

Cerebellar Cognitive Affective (CCAS) / Schmahmann Syndrome Scale

Administration and Scoring Instructions

The Cerebellar Cognitive Affective Syndrome (CCAS) / Schmahmann Scale is a screening instrument to detect the cerebellar cognitive affective syndrome in patients with cerebellar injury. It assesses different cognitive domains: attention and concentration, executive functions, memory, language, visual spatial skills, abstract thinking, and neuropsychiatric features. Time to administer the Scale is approximately 10 minutes in healthy controls, and approximately 12 minutes in patients with impairments. The total possible Raw Score is 120 points; the Pass / Fail measure provides a maximum fail score of 10 (i.e., 10 failed tests). A fail score of 0 is normal. In a patient with cerebellar disease, a fail score of 1 indicates Possible CCAS, a fail score of 2 indicates Probable CCAS, and a fail score of 3 or more indicates Definite CCAS.

Document the patient's name, date of birth, and hospital medical record number. Provide the patient's years of education; 1 year per school grade (completed 12th grade = 12 years), and add further years of study for college courses or degrees earned. Note the date the test was administered.

1. Semantic (Category) Fluency

Administration: The examiner instructs the subject: "Please name as many animals or living creatures as you can in one minute. Are you ready? Go ahead and start."

Scoring: Allocate one point for each correct answer given within one minute.

Example: Subject answers: "owl, bird, bat, cow, grass, bug, horse, dog" earns a score of 7 (*grass* is a set loss error).

The following count as correct answers:

Different names / genders for similar animals, e.g., mare, stallion, rooster, hen.

Categories and exemplars of the category, e.g., dog, poodle, cavalier; bird, eagle, cardinal; fish, salmon, trout

Extinct creatures count, e.g., dinosaur, pterodactyl

The following are wrong answers and do not count:

Errors, such "flower" instead of animals or living creatures

Repetitions of the same word

Conjugations of the same word – elephant, herd of elephants; dog, dogs; red bird, blue bird, yellow bird

2. Phonemic (Letter) Fluency

Administration: The examiner instructs the subject: "Please name as many words as you can in one minute that start with the letter F. Do not use names of people or places or repeat the same word in different forms. Are you ready? Go ahead and start"

Scoring: Allocate one point for each correct answer given within one minute. Errors are not counted (e.g. subject states "phone" instead of a word with the initial letter F. The same holds true for names of people, places, or any conjugation of the same word (e.g., 'fish, fishes' is incorrect, whereas 'fish, fishing' are correct as they have different meanings). Repetitions of the same word are not counted.

Example: Subject answers: "feather, father, friend, forgive, forgiven, fault, fun, Philadelphia, feather" earns a score of 6 (*Philadelphia* is a set loss error, *feather* is a repetition, *forgiven* is the same word with a different word ending).

3. Category Switching (vegetable-profession)

Administration: The examiner instructs the subject: "Please name a type of vegetable and then a type of profession or job, and then another vegetable and another profession, and so on, switching between the two lists. Name as many as you can in one minute. Are you ready? Go ahead and start"

Scoring: Allocate one point for each correct alternation between the two categories. The switching between categories is counted, and the words in the alternating categories have to be correct (and not repetitions). Errors that are not immediately self-corrected do not score points. For example, set loss errors such as "apple" instead of a vegetable are incorrect, and would not be scored. If the first word in each category that the patient produces is incorrect (e.g., not a profession, not a vegetable), then stop, make sure the patient understands the instruction, and then start again. After the first words, if the patient makes three errors in a row you can remind them what the categories are, but continue from that point on (do not start the test gain). Score only the switches / alternations between words that are in the correct categories. Examples below:

Example: Subject answers:

cucumber		1
doctor		2
celery		3
mailman		4
leek		5
teacher		
<u>apple</u>		
librarian		6
spinach		
<u>mailman</u>		
broccoli		
secretary		7

Apple is not scored (i.e., set-loss error).

Mailman is repeated twice (i.e., repetition).

Hence the total score is 7.

4. Verbal registration

Administration: The examiner instructs the subject: "I am going to read you a list of words which I would like you to learn. Please repeat these words. I am going to ask you to give them back in a few minutes. Are you ready? Here they are."

(Read the 5 words at rate of 1 per second. Have the subject repeat them when you are done. Then have the subject repeat them a second time with your prompt.

You may repeat this procedure until subject recalls all 5 words, but stop after 4 attempts at securing registration. Document how many words are repeated.)

Scoring: This part of the memory test is not scored.

5. Digit Span Forward

Administration: The examiner instructs the subject: "I am going to read you some numbers. Please repeat them in exactly the same order. I am going to read each sequence of numbers only once. Are you ready? Here they are".

