

The Clock Drawing Test versus Mini-mental Status Examination as a Screening Tool for Dementia: A Clinical Comparison

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ABSTRACT

There is a growing incidence of dementia patients in the community, and with this growth, there is need for rapid, valid, and easily administrable tests for the screening of dementia and mild cognitive impairment in the community. This review looks at the two most commonly used tests in dementia screening, namely, the clock drawing test (CDT) and the mini-mental status examination (MMSE). Both these tests have been used in dementia screening over the past three decades and have been the subject of scrutiny of various studies, reviews, and meta-analysis. Both these tests are analyzed on their ability to assess dementia and screen for it in the community, general practice and general hospital settings. The methods of administration and scoring of each test are discussed, and their advantages and disadvantages are explained. There is also a direct comparison made between the MMSE and CDT in dementia screening. Future research needs with these tests are also elucidated.

Key words: *Clock drawing test, dementia, mini-mental status examination, screening*

INTRODUCTION

As the population of the developing world ages, dementia is becoming an increasingly important public health concern. In developed countries, the prevalence of dementia is approximately 1.5% at age 65 years and doubles every 4 years, to reach approximately 30% by age 80.^[1] It is a major cause of disability among older people and constitutes one of


the most serious, and expensive, challenges currently facing health and social care services in the developed world.^[2]

Research into the early screening of cognitive disorders, specifically cognitive impairment and dementia, has aroused interest over the last two decades. One of the driving forces is the extended life span of

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the aging population with the consequent increase in the incidence of dementia and mild cognitive impairment (MCI).^[3] MCI can be characterized by an amnesic syndrome, impairment in a single nonmemory domain of cognition, or slight cognitive decline in more than one domain.^[4]

Several studies have shown that dementia and cognitive impairment predicts future survival.^[5] As pharmacological advances for early treatment or symptom management in dementia become available, screening for dementia in the older population will require consideration as a possible preventive strategy.^[6]

BENEFITS OF COGNITIVE SCREENING

Cognitive screening carries a number of important benefits. A firm diagnosis of dementia helps to provide an explanation to patients and families regarding recent changes in instrumental activities of daily living, behavior, intellectual functioning, and mood. Once the diagnosis is established, patient and family can plan for important issues including powers of attorney for property and personal care, living wills for end of life care, planning for long-term care, and the preparation of a last will and testament.^[7] Cognitive screening may help to identify at-risk drivers and those who need further assessment of driving^[8] and delirium risk.^[9] Further, early diagnosis provides opportunity for medication management, if appropriate, with the hope of improving function, behavior, and cognition. Cognitive screening represents the initial step in the process of further assessment for dementia and can help identify potential cases for long-term management.^[10]

Screening should be carried out in individuals who have the greatest risk of developing the disorder. High-risk groups for developing dementia include those with subjective complaints of memory impairment^[11] and those with a history of early- or late-onset depression.^[12] Individuals diagnosed with MCI are the main target for early interventions delaying dementia onset because they are at 31%–44% higher risk of developing dementia compared to normal control subjects.^[13] Alzheimer's dementia is the most common form of dementia and presents with memory loss. However, disturbances with executive cognitive functioning may precede the memory decline,^[14] which results in difficulties with activities of daily living.^[15]

Cognitive impairment is found in up to 30% of general medical patients and between 30% and 75% of these are unrecognized by the attending doctors. Unsuspected cognitive impairment causes diagnostic difficulties when the history is inaccurate and therapeutic difficulties when instructions are given with which the patient cannot

comply.^[16] General practitioners (GPs) play an important role in the early diagnosis of dementia. Most GPs have known their elderly patients for years and are therefore in an excellent position to spot abnormal behavioral changes or cognitive decline. Furthermore, relatives and caregivers are initially likely to seek their GPs' advice once they observe any conspicuous changes in the behavior of an aging family member.^[17] Since the identification of dementia in an early stage is important for the initiation of effective treatment it is crucial that GPs are enabled to accurately screen for dementia.^[18] Geriatric specialist services which see high-risk older adults are also in a position of opportunistic case finding for dementia.^[19]

