Cognitive Performance in Senile Dementia of the Alzheimer's Type: The Kitchen Task Assessment

Carolyn Baum, Dorothy F. Edwards

Key Words: activities of daily living • Alzheimer's disease

The Kitchen Task Assessment (KTA) is a functional measure that records the level of cognitive support required by a person with Senile Dementia of the Alzheimer's Type (SDAT) to complete a cooking task successfully. The results allow the clinician to help caregivers understand the level of support the impaired person needs to perform daily living tasks. This paper presents the validity and internal consistency of the KTA. Data were collected from 106 persons diagnosed with SDAT. Construct validity was established by examining the relationship between subjects' performance on the KTA and standard neuropsychological measures.

Professionals studying and treating persons with dementia need to know the capabilities of the person with Senile Dementia of the Alzheimer's Type (SDAT) to help the caregiver develop strategies for managing his or her family member. It is often difficult to determine the residual capability from self or family reports. Traditionally, neuropsychological tests (specifically, measures of brain function) are used to predict behavioral patterns. These tests are important in diagnostics as they can be used to guide clinical and behavioral management programs and to provide information about deficiencies of language, memory, perception, reasoning, planning, emotion, and self-control (Wilson, 1987). However, critics have cautioned against total reliance on specific neuropsychological tests as predictors of functional status because a person's poor performance could be due to an inability to integrate visual, motor, and cognitive skills (Elithorn, 1965; Heaton & Penleton, 1981). Little is known about the relationship between a person's performance on neuropsychological tests and his or her performance of everyday activities (Wilson, 1987). Neuropsychological testing does not provide information about the ability of the person with SDAT to perform a task or the level of assistance necessary to support him or her in the performance of the task.

The occupational therapist evaluates cognition to determine whether a person can use thinking and memory skills to facilitate performance of daily life tasks (Reed, 1984). It is important to understand a person's strengths in order to bypass the weaknesses resulting from the dementia (Wilson, 1987). It is also important to have an assessment that records change in the performance over time because the person's performance changes as the disease progresses. The Kitchen Task Assessment (KTA) was developed to provide a performance-based standardized assessment.

In 1983, when the KTA was developed, no standardized performance-based cognitive measures existed; two assessments were developed subsequently for occupational therapists' use. The Allen Cognitive Level (ACL) test is a screening tool that identifies a person's potential for rehabilitation (Allen, 1991). It measures "a quality of problem solving used while doing a perceptual motor task" (1991, p. 2). Originally designed for psychiatric patients, the ACL is now used to test persons with other diagnoses. The scoring criteria describe the motor behavior of a person performing a leather lacing task. Though similar to the ACL, as it involves the performance of a task, the KTA differs in that the examiner elicits and records the highest level of performance with cues and assistance.

The other instrument developed since 1983 is the Assessment of Motor and Process Skills (AMPS) (Fisher, 1991). The AMPS measures skills such as posture, mobility, coordination, and strength, as well as attentional, ideational, organizational, and adaptive capabilities. The...
KTA differs from the AMPS in that it measures only the actions associated with the processing skills of initiation, organization, inclusion of all steps, sequencing, safety and judgement, and completion and was designed only to measure the cognitive aspects of performance.

The KTA (a) evaluates the cognitive processes that affect task performance and records the level of cognitive support necessary for successful task completion; (b) can be performed either in a clinic or in the person's home in a short period of time; (c) allows the clinician to observe and translate the person's performance into strategies the caregiver may use to manage the cognitively impaired person on other activities of daily living and instrumental tasks; and (d) generates a score to measure changes in performance over time (either progression or improvement). It can be used with a companion instrument, the Functional Behavior Profile (Baum, Edwards, & Morrow-Howell, in press), to record the caregiver's perception's of the impaired person's capabilities. This paper presents a study examining the content validity and construct validity, inter-rater reliability, and the internal consistency of the KTA.

**Method**

**Subjects**

The subjects in this study came from the Memory and Aging Project at Washington University, a longitudinal study of healthy aging and SDAT. The subjects were recruited through public announcements, the Alzheimer's Disease and Related Disorders Association, and referrals from community physicians and other health professionals. Before enrollment in the Memory and Aging Project, potential subjects were tested for hypothyroidism, vitamin B-12 deficiency, and other potentially reversible causes of dementia. Those with severe hyperension, strokes, severe medical problems, or psychiatric illness were excluded from participation. This study included 106 subjects, 56 women and 50 men with a mean age of 71.75 years (range 53.8-85.4). Ninety-three persons were married; 13 were widowed or single. All were living in the community with a caregiver.

