

ADDENBROOKE'S COGNITIVE EXAMINATION – ACE-R

Australian Administration and Scoring Guide - 2011

The ACE-R¹ is a brief cognitive test that assesses five cognitive domains, namely attention/orientation, memory, verbal fluency, language and visuospatial abilities. Total score is 100, higher scores indicates better cognitive functioning.

Administration of the ACE-R takes, on average, 15 minutes. Scoring takes about 5 minutes.

These instructions have been designed in order to make the questions and their scoring clear for the tester. Please read them carefully before giving the test.

If possible, leave the scoring until the end of the session, since the participant will not be able to check whether the tester is ticking for correct answers or crossing for wrong ones. This might avoid anxiety, which can disturb the participant's performance on the test.

The ACE-R training video can also be viewed at <http://www.ftdrg.org/research/test-downloads/>

O R I E N T A T I O N – score 0 to 10

Ask the participant for the day, date, month, year and season. Score one point for each correct answer.

Ask the participant for the name of the hospital (or building), the floor (or room), the suburb, state and country. Score one point for each correct answer.

Record responses. Allow mistakes for the date (+ or – 2 days). If participant says “23rd of the 3rd”, prompt them to say the name of the month.

If assessing a participant at home, ask for the name of the place i.e. name of the house e.g. “The Gables”, and for the floor you might ask for the name of the room (kitchen, living room, etc). If at a single storey health setting, ask about a local landmark. When the season is changing, e.g. at the end of February, and the participant says “autumn”, ask them “could it be another season?”. If answer is “summer”, give one point, since the two seasons are in transition. Do not give one point if the answer is “winter” or “spring”. If participants come from interstate, orientation for suburb may be scored somewhat more liberally. For instance, participants may say Sydney for suburb. When further prompted, neighbouring suburbs may be accepted as correct, eg near Coogie instead of Randwick (correct).

Seasons: spring – September, October, November; summer – December, January, February; autumn – March, April, May; winter – June, July, August.

For aphasics patients: allow patients to write down their answer, if unable to give verbal responses.

R E G I S T R A T I O N – score 0 to 3

Ask the participant to repeat and remember the words lemon, key, and ball. Speak slowly. Repeat them if necessary (maximum 3 times for scoring purposes). Tell the participant that you will ask for this information later. Record the number of trials. Score the first attempt only.

A T T E N T I O N & C O N C E N T R A T I O N – score 0 to 5

Calculation: Ask the participant to subtract 7 from 100, record the answer, then ask them to subtract 7 from that, record the answer. Do this 5 times. If the participant makes a mistake, carry on and check subsequent answers for scoring. Record responses (Example: 92, **85**, 79, **72**, **65**, score 3).

Spelling: give this test if the participant makes a mistake on the calculation task. Start by asking the participant to spell “world”. Then ask them to spell it backwards. Record responses.

Scoring for the spelling task:

- Score 1 point for each correct letter spelt. Correct sequence = D L R O W = 5 points
- Count one error for each omission, letter transposition (switching adjacent letters), insertion (inserting a new letter), or misplacement (moving W, O, R, L, D by more than one space).

Examples (score in parentheses):

	omission	transposition	insertion	misplacement
omission	DLOW (4)			
transposition	DOLW (3)	DLORW (4)		
	omission	transposition	insertion	misplacement
insertion	DLTOW (3)	DLRWWO (3)	DLRROW(4)	
misplacement	LOWD (3)	LRWOD (3)	LRWOWD (3)	LROWD (4)

A response such as 'LRWWOD' has 3 errors (L and R are correct, for a score of 2). It includes transposition of the W and O, insertion of an extra W, and misplacement of the D. If the patient adds 1 or more of the same letter at the end of the word, count as one error (e.g. 'LDROWWW, would be 2 errors, 1 transposition and 1 addition).

Score one point for each correct calculation or letter spelt. Score only the better performed one.

RECALL – score 0 to 3

Ask the participant to recall the words that you asked them to repeat and remember.
Record responses. Score one point for each correct item.

Anterograde Memory – score 0 to 7

Instruct the participant: "I'm going to read you a name and address that I'd like you to repeat after me. We'll be doing that 3 times, so you have a chance to learn it. I'll be asking you about it later". If the participant starts repeating along with you, ask them to wait until you give it in full.

Record responses for each trial. However, only the third score contributes to the ACE-R score (0-7points).

