

Brief executive function assessment tool (BEAT)

Administration and scoring guide



Drug and Alcohol Network

The BEAT was designed to increase the capacity of alcohol and other drug services to screen for cognitive impairment and to be administered by frontline alcohol and other drug service workers. As many BEAT users will not be psychologists, it is strongly recommended that they watch the training video prior to administering the tool. The need to enhance the capacity of alcohol and other drug services to screen for cognitive impairment has been balanced against the need to ensure psychological tests are not misused or cause harm. Therefore, it is strongly recommended that BEAT examiners who are not psychologists seek the supervision of a psychologist if and/or when interpretation anomalies arise.

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Preferred citation: *Berry J, Nardo T, Sedwell A, Lunn J, Marceau E, Wesseling A, Zucco M, Sugden-Lingard S, Borchard T, Batchelor J and Shores EA. Brief executive function assessment tool: Administration and scoring guide. Sydney: ACI; 2021.*

SHPN (ACI) 200646
ISBN 978-1-76081-501-1

Version: V1; ACI_0309 [10/20] Date amended: February 2021

Trim: ACI/D20/3247

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Overview

The brief executive function assessment tool (BEAT) is a tool used to detect cognitive impairment, and particularly executive function impairment, in a substance use disorder population. It is intended for use in conjunction with the alcohol and drug cognitive enhancement (ACE) screening tool to identify individuals who may need supports to obtain the greatest benefit from substance use disorder treatment. It is part of the larger ACE package designed to identify and support people with substance use disorder and cognitive impairment.

The BEAT has three parts.

- 1. Record form.** This is for the examiner to record examinee responses.
- 2. Response form.** This is for the examinee to complete the trail making, clock drawing and figure copying activities. It also contains the questionnaire, which may either be read by the examiner, or given to the examinee to complete.
- 3. Stimulus card.** This contains the stimuli for the reading and naming activities. It is recommended that examiners laminate a re-usable version of the stimulus card, rather than print one off for each examination.

To increase inter-rater reliability, all of the instructions for administering and scoring the BEAT are provided on the BEAT record form.

The BEAT does not replace a full neuropsychological assessment, but may assist in identifying individuals who might benefit from a fuller assessment of their cognition. The BEAT will provide a score that grossly indicates whether a person has intact or impaired cognitive functioning. For more detailed information about a person's cognitive profile, a full neuropsychological assessment is recommended.

This administration and scoring guide further explains aspects of administration and scoring for test examiners.

Training and test security

All BEAT examiners should review the [BEAT training video](#) before administering the BEAT with examinees. A register of BEAT examiners will be maintained by the Agency for Clinical Innovation, so that updates to the assessment tool can be disseminated efficiently. BEAT examiners are asked to protect the BEAT test by not sharing it with others who have not registered to be a BEAT examiner and reviewed the training video. This helps ensure the test is used appropriately and that test validity is maintained by safeguarding it from access by potential examinees.

Scoring

The BEAT has been designed so that most, if not all, of the scoring can be completed during test administration.

In each item section, there is a key that shows the transformed score, which is used to calculate the BEAT total score. It is recommended that the examiner circle the transformed score corresponding to the observed raw score on this key.

For example, for Item 1 Questionnaire, if the raw score is 24, then the examiner would circle the transformed score under the raw score range of 19–29, i.e. 1.

Raw score	0–9	10–18	19–29	30–70
Transformed score	3	2	1	0

At the end of the test, these transformed scores are plotted onto the table at the end of the BEAT to allow for calculation of the BEAT total score.

Materials and organisation

Because the BEAT has three components, it is important that you are well organised before starting the BEAT. Ensure you have all three components printed and that you can fluently move between each one as needed.

Additionally, you must ensure you have a stopwatch, as this is required for three items trail making, letter fluency and category fluency.

At no time should the examinee see the BEAT record form. All they will see is the BEAT response form and BEAT stimulus card. They should only be able to view these components at certain times. Do not leave any of the BEAT materials in view of the examinee if they are not using them to complete a relevant item.

Giving the BEAT test

It is important that the test is introduced in a manner that minimises anxiety for the examinee. Taking a test can be anxiety provoking for most people, especially if they disliked or had difficulties at school. As such it is important to normalise the likely challenges or difficulty people might experience ahead of taking the test. It is also important to encourage the examinee to put in their best effort.

