2 clock tests had high accuracy and naïve raters had acceptable accuracy for detecting dementia


**QUESTION:** How accurate are clock drawing test (CDT) scoring systems as screening tests for dementia in community dwelling older adults compared with classification using the Consortium to Establish a Registry for Alzheimer's Disease (CERAD) and with naïve judgements?

**Design**
Blinded comparisons of 7 formal CDT systems with the CERAD and naïve raters.

**Setting**
Community based study in Seattle, Washington, USA.

**Participants**
249 community dwelling older adults (69% women). Participants who met DSM-IV criteria for major depression were excluded.

**Description of tests and diagnostic standard**
80 clock drawings, 20 from each of the 4 CERAD performance levels (normal and mildly, moderately, and severely impaired), were randomly selected for which exact agreement had been reached by 2 independent raters. All clocks were scored using published criteria for 7 formal CDT systems that varied slightly. 20 naïve raters with no prior cognitive testing experience scored each CDT as normal or abnormal without formal instructions. Participants were classified as probably demented or not based on history of cognitive decline and current functioning. This classification was confirmed using the CERAD, DSM-IV, and NINDS-ADRDA.

**Main outcome measures**
Diagnostic test characteristics and dementia detection agreement between CDT systems, CERAD, naïve raters, and clinical diagnoses.

**Main results**
Formal CDT systems generally showed high agreement (90–100%) with CERAD normal, moderate, and severe categories but poor agreement (median 35%) with the mild category. Naïve raters showed high agreement with 5 of the 7 formal CDT systems (86–89%). Compared with clinical dementia diagnoses, the Mendez and CERAD CDT systems had the best diagnostic test characteristics (table). Dementia detection by naïve raters had acceptable accuracy (table) and was as effective as 5 of the 7 formal CDT systems.

**Conclusions**
The Mendez and Consortium to Establish a Registry for Alzheimer's Disease clock tests most accurately detected dementia in community dwelling older adults. Naïve raters discriminated normal from abnormal clocks with acceptable accuracy.

**Test characteristics of clock drawing test (CDT) systems and naïve raters for detecting dementia in community dwelling older adults**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>LR</th>
<th>-LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Mendez CDT</td>
<td>76.0%</td>
<td>90.7%</td>
<td>8.17</td>
<td>0.26</td>
</tr>
<tr>
<td>CERAD classification</td>
<td>64.0%</td>
<td>95.3%</td>
<td>13.6</td>
<td>0.38</td>
</tr>
<tr>
<td>Naïve raters</td>
<td>76.0%</td>
<td>83.7%</td>
<td>4.66</td>
<td>0.29</td>
</tr>
</tbody>
</table>

* CERAD = Consortium to Establish a Registry for Alzheimer’s Disease. Diagnostic terms defined in glossary; LRs calculated from data in article.

**COMMENTARY**
In clinical practice, screening tests are used as an adjunct to other clinical information in diagnosing probable Alzheimer's disease, with more specific diagnostic instruments reserved for milder and atypical presentations. Ideal screening tests for dementia are those that are quick to administer, easy to score, acceptable to patients, cost effective, applicable across ethnic groups, and usable in frail, older people.

CDTs for assessing people with Alzheimer's disease have been used for >10 years as a valid and reliable measure of dementia severity. Since then, many such tests have been developed; each has its own published scoring system. However, even the most sensitive CDT may not be able to distinguish very mild Alzheimer's disease from normal aging.

It has been proposed that the CDT assesses both frontal and temporal function, including semantic memory, orientation, executive function, and attention, which explains findings from studies showing its ability to predict cognitive decline, independent of the Mini-Mental State Examination (MMSE).

The properties of the CDT as a screening test of cognitive function in other studies are impressive, with mean sensitivities and specificities of about 85% when measured against validated diagnostic instruments. The high accuracy of the Mendez CDT in the detection of dementia has also been confirmed elsewhere.

Although the CDT may complement the MMSE as a cognitive screen and is able to assess aspects of frontal lobe function, sufficient evidence does not currently exist to suggest that it should be used as a stand alone screening tool for Alzheimer's disease.

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