NEED FOR EFFICIENT SCREENING TESTS

Even though comprehensive neuropsychological batteries of tests such as the Blessed Test of Orientation, Concentration, and Memory^[20] are very useful and perform well in identifying MCI and dementia, the main reasons for not administering the tests were lack of time and fear of offending the patients and inadequacy of easily administered tests. Furthermore, one needs to consider the capacity of local health-care services to manage cases identified by screening and the economic burden of increased screening.^[21] It is therefore crucial to establish efficient yet short screening tests that are simple and easy to administer.^[22]

The value of a cognitive screening procedure depends on its robustness in the presence of confounding influences not directly related to the presence of dementia, such as low education, spoken language, and variable clinical settings and intended uses.^[23] An ideal system would be rapidly administered in diverse settings, minimize false positives, optimize dementia detection, and reduce or eliminate the influence of education, language, or ethnicity.^[24-27] Among the most widely used screening tests for dementia are the Mini-Mental State Examination (MMSE)^[28] and the clock drawing test (CDT).^[29] The CDT (with a score range of 1–5) is strongly correlated with the MMSE in patients with various cognitive dysfunctions.^[30]

The aim of this paper is to review the use and efficacy as well as clinical advantages and disadvantages of the CDT and MMSE as screening tools for dementia in routine clinical practice.

THE CLOCK DRAWING TEST

Method of administration

The CDT has become increasingly popular with clinicians and researchers as a screening instrument

for Alzheimer's dementia^[31,32] either by itself or as part of a brief battery.^[32,33] Some tests include an already predrawn circle. Other authors prefer to observe the patients drawing their own clock circumference as that can indicate some degree of impairment. The disadvantage is that if the patient starts off with a poorly drawn circle, at times merely due to age-related problems such as tremor, the remainder of the test may be compromised. There is no time limit for the test.^[34]

The most common administration instructions are: "Please draw a clock face, placing all the numbers on it. Now set the time to 10 past 11." This allows for the detection of problems in concrete thinking, specially the tendency to pull the minute hand toward the number 10.^[35] The various ways of presenting the test and the different principles involved in scoring make comparisons difficult although some scoring systems are highly inter-correlated.^[36,37]