Retrograde Memory – score 0 to 4

Ask the participant for the name of the current Prime Minister, the current Premier of NSW (or equivalent if the person is from a different state of Australia), the president of the US and the president of the US who was assassinated in the sixties.

Score one point each. Allow answers like Rudd, Gillard, Keneally; Obama; Kennedy. Do not accept answers like Kevin, ask for surname as well. Answers such as "Jeff Kennedy" or "Barry Rudd" would be scored incorrect.

Note if there has been a very recent change in leaders, probe for the name of the outgoing politician.

VERBAL FLUENCY – score 0 to 14

Letters – score 0 to 7

Instruct the participant: "I'm going to give you a letter of the alphabet and I'd like you to generate as many words as you can beginning with that letter, but not the names of people or places. Are you ready? You've got a minute and the letter is P".

Participant might repeat or perseverate words, e.g. pay, paid, pays. Record and count them for the overall total number of responses but do not consider them for the final score. In the same way, intrusions such as words beginning with other letters are recorded but not scored. Proper names (Peter, Peterborough) do not count. For plurals e.g. pot, pots, total = 2, correct = 1. Use the table provided on the ACE-R sheet to obtain the final score for this test.

Animals – score 0 to 7

Instruct the participant: “Now can you name as many animals as possible, beginning with any letter?”

Participant might repeat words. Record and count them for the overall total number of responses, but they should not be considered for the final score. The participant may misunderstand and perseverate by naming animals beginning with “p”. Repeat instructions during the 60 seconds if necessary.

If subject says e.g. “fish”, and later says “salmon” and “trout”, count and record as 3 for “total” but do not accept “fish” as correct (count only 2 out of the 3, e.g. “salmon” and “trout”). However, if only the category is given, e.g. fish, with no specific exemplars, then count fish as 1 for total and final correct responses. The same applies to mammals, reptiles, birds, breeds of dog, insects, etc.

L A N G U A G E - Comprehension (Close your eyes) – score 0 or 1

Instruct the participant: “Read this sentence and do as it says”. If the participant reads sentence aloud but does not follow the instructions, score 0.

L A N G U A G E - Comprehension (3-stage command) - score 0 to 3

Instruct the participant: “Take this paper in your right hand, fold it in half, and put it on the floor”. Do not allow participant to take the paper before you have finished giving the complete instruction.

Score one point for each correct command, e.g. if participant takes the paper and puts it on the floor without folding, score 2; if participant takes the paper in their right hand, and folds it several times and leaves on the table, score 1.

L A N G U A G E - Writing – score 0 or 1

Instruct the participant to write a sentence.

The sentence should contain a subject and a verb, and it should have a meaning.

Do not accept “Happy Birthday” or “Nice day” as a sentence. If participant has difficulty thinking of something to write, prompt gently with “What’s the weather like today?”

L A N G U A G E - Repetition – score 0 to 2

Ask the participant to repeat the words after you. Say one word at a time. Circle the words that were repeated incorrectly. Consider first attempt only for scoring. Record responses. Score 2 if all words are correct; 1 if 3 are correct; 0 if 2 or less are correct.

L A N G U A G E - Repetition – score 0 to 2

Ask the participant to repeat each sentence. Do not accept partially correct repetitions, e.g. “no ifs and buts”, “above below” as correct for scoring. Score one point for each sentence.

L A N G U A G E - Naming – score 0 to 2**Naming (watch and pencil)**

Ask the participant to name each picture. Correct answers: pencil; wristwatch or watch.

L A N G U A G E - Naming – score 0 to 10**Naming (5 animals and 5 objects)**

Ask the participant to name each picture. Correct answers: penguin; anchor; camel or dromedary; barrel, keg, or tub; crown; crocodile or alligator; harp; rhinoceros or rhino; kangaroo or wallaby; piano accordion, accordion or squeeze box.

Score one point each.

L A N G U A G E - Comprehension – score 0 to 4**Comprehension**

Ask the participant to point to the pictures according to the statement read. Do not provide any feedback regarding the word meaning.