Diagnosis and staging were performed by a team of neurologists and psychiatrists using the Clinical Dementia Rating [CDR] (Berg, 1988; Burke et al., 1988). This allows the analysis of data across the progressive stages of the disease. A CDR is derived from the subjects' performance in the areas of memory, orientation, judgment and problem solving, community affairs, home and hobbies, and personal care. Clinical Dementia Ratings of 0.5, 1, 2, and 3 indicate questionable, mild, moderate, and severe dementia.

**Instruments**

The KTA tests the cognitively impaired person's ability to complete the task of making cooked pudding from a commercial package. The test addresses the following questions regarding the person's performance:

1. Can the person begin the task?
2. Can the person gather the items necessary to perform the task?
3. Can the person perform all the steps necessary to complete the task?
4. Can the person sequence the activities that make it possible to complete the task?
5. Is the person safe in performing the task?
6. Does the person know when he or she is finished with the task?

The person administering the test provides the necessary assistance to make it a successful experience for the subject (see Appendix A). Performance is scored on the following components: (a) initiation, (b) organization, (c) performance of all steps, (d) sequencing, (e) judgment and safety, and (f) completion. The level of support required from the tester for each component is scored: 0 (independently competent), 1 (required verbal cue), 2 (required physical assistance), 3 (totally incapable). The higher the score, the more impaired the performance (total scores range from 0 to 18) (see Appendix B).

**Procedure**

The KTA (see Figure 1) was administered in the occupational therapy department kitchen as a part of a Functional Test Battery by an occupational therapist or research assistant trained in its administration. The caregiver was not present, and the testers were blind to the CDR rating. Testers recorded observations regarding the assistance they provided during the assessment but the scoring was recorded only after the task was finished. Verbal assistance and physical assistance were marked regardless of the number of cues given. The subject may have needed several verbal cues and only one physical assistance, but if physical assistance was required, it was recorded.

Five analyses were used in this study: (a) Kendall's tau B to determine the interrater reliability of the KTA; (b) correlation analysis to examine the relationship among the six variables in the measure; (c) factor analysis to identify common relationships among the variables; (d) correlation analysis with other valid instruments to determine the construct validity of the KTA; and (e) analysis of variance to examine the KTA across stages of SDAT and between men and women.

**Results**

For the Kendall's tau B analysis, videotapes of three subjects, each at a different stage of impairment, were scored by 12 persons. The testers were given an orientation to the KTA and a description of the scoring criteria. They
were then shown the videotapes and asked to score 3 subjects. There was no discussion until all three subjects had been scored. The interrater reliability for the total score was .853. The range was .632 for safety to 1.0 for initiation.

As a preliminary step to the correlation and factor analyses, the univariates were reviewed for the total subject group (n = 106) and the four CDR groups. Scores on the KTA increased with the severity of dementia (see Table 1). The CDR 3 group were the most impaired. The tremendous variability within each CDR group should be carefully noted. The importance of staging SDAT persons when conducting research is demonstrated by the performance of the group as a whole. The mean score of 8.71 suggests that all 106 subjects would require physical assistance with the task. When subjects are grouped by CDR stage, the mean scores of the questionable and mild groups (1.75 and 4.65 respectively) clearly indicate that these subjects required only verbal assistance on the KTA.

For the correlation analysis, correlation coefficients were computed among the six KTA variables and the total score (see Table 2). The strong correlation coefficients of .72–.84 suggested that only one dimension might exist (Nunnally, 1978) and that the sample of cognitive domains selected for the KTA all contribute to the measurement of the cognitive performance of the task.

Table 1
Mean, Standard Deviation and Range of Scores on the Kitchen Task Assessment by Stage of Dementia

<table>
<thead>
<tr>
<th>Stage</th>
<th>n</th>
<th>M</th>
<th>sd</th>
<th>range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDR 0.5</td>
<td>38</td>
<td>1.75</td>
<td>2.21</td>
<td>0–07</td>
</tr>
<tr>
<td>CDR 1</td>
<td>42</td>
<td>4.65</td>
<td>3.75</td>
<td>0–18</td>
</tr>
<tr>
<td>CDR 2</td>
<td>21</td>
<td>9.81</td>
<td>4.57</td>
<td>4–18</td>
</tr>
<tr>
<td>CDR 3</td>
<td>10</td>
<td>13.88</td>
<td>4.61</td>
<td>7–18</td>
</tr>
<tr>
<td>Total Subjects</td>
<td>106</td>
<td>8.71</td>
<td>4.05</td>
<td>0–18</td>
</tr>
</tbody>
</table>

Figure 1. The Kitchen Task Assessment.
Factor analysis was used to explore the component structure of the variables. A principal component analysis was computed to determine the internal structure of the variables and to establish the KTA as a unidimensional instrument. A varimax rotation was chosen to reveal the relationship among the variables. The orthogonal rotation resulted in the identification of only one factor accounting for 84% of the variance. All the factor loadings exceeded .88.