Scoring systems

1. Shulman method: One of the oldest scoring systems used was by Shulman *et al.*^[29] They developed a 5-point scale of hierarchical errors with the higher score for a failed attempt to draw a clock. In a subsequent study, this scale was reversed and the maximum points given to a perfect clock^[38-39]
2. Modified Shulman method: In the modified Shulman method,^[40] subjects are asked to add the numbers of a clock face to a predrawn circle and to mark in the hands at 10 after 11. Scores are as follows, namely, 1 "a perfect clock;" 2 "mild visuospatial errors;" 3 "errors in denoting the specified time;" 4 "moderate visuospatial disorganization;" 5 "severe visuospatial disorganization;" and 6 "no reasonable representation of a clock"^[41]
3. Sunderland system: The Sunderland scoring system uses a single 10-point rating, with higher numbers indicating better performance. To use this scale, clock drawings are matched to 1 of 10 clock descriptions, ranging from 1 (no attempt or uninterpretable effort to draw a clock) to 10 (clock face and numbers intact and hands in correct position). The first 5 points reflect drawing a clock face with circle and numbers intact. The remaining points are assigned for accurately drawing hands to denote the time.^[42] They found that interrater reliability was high in clinicians and nonclinicians
4. Wolf-Klein method: In the Wolf-Klein method, subjects are merely asked to "draw a clock" on a preprinted circle. Their scoring system has 10 anchor points which pertain only to the spacing of the numbers; time setting is not assessed. Sample anchor points include: 10 "normal"; 7 "very inappropriate spacing;" 4 "counter-clockwise rotation;" and 1 "irrelevant figures"^[43]
5. Manos and Wu system: The Manos and Wu scoring system is an objective scoring method which can be used by less trained staff.^[44] Originally designed for use with a predrawn circle, the Manos scoring system can be used with participant-drawn circles as well. Clock drawing performance is rated on a 10-point scale, with higher numbers reflecting better performance. One point each is given for the correct placement of numbers 1, 2, 4, 5, 7, 8, 10, and 11 and each hand of the clock. They found that age affected the score in the control group^[44]
6. Mendez system: The Mendez scoring system, also known as the Clock Drawing Interpretation Scale, uses a 20-point scale to evaluate clock drawings, with higher numbers reflecting better performance. The scale is derived from 20 individual items, worth 1 point each. Three items on this scale reflect general characteristics of the clock, 12 items refer to the presentation and placement of numbers, and 5 items assess the existence and placement of each hand. However, the hands need not indicate the correct time to receive full credit^[45]
7. Rouleau system: The Rouleau scoring system is modeled after the Sunderland system but independently assesses three components of the drawing (integrity of the clock face, 2 points; presence and sequencing of numbers, 4 points; and presence and placement of hands, 4 points), yielding an overall 10-point scale, with higher numbers indicating better performance^[46]
8. Pfizer Inc., and Eisai Inc. System: The Pfizer Eisai scoring system 20 uses a 4-point scale, with higher numbers indicating better performance. One point each is assigned for drawing a closed circle, including all 12 correct numbers, placing the numbers in correct positions, and placing the hands incorrect positions^[47]
9. Alzheimer's Disease (AD) Cooperative Study scoring system: The AD Cooperative Study scoring system uses a 5-point scale, with higher numbers indicating better performance. One point each is assigned for drawing an approximately circular face, symmetry of number placement, correctness of numbers, presence of two hands, and hands showing correct length or time^[48]
10. Watson quick screening system: For a quick screening of cognitive status, the method of Watson can be recommended, not because it is much better than the others in terms of sensitivity and specificity, but because of its simplicity. The subject is instructed to draw numbers within a predrawn circle 10 cm in diameter to make that circle look like the face of a clock. After completion, the clock face is divided into quadrants by drawing one line

through the center of the circle and the number 12 and a second line perpendicular to the first line. The number of digits in each quadrant is counted. If a digit falls on the reference line, it is included in the quadrant that is clockwise to the line. The placing of any three digits in a quadrant is considered to be correct. An error score of one is assigned for each of the first three quadrants containing any erroneous number of digits and an error score of four is assigned for the fourth quadrant if it contains an erroneous number of digits. A maximum error score of seven can be obtained. The normal range for the score is 0–3. A score of 4 or greater in this scoring system has a sensitivity of 87%, a specificity of 82%, and a $K = 0.70$ for identifying dementia^[49]

11. Tuokko system: Tuokko *et al.* include clock setting and clock reading in addition to clock drawing. The scoring for the clock drawing uses a series of 25 error types with no ceiling for the total score where more than 2 errors indicate impairment. The errors with highest differences between patients and controls were omissions and misplacement of numbers^[50]
12. Lam *et al.*: The system established by Lam *et al.* uses scores up to 10 points with a score higher than 3 indicating impairment. This system also uses both quantitative and qualitative elements and in addition the functions of copying and time setting.^[51]

Other systems within cognition batteries

Borson *et al.* used a CDT system within a battery, the MiniCog, comprising of the CDT and a simple memory test (three-word recall).^[52] Royall *et al.* developed the CLOX test, a CDT scoring system, which they mention is specifically designed to measure executive control functions. The patient is asked to draw a clock on an empty page and later to copy a clock.^[53]

Jitapunkul *et al.* developed and used the Clock Completion Scoring System to score the CDT in Thai patients with memory complaints. The system uses a 10-point score with a cutoff at 7 points. They reported problems in administering the CDT to an illiterate population and the preference of using a predrawn circle.^[54]

Lin *et al.* derived a simplified system to differentiate early to mild AD in a population in Taiwan. Age and education were significantly related to the CDT although the correlation was low. They also developed a simplified CDT with only three items (hour hand, number 12, and difference between hands) and reported a good comparison between the simplified and the full version of the scoring system.^[55]

CLASSIFICATION OF CLOCK DRAWING

Class 1: Bizarre clocks

These range from a few uninterpretable squiggles to perseverative use of numbers all around the perimeter. Some patients could not apply themselves well enough to make any mark at all.