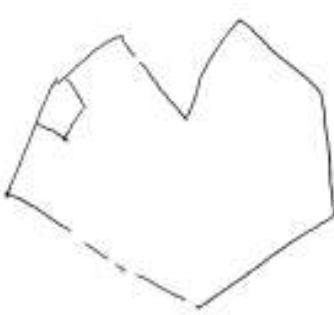
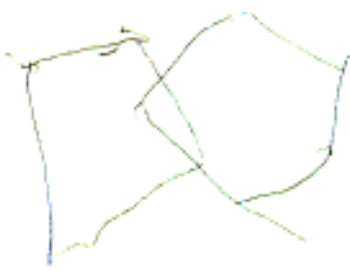
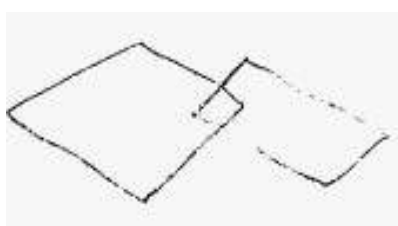
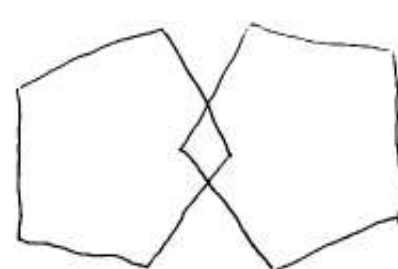

Score one point each. Allow self-corrections.

L A N G U A G E - Reading – score 0 or 1

Ask the participant to read the words aloud. Score one point only if all five words are correctly read. Record the mistakes using the phonetic alphabet if possible.

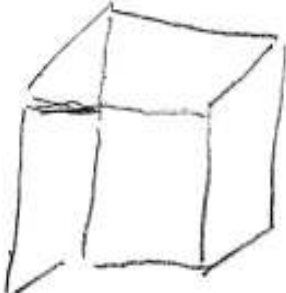
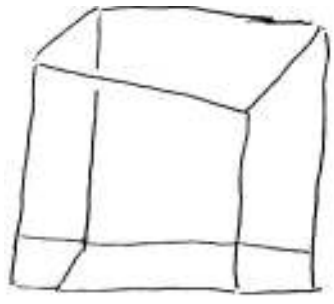
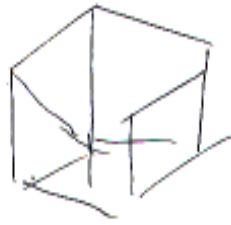
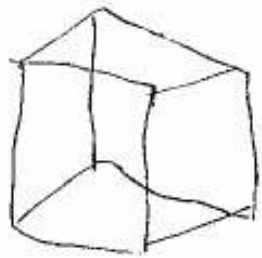
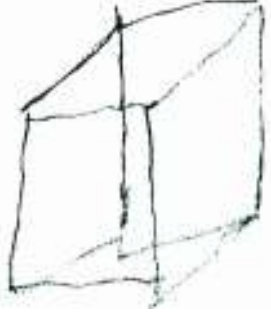
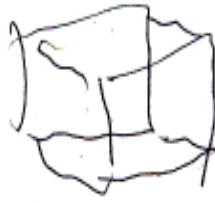

VISUOSPATIAL ABILITIES - Overlapping pentagons – score 0 or 1

The pentagons should clearly show 5 sides and the intersection.

Score 0		
		
Score 1		
		

VISUOSPATIAL ABILITIES - Wire Cube – score 0 to 2

Cube should have 12 lines = score 2, even if the proportions are not perfect. A score of 1 is given if cube has fewer than 12 lines, but general cube shape is maintained. See examples below.



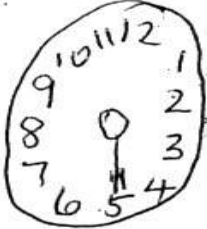

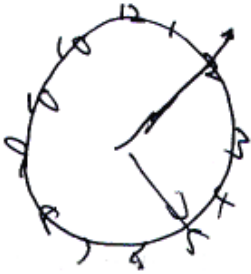



Score 1			
			
Score 2			
			

VISUOSPATIAL ABILITIES - Clock – score 0 to 5

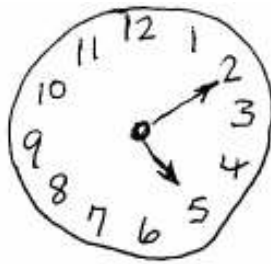
Ask the participant to draw a clock face with the numbers on it. When he/she has finished, ask them to put the hands at “ten past five”. If participant does not like their first drawing and would like to do it again, you can allow for that and score the second clock; participants may correct their mistakes by erasing it while drawing.