In the fourth analysis, construct validity, the KTA was correlated with established valid and reliable neuropsychological and functional tests.

Neuropsychological Tests

Token Test Short Version. This test (De Renzi & Vignolo, 1968) consists of six parts. It measures verbal processing and is sensitive to disrupted linguistic processing. The subject must comprehend the token names and the instructions and be able to pick the correct response and take (a motor response) the token from the table. Parts 1 through 4 are progressively more difficult because of the number of tasks that must be performed in sequence. The process requires the subject to follow a series of commands. Perseveration (inability to move to another task) is often seen as the instructions become more complex. If the person fails to respond in 5 seconds, the instructions are repeated; a half score is recorded for the second try. Thus, the test contains aspects of initiation and sequencing. The test is scored so that the higher the score, the better the performance.

Trail Making Test—Part A (Armitage, 1946) is a timed test of visual conceptual and visuomotor tracking and involves motor and attention skills. The subject must connect numbered circles on a page, a task that involves initiation and sequencing. The test is scored so that the higher the score, the poorer the performance.

Crossing Off. Developed by Botwinick and Storandt (1973), this is a timed test of psychomotor speed functions, without a verbal component, that measures initiation and sequencing. The subject is required to draw vertical lines through a series of horizontal lines. The test is scored so that the higher the score, the better the performance.

Functional Tests

Clinical Dementia Rating (CDR). This test (Hughes et al., 1982; Berg et al., 1982) is a measure of a person’s performance in daily living tasks in the areas of memory, orientation, judgment and problem solving, community affairs, home and hobbies, and personal care. This test was included to see how the subjects’ actual performance as reported by the KTA related to the performance reported by the caregiver. The test is scored so that the higher the score, the poorer the performance.

Blessed Dementia Scale. Developed by Blessed, Tomlinson, and Roth (1968), this is a behavioral check list derived exclusively from questions asked of the caregiver; it rates the subject on performance of everyday activities, changes in personal care, and changes in personality, interests, and drive. This test was included to see how the subjects’ actual performance as reported by the KTA related to the performance reported by the caregiver. The test is scored so that the higher the score, the poorer the performance. The cognitive section of the Blessed Dementia Scale was analyzed separately.

The correlation coefficients of the neuropsychological and functional tests are shown in Table 3. The more complex integrative tasks (Token test 2, 3, 4, 5, and 6) were more highly correlated than the Crossing-Off and Token Test 1. The CDR and the Blessed were significant

### Table 2
**Pearson Correlation Coefficients Among Test Items**

<table>
<thead>
<tr>
<th>Test</th>
<th>Initiation</th>
<th>Organization</th>
<th>All Steps</th>
<th>Sequencing</th>
<th>Safety</th>
<th>Completion</th>
<th>Total</th>
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<tbody>
<tr>
<td>Initiation</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>.82</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Include All</td>
<td></td>
<td>.78</td>
<td>.82</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequencing</td>
<td></td>
<td>.77</td>
<td>.86</td>
<td>.89</td>
<td>1.0</td>
<td>.90</td>
<td>1.0</td>
</tr>
<tr>
<td>Safety/Judgement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.72</td>
<td>.77</td>
<td>.81</td>
</tr>
<tr>
<td>Completion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.91</td>
<td>.93</td>
</tr>
<tr>
<td>Total KTA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.88</td>
</tr>
</tbody>
</table>

Note: None of the correlation coefficients was below .72 ($p < .0001$).