Say: We're about to have a look at your memory and thinking skills by asking you to do some mental tasks. You may find some tasks very easy and others a little challenging. It's normal to experience some difficulties, the main thing is for you to try your best.

Prompt 1. Prospective memory

There are two prospective memory tasks on the BEAT, each requiring a setup and a cue. The first of the setups occurs before the first item is administered.

Prospective memory end setup

1. *Say: At the end of this test I will say 'that's the end'. When I say that, I want you to remind me to ask about your schooling.*

If you have already asked about the examinee's schooling, then replace the word schooling with some other relevant phrase such as hobbies, talents or interests.

2. Tick the box indicating that you have provided the instruction for the setup.

Item 1. Questionnaire

1. Present the response form Item 1 Questionnaire to the examinee.
2. *Say: To start with, I've got a brief questionnaire that asks on how many days out of the past seven days you experienced issues with your thinking or functioning. Would you like to complete it yourself, or would you prefer I read it to you?*
3. Either allow the examinee to complete the questionnaire themselves, or read it to them and mark their verbal responses onto the response form.

4. If you read the questions, note it in the tick box on the record form.
5. The raw score is the total number of days for all 10 questions. Add up the days across the 10 questions and write it onto the record form in the raw score field.

Item 2. Trail making


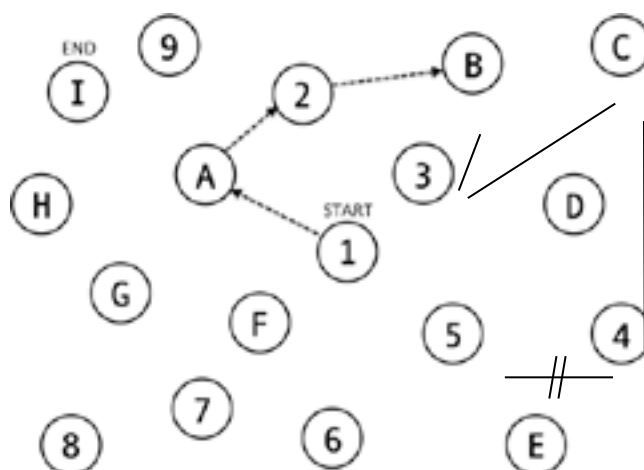
1. Make sure you have a stopwatch to record the time. 
2. Present response form Item 2 Trail making to the examinee.
3. *Say: I'd like you to start at number 1 and draw a line from 1 to A, A to 2, 2 to B and so on. Keep alternating between number and letter, as fast as you can until you reach the end here.*
4. Point to each number and letter as you explain.
5. Use a stopwatch to time how long the examinee takes to complete the trail.
6. If the examinee makes a mistake, **say 'that's not quite right, continue from here'**. Cross out the error with two lines and point to the last correct number or letter (Figure 1). Do not stop timing.
7. The raw score is the total time taken to complete the trail (in seconds). Write this down in the raw score field on the record form.

Figure 1. Example of how to mark an error



Item 3. Clock drawing

1. Present response form Item 3 Clock drawing to the examinee.
2. *Say: This circle represents a clock. Put in all the numbers so that it looks like a clock and then set the time to ten minutes past eleven.*
3. The raw score is the first two numbers that are drawn. Write this down in the raw score field on the record form.

Item 4. Figure copying

1. Present response form Item 4 Figure copying to the examinee.
2. *Say: Copy this diagram as accurately as you can over here.*
3. Point to the space below the design.
4. Give a point for each of the nine elements that are drawn. An element must be clearly recognisable to attract a point, even if it is in the wrong location.
5. The raw score is the total number of elements drawn. Write this down in the raw score field on the record form.
6. Note that the images on the record form are upside down so that you can start to mark the responses as the examinee is drawing the figure. See Figure 2.
7. Remove the response form from the examinee when copy is complete.
8. *Say: I would like you to remember that last drawing you copied because I will ask you to draw it again later on.*