Circle	1 point maximum if it is a reasonable circle
Numbers	2 points if all included and well distributed 1 point if all included but poorly distributed 0 points if not all included
Hands	2 points if both hands are well drawn, different lengths and placed on correct numbers (you might ask which one is the small and big one) 1 point if both placed on the correct numbers but wrong lengths OR 1 point if one hand is placed on the correct number and drawn with correct length OR

1 point if only one hand is drawn and placed at the correct number i.e. 5 for 'ten past five'

Score 2		
<p>Circle (1); one hand placed correctly (1)</p> 	<p>Circle (1); all the numbers but not placed inside the circle (1)</p> 	
Score 3		
<p>Circle (1); all the numbers but not proportionally distributed (1), one hand placed correctly (1)</p> 	<p>Circle (1), all the numbers but not placed inside the circle (1), one hand placed correctly (1).</p> 	<p>Circle (1), note that numbers are not inside the circle and there are 2 number 10s (0), hands placed correctly</p> 
Score 4		
<p>Circle(1); numbers proportionally distributed (2); one hand placed correctly (1)</p> 	<p>Circle (1); all the numbers but not proportionally distributed (1); both hands placed correctly (2)</p> 	<p>Circle (1); numbers proportionally distributed (2), one hand placed correctly (1)</p> 
Score 5		

Circle (1); numbers proportionally distributed on both halves of the clock face (2); hands placed correctly (2)



PERCEPTUAL ABILITIES – score 0 to 4

Counting dots

Participant is *not* allowed to point to the picture. Score one point for each correct answer.
Correct answers, from top left clockwise: 8, 10, 9 and 7.

PERCEPTUAL ABILITIES – score 0 to 4

Identifying letters

Participant is allowed to point to the picture. Score one point for each correct answer.
Correct answers, from top left clockwise: K, M, T and A.

For aphasic patients: if the patient is unable to say the letter name, allow them to identify the letters by writing them out, or saying the letter sound that matches (e.g “mmm”)

RECALL – score 0 to 7

Recall

Say to the participant: “Now tell me what you remember of that name and address we were repeating at the beginning”. Tick and score one point for each item recalled, using the score guide provided in the test.

**Harry Barnes
73 Market Street
Rockhampton
Queensland**

Example 1a

Harry Bond	1 + 0	Score 3/7
78 Market Street	0 + 1 + 1	
Rockingham	0	
....	0	
....	0	

Example 2a

Harry Barnes	1 + 1	Score 5/7
73 Rockhampton Street	1 + 0 + 1	
....	0	
Queensland	1	
....	0	

Example 3a

Harry Bond	1 + 0	Score 2/7
33 Hampton Way	0 + 0 + 0	
Rockhampton Street	0 + 0	
Cambridge	0	
Queensland	1	
....	0	

RECOGNITION – score 0 to 5**Recognition – only to be given if participant fails to recall one or more items in the recall task.**

This task should be given to allow the participant a chance to recognise items that he or she could not recall. If the participant recalls the name and address correctly, this test is not needed and the participant scores 5. However, many participants will recall only parts. Start by ticking the correctly remembered items on the shadowed column (right hand side) and then tell them “Let me give you some hints. Was the number (or whatever was forgotten or mistaken) x, y or z?” and so on. Every recognised item scores one point. Maximum score is 5. Adding recalled items to those recognised gives the final score for this part of the test.

Example 1b (based on example 1a)

Tester ticks “Market Street” on the right hand side shadowed column because participant had recalled that item. The tester should then ask:	Participant’s answers:	
- Was it Jerry Barnes, <u>Harry Barnes</u> or Harry Bradford?	Harry Barnes	1
- Was it 37, <u>73</u> or 76?	76	0
- Was it <u>Margate</u> , Rockhampton or Cairns ?	Rockhampton	1
- Was it <u>Queensland</u> , New South Wales or Victoria?	New South Wales	0
		+ 1 (Market Street)
		Score 3/5

Example 2b (based on example 2a)

Tester ticks “Harry Barnes”, “73” and “Queensland” on the right hand side shadowed column because participant had recalled those items. The tester should then ask:	Participant’s answers:	
- Was it <u>Market Road</u> , Martin Street or <u>Market Street</u> ?	Market Street	1
- Was it Margate, <u>Rockhampton</u> or Cairns?	Rockhampton	1
		+ 3 (Harry Barnes, 73, Queensland)
		Score 5/5

Example 3b (based on example 3a)

Tester ticks “Queensland”, on the right hand side shadowed column because participant had recalled that item. The tester should then ask:	Participant’s answers:	
- Was it Jerry Barnes, <u>Harry Barnes</u> or Harry Bradford?	Jerry Barnes	0
- Was it 37, <u>73</u> or 76?	37	0
- Was it Market Road, Martin Street or <u>Market Street</u> ?	Martin Street	0
- Was it Margate, Rockhampton or Cairns?	Cairns	0
		+1 (Queensland)
		Score 1/5

MMSE – score 0 to 30

The MMSE score can be obtained by adding up the scores in the shaded boxes to the right hand side of each test.