### Table 3
**Correlation Coefficients of Neuropsychological Measures with the Kitchen Task Assessment**

<table>
<thead>
<tr>
<th>Test</th>
<th>Initiation</th>
<th>Steps</th>
<th>Organization</th>
<th>Sequencing</th>
<th>Safety</th>
<th>Completion</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part 1</td>
<td>- .34**</td>
<td>- .31**</td>
<td>- .36**</td>
<td>- .28</td>
<td>- .32**</td>
<td>- .34**</td>
<td>- .36**</td>
</tr>
<tr>
<td>Part 2</td>
<td>- .48**</td>
<td>- .44**</td>
<td>- .50**</td>
<td>- .50**</td>
<td>- .47**</td>
<td>- .50**</td>
<td>- .53**</td>
</tr>
<tr>
<td>Token Test</td>
<td>- .35**</td>
<td>- .45**</td>
<td>- .51**</td>
<td>- .48**</td>
<td>- .44**</td>
<td>- .47**</td>
<td>- .51**</td>
</tr>
<tr>
<td>Part 4</td>
<td>- .58**</td>
<td>- .50**</td>
<td>- .67**</td>
<td>- .59**</td>
<td>- .62**</td>
<td>- .65**</td>
<td>- .68**</td>
</tr>
<tr>
<td>Part 5</td>
<td>- .54**</td>
<td>- .60**</td>
<td>- .61**</td>
<td>- .55**</td>
<td>- .64**</td>
<td>- .64**</td>
<td>- .66**</td>
</tr>
<tr>
<td>Token Test</td>
<td>- .30**</td>
<td>- .56**</td>
<td>- .58**</td>
<td>- .56**</td>
<td>- .48**</td>
<td>- .55**</td>
<td>- .61**</td>
</tr>
<tr>
<td>Trail Making A (sec)</td>
<td>39</td>
<td>.42**</td>
<td>51**</td>
<td>39</td>
<td>35</td>
<td>.23</td>
<td>.48**</td>
</tr>
<tr>
<td>CDR</td>
<td>63</td>
<td>.61**</td>
<td>.66**</td>
<td>.64**</td>
<td>.55**</td>
<td>.58**</td>
<td>.67**</td>
</tr>
<tr>
<td>Crossing-Off</td>
<td>.43**</td>
<td>.40**</td>
<td>.46**</td>
<td>.42**</td>
<td>.41**</td>
<td>.34**</td>
<td>.46**</td>
</tr>
<tr>
<td>Blessed Dementia</td>
<td>.57**</td>
<td>.54**</td>
<td>.55**</td>
<td>.56**</td>
<td>.47**</td>
<td>.50**</td>
<td>.59**</td>
</tr>
<tr>
<td>Blessed Dementia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive</td>
<td>.62**</td>
<td>.58**</td>
<td>.58**</td>
<td>.59**</td>
<td>.53**</td>
<td>.58**</td>
<td>.64**</td>
</tr>
</tbody>
</table>

$^a p < .01$

$^b p < .0001$
One possible explanation for the less than perfect correlation of the caregiver reporting on the person with SDAT at the gender, the KTA differentiates performance across all stages of the disease. The highly significant correlations with the psychometric measures served to establish construct validity of the KTA. The KTA, as a test of practical cognitive skills, is related to the cognitive skills measured by neuropsychological tests.

The coefficient alpha sets an upper limit to the internal consistency of a test and provides a good estimate of reliability (Nunnally, 1978). The Cronbach Alpha for standardized variables was .961. The coefficient alpha of the KTA by CDR group was: .873 for CDR 0.5, .909 for CDR 1, .914 for CDR 2, and .953 for CDR 3. The high reliability coefficients support the structure of the test.

The fifth analysis, analysis of variance, examined the differences on the KTA across the stages of SDAT and yielded a significant F-ratio of 37.23 (df = 4,102, p < .0001). This demonstrates that performance on the KTA was affected by the progression of the disease. Post hoc Scheffé tests (see Table 4) on the means demonstrated significant differences for all stages of the disease. Because there could be a question of gender bias in the selected task, Table 4 also reports the performance of subjects in CDR groups by gender. There is a difference between the scores of male and female subjects in the questionable (CDR = 0.5) and moderate (CDR = 2) stages of the disease.

Perhaps men in the questionable stage of the disease (CDR = 0.5) performed better because they read and followed the directions, whereas women in this group, who may have been more familiar with the task of cooking, were less likely to refer to instructions. In the moderate stage (CDR = 2) women may have performed better because they relied on over-learned skills. Regardless of gender, the KTA differentiates performance across all stages of the disease.

Discussion
The Kitchen Task Assessment was designed to guide the occupational therapist in treatment planning. It allows the clinician to administer a standardized measure without employing an artificial task. The KTA is a valid and reliable measure that can be used as a clinical as well as a research tool because it discriminates the performance of persons across all stages of the disease, therefore, it can record changes in the person’s performance.