Class 2: Major spacing abnormality

These clocks contain all the correct numbers but are spaced very poorly. All 12 numbers may be bunched around one side of the clock and if the bunching finishes with the 11 (or 12 if started with 1) before the 9 o'clock horizontal, a major spacing abnormality is present.

There may be several bunches of numbers (example 6). One number may be omitted or an extra number (usually a second 12) may be added. Multiple number omissions or additions belong to Class 1.

Class 3: Minor spacing abnormality

The numbers are correct, but spacing is slightly abnormal. If the numbers finish above the 9 o'clock horizontal, it is included here. When a more major spacing abnormality is recognized spontaneously (usually at the 3 or 6 location) and corrected normally for the remainder of the clock, or when there are single number errors with normal spacing, they are included here.

Class 4: Normal clocks

These are completely normal. Filling in 12, 3, 6, and 9 only in the correct location is classed as normal.

The top six errors (wrong time, no hands, missing numbers, number substitutions, repetition, and refusal) are all easily observed by untrained individuals and require little judgment or subjective interpretation. An algorithm using these errors, plus refusal, had good specificity (88%) and sensitivity (71%) for dementia in this sample. These findings also suggest that many nondiscriminating errors may be safely ignored when using the CDT to screen for dementia.^[56-57]

CLINICAL UTILITY OF CLOCK DRAWING TEST

The CDT is a simple neuropsychological instrument that can be easily applied to reflect frontal and temporoparietal functioning.^[58] The CDT was introduced initially as an indicator of constructional apraxia. From 1953 to 1986, the CDT was mainly used to screen visuoconstructional disorders associated with lesions in the parietal region of the brain. Constructional apraxia may occur in many neurological diseases, such as in patients with stroke sequelae and is often present in early dementia. In the

past two decades, the CDT has aroused considerable interest for its role in early screening of cognitive impairment, especially in Alzheimer's dementia,^[59] vascular dementia, the second most frequent diagnosis, and frontotemporal dementia are also thought to show deficits in executive functioning.^[60,61]

Its contribution has also been investigated in the assessment and follow-up of delirium, focal cerebral lesions, Huntington's disease, schizophrenia, unilateral neglect, multiple sclerosis, among others.^[62]

A variant of the CDT, "CLOX," was able to distinguish between Alzheimer's dementia and MCI, finding that subjects with MCI had worse verbal, visuospatial, and executive function skills than control subjects.^[29]

The test taps into a wide range of cognitive domains that may be impaired early in the course of Alzheimer's dementia, such as verbal understanding, memory, spatially coded knowledge, abstract thinking, planning, concentration, and visuoconstructive skills.^[63] Visuo-perceptual and visuomotor abilities to internally represent the clock face and to translate the mental representation into a motor program and visuoperception also guides the ongoing layout of the clock and monitors the output. Hemi-attentional processes are needed to produce features on both sides of space, the linguistic system must provide the graphomotor representation on numbers, and executive function must coordinate the planning, organization, and simultaneous processing. This includes corrections and inhibition of incorrect responses such as perseveration. Memory is needed to remember the instruction to set the time and retrieve it once the clock face is complete, and finally, the time setting of 10 past 11 with the 2 recoded as 10 min past the hour cannot be stimulus-driven but must rely on executive function.^[64]