NORMATIVE DATA

A total of 326 subjects (England and Australia), consisting of three groups: a dementia group (n=142), a mild cognitive impairment group (n=36) and a control group (148).

Table 1: ACE-R total and sub-scores according to age (50-59, 60-69, 70-79), showing control means (standard deviations in brackets). This sample includes English and Australian controls; there were no significant differences between their scores, which were combined below.

Age range	Education (years)	Total ACE-R score	Attention/Orientation	Memory	Fluency	Language	Visuospatial
50-59 (n=33)	13.79 (3)	95.82 (3.8)	17.82 (0.4)	24.67 (2.1)	12.15 (1.4)	25.55 (0.9)	15.64 (0.9)
60-69 (n=64)	13.35 (2.3)	94.45 (3.2)	17.78 (0.5)	23.89 (1.7)	12.00 (1.7)	25.13 (0.9)	15.63 (0.8)
70-79 (n=51)	12.87 (3.4)	93.78 (3.9)	17.73 (0.5)	23.57 (2.3)	12.12 (1.5)	24.82 (1.4)	15.57 (0.8)

Table 2: Sensitivity, Specificity and Positive Predictive Values (PPV) at different prevalence rates of two cut-off total ACE-R scores. Values in parenthesis represent the respective Negative Predictive Values¹

ACE-R cut-off	Dementia		PPV at different prevalence rates			
	Sensitivity	Specificity	5%	10%	20%	40%
88	0.94	0.89	0.31 (1.0)	0.48	0.68	0.85 (1.0)
82	0.84	1.00	1.0 (0.96)	1.0	1.0	1.0 (0.90)

CLINICAL INTERPRETATION

Cut offs

Two cut-offs are recommended, 88 for screening, and 82 for research purposes.

Sensitivity to dementia

At the low cut-off of 82, the ACE-R has high sensitivity (84%), excellent specificity (100%), and very good predictive values on a wide range of dementia prevalence [1]. The cut-off at 88 offers even better sensitivity (94%), but the trade-off is the lower specificity, when a number of false positives can be generated (controls scoring below 88 but above 82).

To overcome the grey zone between the two cut-off scores, a table of likelihood ratios was developed. For each given score between 88 and 82, a likelihood ratio of dementia was given. For instance, a score of 88 yields a chance of 8.4%, whereas a score of 82 yields a 100% chance of having dementia. This interpretation should, however, be combined with standard clinical assessment and corroboration from an informant of progressive decline from a previous level of functioning.

Studies involving patients with mild cognitive impairment (MCI) have shown that the ACE is very sensitive to early stages of dementia, and can also predict those who are likely to convert to dementia [2-3]. A recent study[3] has shown that those scoring above 88 at baseline did not convert to dementia at the 2-year follow-up visit [3].

Table 3: Likelihood ratios for probability of dementia at various ACE-R cut-off scores[1]

ACE-R score	Likelihood ratio of dementia
88	8.43
87	11.5
86	14.2
85	18.9
84	27.6
83	52.5
82	100

Differential diagnosis

Because the ACE assesses several cognitive domains, it is possible to derive profiles of cognitive impairment that can be used in differential diagnosis. We will present some possible interpretations below.

Differentiating Alzheimer's Disease from frontotemporal dementia (FTD)

The ACE can reliably differentiate between Alzheimer's Disease (AD) and FTD with a simple ratio. The VLOM ratio, which is composed by the scores of verbal fluency + language/orientation + memory (recall of name and address only) yields a ratio that can help differentiating AD from FTD patients. This ratio basically shows that relative high scores on verbal fluency and language, with low scores on orientation and memory is typical of AD, with the opposite being true for FTD (See [4] for more information). On the revised version, a VLOM ratio of < 2.2 could differentiate FTD from AD (sensitivity of 58% and specificity of 95%), whereas a VLOM ratio of >3.2 could differentiate AD from FTD (sensitivity of 74% and specificity of 85%) [1, 4].