Prompt 2. Prospective memory bell setup

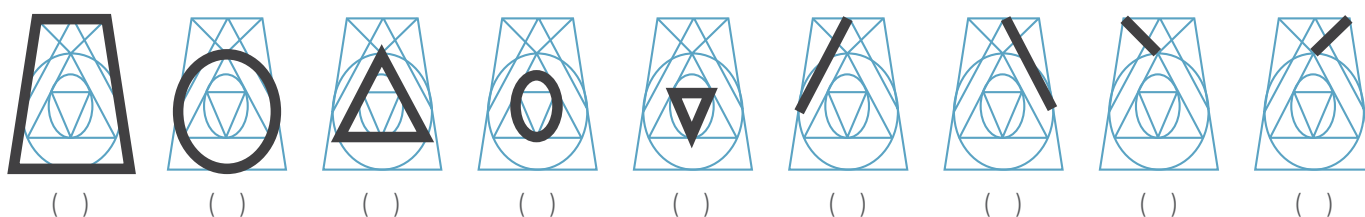
Say: Also, if you see a bell, I want you to say to me, 'that rings a bell'.

Tick the box indicating that you have provided the instruction for the setup on the record form.

Item 5. Word list learning

1. **Trial 1:** *Say: Now I'm going to say some words. Listen carefully, because after I've said them, I want you to tell me as many of them as you can remember, in any order you like. Ready?*
2. Read the words from left to right starting with 'violin' at a rate of one per second.
3. **Trial 2:** *Say: I'm going to say all the words again and when I stop, I want you to tell me all the words from the list, including the ones you've already told me. Ready?*
4. Read the words from left to right starting with 'violin' at a rate of one per second.
5. **Trial 3:** *Say: I'm going to say all the words one more time and when I stop, I want you to tell me all the words from the list, including the ones you've already told me. Ready?*
6. Read the words from left to right starting with 'violin' at a rate of one per second.
7. The raw score is the total number of words recalled across the three trials. Add up the totals for each trial and write it in the total column on the record form, then add the totals for the total raw score.

Figure 2. Figure copying scoring



Item 6. Attention span

1. Say: *I'll say some numbers and I want you to repeat them back to me in the same order. For example, if I say '3, 5', what would you say?*
2. Start with the sequence length 5 and record response in the table.
3. Go up if correct or down if incorrect. If going up, discontinue when the first error is made. If going down discontinue when the first correct response is made.
4. The raw score is the highest sequence length the examinee correctly repeats. It may be helpful to circle the maximum correct sequence length in the table, as shown in Figure 3. Write this in the raw score field on the record form.

Figure 3. Example of a completed attention span table

Sequence length	Stimuli	Response
7	3-1-9-7-5-8-4	
6	7-6-1-4-5-8	7 6 1 4 8 5 ✗
5 Start Here ->	2-5-6-9-7	2 5 6 9 7 ✓
4	5-1-8-4	
3	4-1-3	

Item 7. Working memory

1. Say: *I'll say some more numbers and this time I want you to say them in reverse order. For example, if I say '7, 2', what would you say?* They should say '2, 7'. If incorrect, explain again until the examinee understands the task.
2. Start with the sequence length of 3, then go up if correct or down if incorrect and record response in the table. If going up, discontinue when the first error is made. If going down discontinue when the first correct response is made.
3. The raw score is the highest reverse sequence length the examinee achieves. Write this in the raw score field on the record form.

Figure 4. Working memory table

Sequence length	Stimuli	(Expected response) Response
6	2-4-5-8-6-9	(9-6-8-5-4-2)
5	2-5-6-9-7	(7-9-6-5-2)
4	5-1-8-4	(4-8-1-5)
3 Start here ->	4-1-3	(3-1-4)
2	9-6	(6-9)

Item 8. Attention span minus working memory

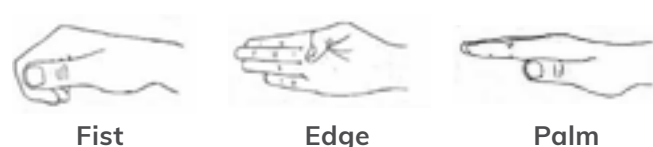
This is not a question you have to ask the examinee. You calculate this item based on the raw scores of the previous two items.

The raw score is attention span raw score minus working memory raw score. This may be a negative number, so take care to include a minus sign in the calculation of the raw score. Write this in the raw score field on the record form.

Item 9. Motor series

1. **Say:** Look carefully at what I'm doing.
2. Perform fist-edge-palm (but do not say this out loud) three times with your **left hand** on the table (your hand should touch the table with each movement). Although you should not say 'fist-edge-palm' aloud, saying it in your mind might help you to ensure you demonstrate it correctly and fluently. You will need some practice doing this before you administer the BEAT for the first time.