Poorer clock drawing performance is associated with known risk factors for Alzheimer's dementia, such as older age, depression lower education level, and hypertension.^[65] Education, age, and mood can influence the test results, with subjects of low education, advanced age, and depression performing more poorly.^[66] The CDT may then be an apt means of measuring early cognitive decline, possibly before MMSE, or other screening tests.^[67]

Advantages

The key benefits of CDT are simple and quick application having the potential to be less offensive, less threatening to patients, easily remembered, requires minimal equipment, is portable and can be administered to the hearing impaired (with written instructions if necessary), the very ill and the poorly educated and non-English

speakers to survey global cognitive functions. It is easy to document graphically in clinical records, and it can be used to document deterioration over time in dementia patients. Normal clock drawing ability reasonably excludes cognitive impairment. Therefore, it is an ideal screening tool for the GPs. For resident doctors, it is quick and easy to remember. Because of the high proportion of elderly admissions to hospital with cognitive impairment and the large numbers who remain undetected, a simple, sensitive screening test is required. The CDT fits the bill in this regard.

Irrespective of the scoring system was used, the CDT has been found to be effective in identifying mild-to-moderate dementia in a memory disorders clinic population and to correlate highly significantly with two commonly used measures of cognitive ability and a measure combining basic and instrumental activities of daily living (the Blessed Dementia Scale).^[68] In addition, clock drawing performance was found to be independent of depressive symptoms as measured by the Hamilton Rating Scale for Depression and the Geriatric Depression Rating Scale.^[69]

The CDT can be rapidly and easily administered by nonprofessional testers such as family members and office assistants, an advantage that could accelerate the inclusion of preliminary dementia screening procedures for clinical populations at risk.

Disadvantages

The effects of education remain controversial, with some researchers questioning the validity of clock drawing in lowly educated subjects. Although AD patients and comparison subjects could be differentiated with a relatively high degree of accuracy, the ratings were considerably less useful when making the distinction between a diagnosis of MCI and AD. Therefore, while the CDT may be a good screening instrument for AD, it may not be a sensitive instrument for screening MCI.^[70] Although the CDT has already been used widely for diagnosing dementia, it is still a subject for debate on whether the CDT is valid as a screening instrument for MCI.

The CDT appears to be less sensitive than these other instruments in detecting the earliest signs of dementia. The clock drawing task (and perhaps any single cognitive test) is therefore inappropriate as a diagnostic or screening instrument in very early dementia of Alzheimer's type. Diagnosis should always be made in the context of a thorough clinical assessment, including performance on several tasks together.

When screening for MCI, the presence of an abnormal CDT in isolation (based on subjective clinician rating)

may result in a large number of false positive or false negative errors.^[71] A problem with using the test as a diagnostic measure is that visuoconstructive dysfunction and other signs of cognitive dysfunction may interfere and that patients with demonstrated neglect may show no impairment or only slight impairment in clock drawing. It has therefore been recommended that the test not be used as a measure of visuospatial neglect. Verbal intelligence may compensate for left unilateral spatial neglect, thereby resulting in a false-negative outcome.^[71]

The discrepancy among the raters highlights the difficulty that clinicians face when scoring clocks subjectively. CDTs' role in the detection of dementia is more relevant in the primary care context than in a specialist setting and that the many versions of CDTs are not necessarily comparable or equal in utility. Despite its popularity, there is no consensus on the most appropriate way to apply and score the CDT because of the large number of scoring systems available and their varying levels of complexity. This makes it difficult to compare study results.

Compared with the MMSE, it was found that the CDT lacks sensitivity and negative predictive value. Thus, the CDT alone would not be ideally suited to use as an initial screening tool followed by more definitive testing if necessary.