The ACE can also distinguish between behavioural variant FTD (bvFTD) from psychiatric syndromes that mimic bvFTD, such as the subgroup recently termed phenocopy bvFTD [5-8]. A study showed that true bvFTD (those with documented atrophy on initial MRI, and who deteriorate to stage of nursing home care, have clear cognitive decline on the ACE, whereas those with phenocopy bvFTD show no change on the ACE over a long period of time, paralleling control performance [9].

More specifically, the ACE can be used to discriminate between AD and semantic dementia using a simple algorithm, the semantic index. The rationale behind the semantic index lies on the significant group differences on ACE sub-scores for naming, reading and orientation in time. The semantic index is composed by (naming + reading) – (serial 7s scores + orientation in time and drawing). The possible range is therefore +14 to -15 [10]. Although this index has not yet been validated in the revised ACE, it has potential clinical application in differentiating patients with AD and SD, especially in the context of SD patients presenting with low scores on verbal memory tests and, as a result, being misdiagnosed with AD.

Different cognitive profiles in atypical Parkinsonian syndromes

More recent work has shown that the ACE is valuable in the assessment for patients with atypical Parkinsonian syndromes such as corticobasal degeneration (CBD), and progressive supranuclear palsy (PSP), each of which produces distinct cognitive profiles. Bak [11-12] showed that CBD patients have overall poor performance on all ACE sub-scores, equivalent to that seen in AD. The progressive supranuclear palsy (PSP) group produces impaired fluency but much better performance than CBD patients (See [11] for more information). In this same study, sensitivity and specificity of the MMSE and ACE were compared, establishing ACE's superiority. The MMSE was shown to be inadequate to detect cognitive impairment in subcortical syndromes.

Dementia and affective disorder

The ACE can also be very helpful in discriminating between patients with affective disorders from those with dementia. "Pure" affective disorder patients score significantly higher than AD or FTD patients. More interestingly, the ACE is able to predict those who could develop dementia in a mixed group. Dudas [13] showed that patients with affective symptoms primarily (with a probable progressive-degenerative disorder, as well as patients with suspected dementia concomitant with an affective disorder) and that eventually developed dementia, could be distinguished by their baseline ACE scores. All of those who later developed dementia had scored below 88 two years prior to the clear onset of the neurodegenerative disease.

Conclusions

When interpreting scores on cognitive tests such as the ACE, it is important to bear a number of issues in mind. Scores on tests should not be used in isolation. The ACE is not a conclusive diagnostic test of dementia, it is rather a tool that can aid the clinician in making a diagnosis as well as in differentiating dementias. Several conditions can cause cognitive impairment, therefore clinical judgement should prevail [14]. Finally, the criteria for diagnosis of dementia state that patients should present with cognitive impairment sufficient to impair everyday life activities. It is crucial, therefore, to ascertain impairment on activities of daily living (ADLs) as well as level of cognitive decline in

suspected dementia. It is well established in AD that changes in everyday function are associated with cognitive dysfunction [15-17], but in FTD cognitive assessment in isolation can overestimate abilities [18-19]. Also, other important issues are related to cut-off scores and premorbid education. Many countries have been validating the ACE for their own population, so it is crucial that cut-offs are used accordingly. A large study using the old ACE in India revealed marked differences in scoring for each educational level [20]. A final aspect in interpretation should be noted in terms of prevalence. All ACE and ACE-R studies, to date, were conducted within settings with high prevalence of dementia. When using the ACE in a community sample, one should keep in mind that community samples have a much lower rate of prevalence in comparison to specialised centres. A major disadvantage is that the ACE, to date, has not been validated against a community sample [21]. The ACE-R has been used in over 40 countries (Argentina, Australia, Austria, Belgium, Bosnia & Herzegovina, Brazil, Canada, Chile, China, Cuba, Czech Republic, Denmark, Egypt, England, France, Germany, Greece, Holland, Hong Kong, Hungary, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Mexico, New Zealand, Northern Ireland, Paraguay, Poland, Portugal, Qatar, Romania, Saudi Arabia, Scotland, Slovenia, South Africa, South Korea, Spain, Switzerland, Thailand, Turkey, Uruguay and USA), and in 28 languages to date.