Figure 5. Motor series



3. **Say:** Now with your right hand, do the same series with me.
Perform series three times with the examinee. Tick for each series that is performed correctly on the record form.
4. These three practice trials **do not** contribute to the raw score. For the actual test, score steps five and six on the record form.

5. **Say:** Now do it on your own.
Allow examinee six attempts. Tick the record form for each trial that is performed correctly.
6. The raw score is the total number of trials examinee could gesture fist-edge-palm (in that order) on their own correctly. Write this in the raw score field on the record form.

Item 10. Abstraction


1. **Say:** In what way are a banana and orange alike?
2. Note the response and if anything other than 'fruit(s)'. **Say:** Yes, and they're both fruits.
3. **Say:** In what way are a table and chair alike?
4. Repeat for the other items in a similar fashion.
5. Record responses verbatim on the record form. This allows you to check in more detail whether a response should be credited if you do not have time to do it during the test.
6. Record one point for each correct answer. See Figure 6 for correct and incorrect examples.
7. The raw score is the total number of points across the four word pairs. Write this in the raw score field on the record form.

Figure 6. Abstraction scoring key


Scoring key							
Table – Chair		Wind – Rain		Salt – Pepper		Salt – Seaweed	
0 point examples	1 point examples	0 point examples	1 point examples	0 point examples	1 point examples	0 point examples	1 point examples
Matching For dining Made of wood Four legs Go together Eat at them Part of a set	Furniture	Elements Come from the sky or atmosphere Nature Environmental forces Seasons Precipitation When there's rain there's wind	Weather	Herbs or spices Additives Make food taste nice Add flavour Ingredients Granulated Comes from a shaker	Condiments Added to food, goes on food Seasoning	Start with S Salty or have salt Taste the same Saltwater Edible, eat them or food Beach Salt comes from the sea Marine	From the sea or ocean From water

Figure 5 is 'Fist-edge-palm' from Leonidovna SA, Sergeevna, SA. The use of 'The program of forming neuro-psychological space of junior schoolchildren' in teaching process. International Journal of Professional Science.2016;(1)

Item 11. Letter fluency

1. Make sure you have a stopwatch to record the time. 
2. Say: *I'd like you to tell me as many words as you can think of that begin with a particular letter of the alphabet. Only give me words that start with that letter. Don't tell me the names of people or places, and don't give me the same word with different endings, like eat, eating, eaten, etc. Tell me as many words as you can think of, as fast as you can, that start with S. Go ahead.*
3. Start the stopwatch.
4. Record responses verbatim.
5. Say: **Stop** after 60 seconds.
6. The raw score is the total number of correct words. Ensure you do not count words that are repetitions or rule breaks (e.g. proper nouns). Write down the total number of correct words in the raw score field on the record form

Item 12. Category fluency

1. Make sure you have a stopwatch to record the time. 
2. Say: *Next I will ask you tell me the names of things that belong to a particular category. They can start with any letter. As fast as you can, tell me as many different names of fruits as you can think of. Go ahead.*
3. Start the stopwatch.
4. Record responses verbatim.
5. Say: **Stop** after 60 seconds.
6. The raw score is the total number of correct words. Ensure you do not count words that are repetitions or rule breaks (e.g. not in the category). Write down the total number of correct words in the raw score field on the record form.

Item 13. Letter fluency minus category fluency

Note: This is not a question you have to ask the examinee. You calculate this item based on the raw scores of the previous two items.

The raw score is letter fluency raw score minus category fluency raw score. This may be a negative number, so take care to include a minus sign in the calculation of the raw score. Write this in the raw score field on the record form.

Item 14. Word list recall

1. Say: *A little while ago I read you some words several times. I want you to tell me all the words again in any order.*
2. For words that are not freely recalled, provide a category cue. A category cue is provided by consulting the category cued recall section of the table below. Say: **One of the words was...** If the word is not recalled with a category cue, immediately provide the multiple choice cue. A multiple choice cue is provided by consulting the multiple choice cued recall section of the table below. Say: **Was it...?**
3. The raw score is calculated by:
 - a. multiplying the free recall score by 3
 - b. multiplying the category cued recall score by 2.
 - c. adding these amounts to the multiple choice cued recall score.
4. Write this down on the record form in the bottom right of the table.