THE MINI-MENTAL STATUS EXAMINATION

Method of administration and scoring

The MMSE was developed from items selected from different neuropsychological batteries and includes five sections: Orientation (10 points); registration (3 points); attention and calculation (5 points); recall (3 points); and language (9 points) for a total of 30 points. Folstein acknowledges the MMSE's limited sensitivity to frontal and subcortical changes and has recognized the need to add specific tests of frontal and executive function.^[72]

The MMSE offers two tests of concentration, serial 7's, and spelling WORLD backwards, which are used interchangeably but may not have the same psychometric properties. These and other concerns about the administration and scoring of the MMSE have led to the development of variations including the Standardized MMSE (SMMSE)^[73] and the modified MMSE (3MS).^[74]

The standardized mini mental status examination

The standardized approach recommends explicit time limits on all the tasks. For orientation to place, items are asked in decreasing order from the

largest unit size (e.g., country) to the smallest unit size (e.g., floor of the hospital). The three-word memory and registration task are standardized to three specific words (apple, penny, and table). The SMMSE also offers alternative three-word sets. Attention and concentration are tested only using the WORLD backwards task. Subjects are asked to spell WORLD forward first; however, and if not able to do this successfully, score zero. The three-stage command provides the following specific instruction, "take this paper in your (nondominant) hand, fold the paper in half once with both hands, and put the paper down on the floor." For the copy design task (intersecting pentagons), a score of one point is awarded only if a four-sided figure is created by the overlapping of the two pentagons.^[73]

Advantages

The MMSE appears to be useful as a good first step in the evaluation of cognitive status and maintains its original purpose in detecting cognitive decline over time. The utility of the MMSE extends to effectively recognizing mild AD. Incorrect responses for the items date, day of the week, and delayed recall can indicate mild AD.^[75]

In the absence of depression, MMSE total score may differentiate between normal age-associated memory symptoms and MCI (a possible prodromal state of AD). The MMSE is therefore capable of providing useful information necessary for physicians to pursue early treatment and/or referral of patients displaying early signs of cognitive decline.^[76]

This is due in part to its psychometric properties such as excellent interrater reliability and good evidence of criterion and construct validity for dementia.^[77]

Unlike the CDT, there is a standard scoring system for the MMSE, and no major variations exist worldwide. It has been translated into many languages worldwide, and a Hindi version for India exists.^[78]

Disadvantages

Patients with high premorbid intelligence or education show a ceiling effect thus leading to false negatives. Greater age, limited education, foreign culture, and sensory impairment can produce false positives. Consequently, MMSE score needs adjustment for age and education.^[79] In the Sao Paulo Ageing and Health Study, the MMSE was found to have an unacceptably high dementia misclassification for older illiterate adults at its regular cutoff point.^[80] It is also described by general physicians as impractical because it takes 15 min to administer.

The MCI studies demonstrated very little value of the MMSE in making a diagnosis of MCI against healthy controls and modest rule-out accuracy. It had similarly limited ability to help identify cases of Alzheimer's dementia against MCI.^[81]

Depression, an important differential diagnosis in the elderly population, was not well separated from normal elderly controls or MCI by the MMSE. Other studies have shown that detecting cognitive impairment due to depression requires more complex tasks involving executive function or speed. Due to the overlap in cutoff scores on the MMSE that separated controls from MCI (≤ 27) and from depression (≤ 28) subjects, caution should be exercised when patients' overall score falls in this range. This finding also demonstrates that additional specific testing of mood is important for an elderly person with suspected cognitive decline.^[82]

The MMSE often fails to identify executive dysfunction even if it is quite severe. Nine, there are detailed neuropsychological tests and more extensive bedside tests available to evaluate executive function specifically, but most of them are impractical for busy physicians.^[83] A further concern is a recent suggestion that its widespread usage may result in users learning appropriate responses.^[84]

UTILITY OF THE MINI-MENTAL STATUS EXAMINATION IN CLINICAL PRACTICE

The MMSE is a brief assessment of mental state that is widely used to assess cognitive function in relation to dementia. Guidelines recommend the MMSE as a screening instrument for identifying cognitive impairment in older people in primary care that is suitable for inclusion in the assessment for patients over the age of 75 years.^[85] An abnormal score ($< 26/30$) remains an important signal that more evaluation and investigations may be necessary to diagnose dementia.

