospatial impairment (Brodaty & Moore, 1997; Shulman et al, 1986).

The CDT is hypothesized to assess more specific aspects of planning, organization, and visuospatial skill. Directions for completing the CDT involve asking a patient to draw the face of a clock, including the numbers, and then to place the hands to designate a certain time, such as “ten minutes after eleven.” Although different scoring templates for the CDT exist, most often code for features such as relative size, spacing and placement of numbers or hands, disorganization, perseveration, completeness, and other potential errors that are hypothesized to indicate cognitive impairment.

Research results indicate that in a clinic population, clock drawing, especially if scored according to the Shulman scale and combined with the MMSE, is an extremely efficient test screening measure for mild to moderate dementia of the Alzheimer’s type with low false negative and false positive rates. This may have implications for screening elderly populations.

One study suggested that there is evidence to suggest that clock drawing provides an excellent measure of the certain types of executive function deficits (i.e., frontal lobe) associated with dementia.

PROS:

Quick and easy to administer. Becoming more widely known and accepted with a body of research to support its validity. Little to no culture, gender, or educational bias.

CONS:

Various ways to score and different opinions on the most effective scoring method.

EXIT25 (Executive Interview)

The EXIT is a screening instrument for executive cognitive dysfunction in patients with mild dementia. The EXIT is a 25-item interview that takes 15–20 minutes. It is designed to be administered at the bedside by non-neuropsychiatrically trained personnel. The EXIT score strongly correlates with the findings of an extensive battery of diagnostic neuropsychiatric tests (r range 0.64–0.83), and interrater reliability between 2 physicians is high (r = 0.90).

The EXIT25 is a 25-item multitask assessment of executive function that is easily administered at the bedside by a professional such as an Occupational Therapist. Scores on the EXIT25 correlate strongly with scores on other executive measures including the Wisconsin Card Sorting Test (r =

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0.54), Lezak's Tinker Toy Test ($r = 0.57$), Test of Sustained Attention (time, $r = 0.82$; errors, $r = 0.83$), and Trail Making Part B ($r = 0.64$). The interrater reliability of the EXIT25 is high ($r = 0.90$).

An EXIT25 score of 15 of 50 indicates executive impairment. This score best discriminated well elderly retirees from those in supervised settings and best predicted capacity to give informed consent for health care.

PROS:

Focuses on executive functions.

CONS:

Not as well known or researched as the other tools. Takes longer to administer and requires more training to administer and score.

Understanding Executive Function Impairment

Executive functions can be described as a set of cognitive skills that are required for the planning, initiation, and regulation of complex goal-directed behavior. Neuroanatomically, executive functions are associated with the prefrontal cortex and its basal ganglia-thalamic connections.

Most dementing illnesses involve some degree of executive impairment. In patients with Alzheimer's disease, the severity has been associated with functional decline, need for care, and development of neuropsychiatric symptoms.

It is therefore unfortunate that the most-used assessment scale in dementia, the Mini-Mental State Examination (MMSE), contains no measurement of executive function.

Summary

Often cognitive impairment such as executive function disorder is not identified and yet there are many reasons for early recognition of these deficits.

1. Providing seniors with mild cognitive impairment (MCI) and early dementia the correct living environment and caregiver support
2. Executive function deficits can lead to problems in safety, function, employment, and emotional well-being
3. Also, there is significant agreement on the importance of early identification in order to provide medications at the point of MCI to slow the progression of the disease
4. Studies show that approximately 50% of those with MCI go on to develop Alzheimer's disease

We would liken MCI to Allen Level Low 5 performance. We have a variety of tools in the Allen battery to assist with identification of level 5 including the LACLS/ACLS and some ADM projects. In addition, we can utilize the RTI and the Cognitive Performance Test (CPT) by Theresa Burns to identify Allen Level 5 abilities. However, it is important to note that there has been some debate as to whether using routine, familiar activities such as those contained within the RTI or the CPT is an effective way to identify higher cognitive levels as they might not truly evaluate executive functions.

A therapist can administer these Allen assessment tools once the person is on caseload to further validate screening findings. It is very important for a team member (which could be a therapist, nurse, social worker, etc.) to consider using one of the previously described screening tools as a method of initial cognitive screening. If a problem is identified during the screening, a physician evaluation and a therapy assessment may be necessary.

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The value of clock drawing in identifying executive cognitive dysfunction in people with a normal Mini-Mental State Examination score

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