REFERENCES

1. Mioshi, E., et al., *The Addenbrooke's Cognitive Examination Revised (ACE-R): a brief cognitive test battery for dementia screening*. International Journal of Geriatric Psychiatry, 2006. **21**(11): p. 1078-1085.
2. Galton, C.J., et al., *A Comparison of the Addenbrooke's Cognitive Examination (ACE), Conventional Neuropsychological Assessment, and Simple MRI-Based Medial Temporal Lobe Evaluation in the Early Diagnosis of Alzheimer's Disease*. Cogn Behav Neurol, 2005. **18**(3): p. 144-150.
3. Mitchell, J., et al., *Outcome in subgroups of mild cognitive impairment (MCI) is highly predictable using a simple algorithm*. J Neurol, 2009.
4. Mathuranath, P.S., et al., *A brief cognitive test battery to differentiate Alzheimer's disease and frontotemporal dementia*. Neurology, 2000. **55**(11): p. 1613-20.
5. Kipps, C.M., et al., *Combined magnetic resonance imaging and positron emission tomography brain imaging in behavioural variant frontotemporal degeneration: refining the clinical phenotype*. Brain, 2009.
6. Kipps, C.M., et al., *Understanding social dysfunction in the behavioural variant of frontotemporal dementia: the role of emotion and sarcasm processing*. Brain, 2009. **132**(Pt 3): p. 592-603.
7. Davies, R.R., et al., *Progression in frontotemporal dementia: identifying a benign behavioral variant by magnetic resonance imaging*. Arch Neurol, 2006. **63**(11): p. 1627-31.
8. Kipps, C.M., et al., *Behavioural variant frontotemporal dementia: not all it seems?* Neurocase, 2007. **13**(4): p. 237-47.
9. Kipps, C.M., et al., *Measuring progression in frontotemporal dementia: Implications for therapeutic interventions*. Neurology, 2008. **70**(22): p. 2046-52.
10. Davies, R.R., et al., *Differentiation of semantic dementia and Alzheimer's disease using the Addenbrooke's Cognitive Examination (ACE)*. Int J Geriatr Psychiatry, 2008. **23**(4): p. 370-5.
11. Bak, T.H., et al., *Cognitive bedside assessment in atypical parkinsonian syndromes*. J Neurol Neurosurg Psychiatry, 2005. **76**(3): p. 420-2.
12. Bak, T.H., et al., *Subcortical dementia revisited: similarities and differences in cognitive function between progressive supranuclear palsy (PSP), corticobasal degeneration (CBD) and multiple system atrophy (MSA)*. Neurocase, 2005. **11**(4): p. 268-73.
13. Dudas, R.B., G.E. Berrios, and J.R. Hodges, *The Addenbrooke's cognitive examination (ACE) in the differential diagnosis of early dementias versus affective disorder*. Am J Geriatr Psychiatry, 2005. **13**(3): p. 218-26.
14. Mioshi, E. and J.R. Hodges, *Commonly used cognitive screening instruments for diagnosis of dementia*. Journal of Internal Medicine Concepts and Practice (Mandarin), 2009. **4**: p. 247-250.
15. Feldman, H., et al., *The disability assessment for dementia scale: a 12-month study of functional ability in mild to moderate severity Alzheimer disease*. Alzheimer Dis Assoc Disord, 2001. **15**(2): p. 89-95.
16. Galasko, D., J. Corey-Bloom, and L.J. Thal, *Monitoring progression in Alzheimer's disease*. J Am Geriatr Soc, 1991. **39**(9): p. 932-941.
17. Suh, G.H., et al., *A longitudinal study of Alzheimer's disease: rates of cognitive and functional decline*. Int J Geriatr Psychiatry, 2004. **19**(9): p. 817-24.
18. Mioshi, E., et al., *Activities of daily living in frontotemporal dementia and Alzheimer disease*. Neurology, 2007. **68**(24): p. 2077-84.
19. Mioshi, E., C.M. Kipps, and J.R. Hodges, *Activities of daily living in behavioral variant frontotemporal dementia: differences in caregiver and performance-based assessments*. Alzheimer Dis Assoc Disord, 2009. **23**(1): p. 70-6.
20. Mathuranath, P.S., et al., *Mini mental state examination and the Addenbrooke's cognitive examination: effect of education and norms for a multicultural population*. Neurol India, 2007. **55**(2): p. 106-10.
21. Cullen, B., et al., *A review of screening tests for cognitive impairment*. J Neurol Neurosurg Psychiatry, 2007. **78**(8): p. 790-9.