The MMSE has widely been used by clinicians and researchers in the treatment or study of late-life depression (LLD). In addition, most clinicians are very familiar with this instrument, and many use it to estimate global cognitive performance or to screen for acute cognitive impairment. In clinical trials, it is often used to exclude subjects with cognitive impairment that may interfere with treatment or assessment of response.

Traditionally, a MMSE cutoff score of 24 has been used in clinical settings to detect cognitive impairment.^[86] Similarly, cutoff scores of 24 or 25 and below have been used to exclude subjects from participating in LLD pharmacological and psychological treatment studies.^[87]

Some additional points about the mini mental status examination

In 34 dementia studies and 5 MCI studies, it was determined that the best value of the MMSE was for ruling out a diagnosis of dementia in community and primary care where negative predictive values were 98.5% and 95.7% respectively.^[88]

Some studies have suggested that when these cutoff scores are used, the MMSE is neither sensitive nor specific in the detection cognitive impairment.

In an analysis conducted on MMSE scores in a large sample of patients with LLD who were categorized as being cognitively impaired or intact using a more comprehensive instrument, the Dementia Rating Scale 2. It hypothesized that at the traditional cutoff of 24, the MMSE has low sensitivity in the detection of cognitively impaired subjects with LLD and that increasing the cutoff score will significantly improve this sensitivity at the expense of a minimal reduction in specificity.^[89]

Despite its clear limitations, the MMSE has proved resilient in the clinical arena for over 25 years.

THE CDT VERSUS THE MINI-MENTAL STATUS EXAMINATION: CLINICAL POINTS

The CDT may have some clinical advantages over the MMSE:

1. The CDT may focus differently to the standard MMSE, and this be especially relevant as the earliest deficits that are manifested in AD, the most common form of dementia, may be visuospatial or visuospatial and executive functioning, even in those with high MMSE values^[90,91]
2. The administration is easy and simple and puts less burden on the patient-doctor relationship. It is rarely humiliating to the patient and its administration time is at least three times less than that of the MMSE. In addition, while observing the patient performing the task, the doctor gets important further information, for example, about the patient's planning abilities. The CDT is not immune to confounding by education and language, but this appears to be less pronounced than other instruments such as the MMSE that rely more heavily on language
3. The CDT has acceptable validity in comparison with the MMSE using simple scoring by a nurse without special knowledge
4. When compared with the MMSE, an abnormal CDT can alert the admitting doctor to the

necessity for further testing. Rather than excluding cognitive impairment, the test is proposed as a simple and rapid tool for use by admitting junior staff to highlight possible cognitive impairment or other causes of abnormal MMSE testing, such as affective disorders and delirium; diagnoses which are frequently overlooked in such patients and can significantly influence patient management and response to treatment

5. The correlation of the CDT with other screening tests, including the “gold standard” MMSE, is good in most studies. A review of the literature demonstrates that the correlation between different CDTs and the MMSE score varies from moderate ($r = 0.3$) to high ($r = 0.77$). The highest correlations were found between the MMSE score and the Shulman scale^[92]
6. Some authors argue that there may be a rationale for using both the MMSE and the CDT while screening for MCI or dementia, as the MMSE measures mostly verbal skills and so could miss patients with early dementia. However, this would considerably increase the time of administration and so impair one of the characteristics of a good screening test.^[93]

CONCLUSIONS

The paper has reviewed the clinical usage of the CDT and MMSE in dementia screening. It has refrained from analyzing studies done using both the tests and rather focused on the administration, utility, advantages, and disadvantages of both these tests while positing a comparison between the two. This review hopes to serve as a clinical guideline for psychiatrists, psychologists, family physicians, and mental health professionals to choose a particular screening test for clinical and research purposes. Further studies on these two tests in varying geriatric populations in the Indian setting is warranted to determine further utility of these tests.

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