Item 15. Reading

1. Present the BEAT: stimulus card to the examinee.
2. Say: *Read these words for me out loud, starting at number one. Some of these are hard words that you may not have come across before. Just try your best to pronounce them correctly.*
3. The raw score is the total number of words pronounced correctly (pronunciation below). Write this in the raw score field on the record form.
 - [] 1. Address (pronounced like 'a-dress')
 - [] 2. Climb (pronounced like 'clime')
 - [] 3. Equestrian (pronounced like 'e-quest-rian')
 - [] 4. Liaison (pronounced like 'lee-ayze-on', or 'lie-ayze-on')
 - [] 5. Ubiquitous (pronounced like 'you-bick-weh-tus')
 - [] 6. Anechoic (pronounced like 'an-eck-oh-ick')
 - [] 7. Vivace (pronounced like 'viv-arch-ie')

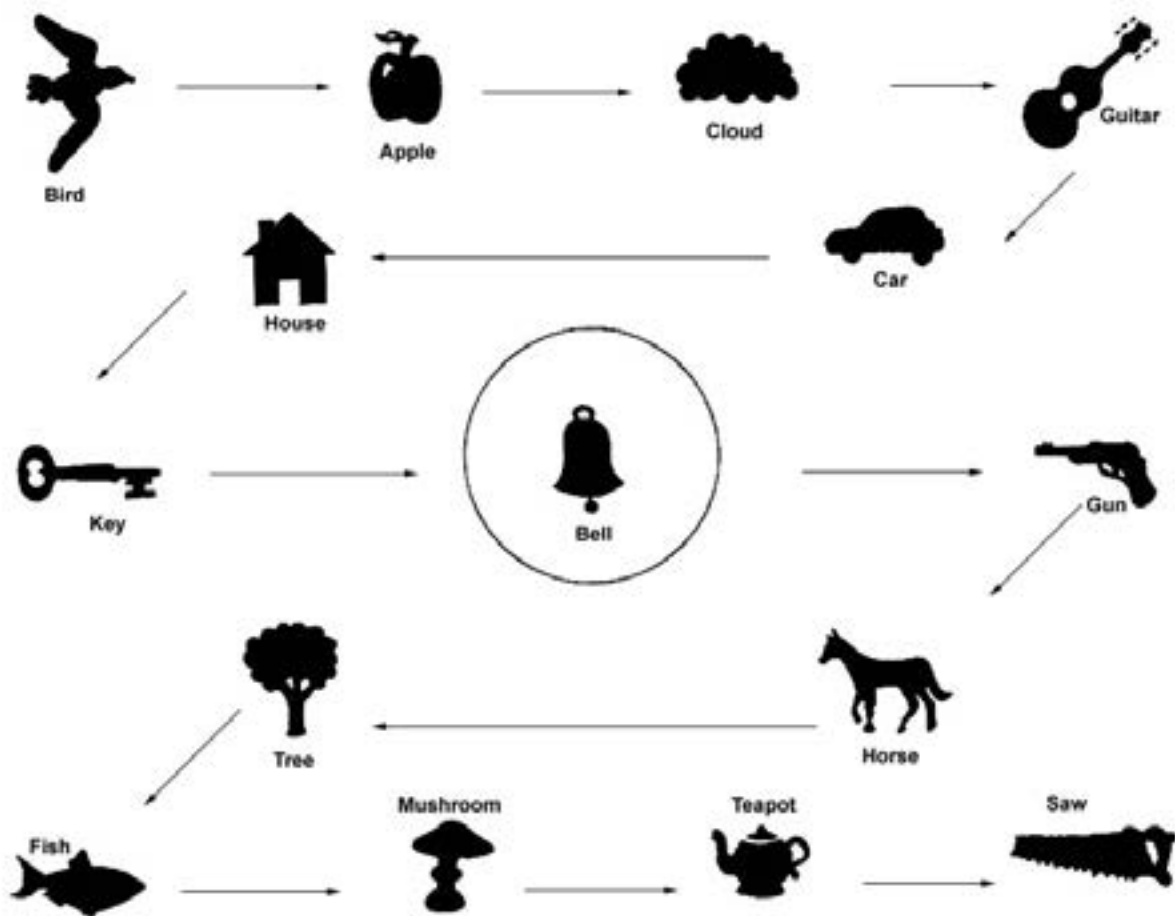
Figure 7. Word list recall scoring

Free recall	Category cued recall 'One of the words was...'	Multiple choice cued recall 'Was it...'
VIOLIN	a musical instrument	guitar, piano or violin?
STOVE	something you find in a kitchen	sink, stove or fridge?
FROG	an animal	frog, monkey or snake?
LIP	part of a face	cheek, lip or nose?
SHIRT	an item of clothing	shirt, jeans or singlet?
LETTUCE	a vegetable	carrot, lettuce or cucumber?
NURSE	a profession	lawyer, doctor or nurse?
Total	Total	Total
Total x 3	Total x 2	Total x 1
Raw score: Add total multiplied scores from each column		

Item 16. Naming

1. Present the BEAT: stimulus card to the examinee.
2. *Say: What's this a picture of?*
Point at each of the silhouette drawings on the stimulus card, in the order below.
3. The raw score is the total number of items named correctly. Write this in the raw score field on the record.

Figure 8. Naming items



Prompt 3. Prospective memory bell response

- Give two points if the examinee responds to the bell cue by correctly stating the phrase 'that rings a bell'.
- Give one point if the examinee responds to the bell cue but cannot recall what they need to say.
- Give zero points if the examinee does not immediately respond to the bell cue (even though they might do so later).
- Award points by circling the raw score in the scoring key on the record form. You will later use this to calculate the raw score for Item 20 Prospective memory.