The information obtained from the administration of the KTA will be helpful in obtaining objective information that the clinician can use in training the caregiver to assist the person with SDAT in daily living tasks. The mean scores of those in the mild stage of the disease (CDR = 1) indicates that verbal cuing is necessary to support performance; those in the moderate and severe stages of the disease (CDR = 2 and CDR = 3) require physical assistance. However, the variation demonstrated by the subjects in the task indicates that knowledge of the diagnosis and the stage of the disease does not perfectly predict the person’s capabilities. Individual assessment is necessary to determine the actual functional capabilities of the person with SDAT. Some of the variability in the performance of subjects in the questionable and mild SDAT groups may be attributed to their unfamiliarity with the testing environment. A study to test the instrument’s ecological validity in the home and clinic setting is needed.

The health care team will benefit from knowing whether or not a person with SDAT can perform a complex basic living task independently and the level of cognitive support necessary for successful task completion. The information from the KTA can assist the team in discharge planning and counseling a family on the level of interaction necessary to support a cognitively impaired person in the community. This standardization of the KTA was on a selected sample of persons with SDAT. For use with other populations, the validity of the test with that population must be established first.

Acknowledgments
We thank Leonard Berg, PhD, Director of the Alzheimer’s Disease Research Center, and David Gillespie, PhD, George Warren Brown School of Social Work at Washington University, for their thoughtful reviews of this paper.

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Appendix A
Administration Procedure

Pre-test Setup
1. Place to the left on the counter:
   2 or 3 flavors of pudding mix (the kind that requires cooking, not instant)
   a 3-1/2 quart saucenpan with a heat-resistant handle
   a wooden spoon
   a rubber scraper
   a 2 cup glass measuring cup
   4 small dishes (paper cups will do)

Table 4
Means of KTA Scores across the stages of SDAT for Females, Males, and All Subjects

<table>
<thead>
<tr>
<th></th>
<th>CDR 0.5 (questionable)</th>
<th>CDR 1 (mild)</th>
<th>CDR 2 (mod.)</th>
<th>CDR 3 (severe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female score</td>
<td>46</td>
<td>2.00*</td>
<td>1.33</td>
<td>8.83*</td>
</tr>
<tr>
<td>Male score</td>
<td>50</td>
<td>1.47*</td>
<td>4.99*</td>
<td>11.11*</td>
</tr>
<tr>
<td>Total score</td>
<td>106</td>
<td>1.70*</td>
<td>4.65*</td>
<td>9.18*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| *p < .05

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2. Have a quart of milk in the refrigerator

3. Print the instructions in large letters on a piece of paper and mount the instructions where the person can read them. Use the same instructions that are on the box, except add "pour into cups."

4. Have hand soap and paper towels near the sink.

Before you begin the assessment:

Determine the individual with SDAT's ability to respond to verbal or physical assistance or both by instructing him or her to wash his or her hands. If the person can not do this, either with or without assistance, the test should not be administered, as the person will not be able to follow cues and will be unsuccessful.

Instructions

Tell the person

• to mix a box of pudding and pour the mixture into four dishes
• that the milk is in the refrigerator
• how the stove works and what burner to use
• that the instructions are on the box and on the wall
• to begin when ready

• You will give only after you have determined if or she cannot perform without help (wait five seconds) UNLESS safety is an issue.

Appendix B

Scoring Guide

Initiation: Did he or she begin the task after being told to begin? If not, did he or she begin when reminded (verbal) or did you have to open the box and hand it to him or her (physical)?

Organization: Was he or she able to get the milk from the refrigerator and use the tools appropriately? Some may use the tools or equipment incorrectly, for example, some try to cook in the measuring cup. Did the person respond to verbal help or did he or she require physical assistance?

Performance of all steps: Did he or she perform all the major steps—measuring, stirring, pouring—alone? Did you have to assist him or her, for example, light the stove? Was it verbal or physical assistance?

Sequencing: Was he or she able to do the tasks in a functional sequence? During sequencing, it is essential not to overrule. Some people stir the mixture initially in the cup. This is permissible if he or she has the right amount of milk and all of the mix from the box. Some people pour the hot mixture into the measuring cup before filling the serving dishes. This, too, is permissible. A problem arises when the person does not perform the tasks necessary to proceed with the activity, i.e., pour milk or powder into the dishes, or turn on the stove before starting.

Judgment and Safety: Evaluation is based on how the person manages the stove and the hot pudding. Because of the possibility of injury, the examiner must be alert to the subjects' needs. Give physical assistance if the person is in danger.

Completion: Evaluation is based on whether the person knows he or she is finished. Some will continue the process and do chores such as scraping the pan after it is empty or moving the dishes around on the counter. He or she may put the dishes in the sink, but is not required to clean up. Saying that you will wash the dishes is not considered a verbal cue; however, you must wait until he or she puts the pudding in the dishes before you offer to clean up.

References