Figure 8. Naming items source: © 2006 Oxford Publishing Limited. Strauss, Sherman and Spreen. A Compendium of Neuropsychological Tests. Reproduced with permission of the Licensor through PLSClear.

Item 17. Delay discounting

1. Say: *In a hypothetical situation where someone is offering you money, would you prefer to receive...* [name each of the options in the table].
2. On the record form, circle the amount the examinee selects.
3. The raw score is the total number of delayed choices. Write this in the raw score field on the record form.

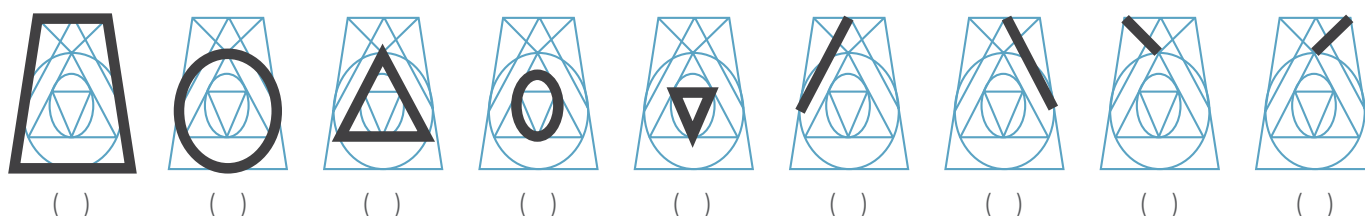
Figure 9. Delay discounting scoring

1	\$3 now or \$10 in one week		
2	\$50 now or \$100 in six months		
3	\$20 now or \$100 in six months		
4	\$2 now or \$10 in one week		
5	\$10 now or \$50 in one month		
6	\$80 now or \$100 in six months		
7	\$6 now or \$10 in one week		
8	\$30 now or \$100 in six months		
9	\$25 now or \$50 in one month		
10	\$8 now or \$10 in one week		
11	\$30 now or \$50 in one month		
12	\$40 now or \$50 in one month		
13	\$20 now or \$50 in one month		
14	\$60 now or \$100 in six months		
15	\$1 now or \$10 in one week		
16	\$45 now or \$50 in one month		
17	\$10 now or \$100 in six months		
18	\$70 now or \$100 in six months		
19	\$35 now or \$50 in one month		
20	\$7 now or \$10 in one week		
21	\$5 now or \$10 in one week		
22	\$5 now or \$50 in one month		
23	\$40 now or \$100 in six months		
24	\$9 now or \$10 in one week		
25	\$4 now or \$10 in one week		
26	\$15 now or \$50 in one month		
27	\$90 now or \$100 in six months		
Total now =		Total delay = <input style="border: 2px solid green;" type="text"/>	

Item 18. Visual memory

1. Present response form Item 18 Visual memory to the examinee.
2. Say: *A little while ago, you copied a diagram. I want you to draw that diagram now as best as you can from memory.*
The diagram is presented upside down in the record form so scoring can be undertaken during drawing.
3. Give a point for each of the nine elements that are recalled. An element must be clearly recognisable to attract a point, even if it is in the wrong location.
4. The raw score is the total number of elements drawn from memory. Write this in the raw score field on the record form.

Figure 10 - Visual memory scoring



Item 19. Incidental learning

1. Say: *Earlier, I showed you a page with 15 silhouette drawings and I asked you to name them. I want you to tell me as many of them as you can remember.*
2. Tick the items recalled by the examinee on the record form (if they incorrectly named an item originally and used the same incorrect name in recalling it, give them a point).
3. The raw score is the total number of pictures recalled. Write this in the raw score field on the record form.

Prompt 4. Prospective memory end response

1. Say: *That's the end.*
2. Give two points if the examinee responds to the cue by correctly asking you to ask them about their schooling (or other topic mentioned in the setup).
3. Give one point if the examinee responds to the cue but cannot recall what they need to say.
4. Give zero points if the examinee does not immediately respond to the cue.
5. Award points by circling the raw score in the scoring key on the record form. You will later use this to calculate the raw score for Item 20 Prospective memory.

Item 20. Prospective memory score

The raw score for this item is the combined raw scores for Prompt 3 Prospective memory bell response and Prompt 4 Prospective memory end response. Write this in the raw score field on the record form.

Education

1. Say: *What is highest level of education you've completed?*
2. Tick the box on the record form, corresponding to the examinee's highest level of education attained.
3. Clarify whether a qualification was attempted but not completed, but count full years completed only (e.g. if someone completed their first year of a Bachelor Degree, then count that as 13 years).
4. Write the corresponding number of years in the years of education field on the record form.
5. Please note this is not recoded but provides qualitative information to aid in interpreting results.

Calculating the BEAT score

Use the following steps to calculate the BEAT total score.

1. Circle the transformed scores for each item in the table below.
2. Add up the columns for 1, 2, and 3 scores.
3. Add up the totals of those columns.
4. That total is the BEAT total score.

See Figure 11 below for an example of how this table is to be completed.

In this example the BEAT total score was 33. Since this is higher than the cut-score of 30, then this examinee is deemed intact (i.e. not cognitively impaired) on the BEAT.

Figure 11. Example of BEAT score calculation

Item	Transformed score			
	0	1	2	3
Item 1. Questionnaire	0	1	2	3
Item 2. Trail making	0	1	2	3
Item 3. Clock drawing	0	1		3
Item 4. Figure copying	0			3
Item 5. Word list learning	0	1	2	3
Item 6. Attention span	0	1	2	3
Item 7. Working memory	0	1	2	3
Item 8. Attention span minus working memory	0			3
Item 9. Motor series	0			3
Item 10. Abstraction	0	1	2	3
Item 11. Letter fluency	0	1	2	3
Item 12. Category fluency	0	1	2	3
Item 13. Letter fluency minus category fluency	0	1	2	3
Item 14. Word list recall	0	1	2	3
Item 15. Reading	0	1	2	3
Item 16. Naming	0			3
Item 17. Delay discounting	0	1	2	3
Item 18. Visual memory	0	1	2	3
Item 19. Incidental learning	0	1	2	3
Item 20. Prospective memory score	0	1		3
Total score		7	14	12

33

Cognitive impairment if BEAT score is 30 or less

The Agency for Clinical Innovation (ACI) is the lead agency for innovation in clinical care.

We bring consumers, clinicians and healthcare managers together to support the design, assessment and implementation of clinical innovations across the NSW public health system to change the way that care is delivered.

The ACI's clinical networks, institutes and taskforces are chaired by senior clinicians and consumers who have a keen interest and track record in innovative clinical care.

We also work closely with the Ministry of Health and the four other pillars of NSW Health to pilot, scale and spread solutions to healthcare system-wide challenges. We seek to improve the care and outcomes for patients by re-designing and transforming the NSW public health system.

Our innovations are:

- person-centred
- clinically-led
- evidence-based
- value-driven.

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