(Read aloud at rate of one digit per 1 second. Start with * 4 digits. If subject fails 4, try 3, and then 2. If the subject repeats 4 digits, then read the 5-digit number, then the 6-digit number and so on. Stop when you reach 8 digits, or when the subject fails the repetition. Allow one trial per digit sequence).

Scoring: Allocate one point per digit for the longest string of numbers correctly repeated. Any error within one string of digits (e.g. subject states "1-6-9-~~4~~-5" instead of "1-6-9-2-5" that is not immediately self corrected is an error, and the previous longest digit length achieved is scored (here 4 points, not 5).

6. Digit Span Backwards

Administration: The examiner instructs the subject: "Now I would like you to say these numbers backwards (in reverse order. If I say 5-8, I want you to say 8-5. Do you understand? I am going to read each sequence of numbers only once. Are you ready? Here they are".

(Start with * 2 digits, stop when you reach 6 digits, or when the subject fails the reverse sequence. Allow one trial per digit sequence).

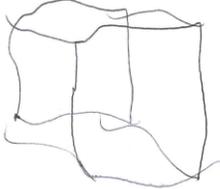
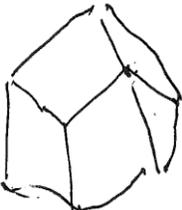
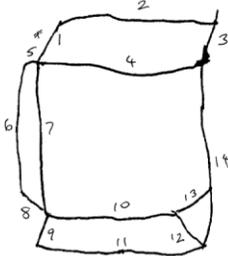
Scoring: Allocate one point per digit for the longest string of numbers correctly repeated. Any error within one string of digits (e.g. subject states "~~8~~-2-3" instead of "2-8-3" that is not immediately self corrected is an error, and the previous longest digit length is scored (here, 2 points not 3).

7. Cube Draw:

Administration: The examiner instructs the subject: "Please draw a cube – a six-sided box, make it transparent or see-through". (No time limit)

Scoring: Allocate maximum score of 15 points if all 12 lines are present and the diagram is 3-dimensional. If there are < 12 lines or > 12 lines, and the diagram is not 3-dimensional, administer "Cube Copy" (in the latter case no points are earned for cube draw).

Examples:

	<p>Correct drawing (has 12 lines and is three dimensional). Lines do not have to be perfectly drawn.</p>
	<p>Incorrect drawing (has 13 lines and is not a recognizable copy of the 3-D example). Move to the Cube Copy task. (If this was the Cube Copy condition, score would be 10. 12-1 for the extra line; -1 for not being 3-D).</p>
	<p>Incorrect drawing (has 14 lines; 2 lines more than permitted and is not 3-D). Move to the Cube Copy task. (If this was the Cube Copy condition, score would be 9. 12 – 2 for the extra lines; – 1 for not being 3-D).</p>

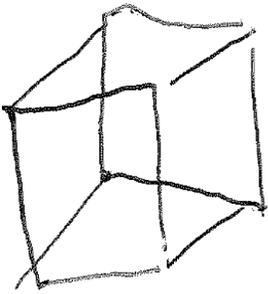
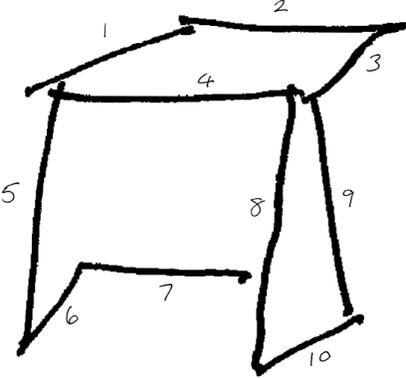
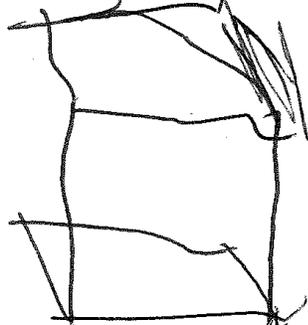
The patient should draw the cube to the best of their ability. Observe the patient do this. Inaccuracies because of untidiness or difficulty with pen control do not count as errors. The test measures visual spatial concept formation and execution, assessed by the patient's ability to draw 12 lines and make it look 3-dimensional. It is not designed to be a measure of motor control. If the patient cannot draw the cube correctly, have them copy the cube. If the patient is too disabled from upper extremity dysmetria to hold the pen, or to hold it steady enough to draw or copy the diagram, then do not include it in the final Raw Score. In this case, the Total Raw Score will be out of 105, not 120. Also, do not count it as a Fail (in the Pass-Fail column). Make note of the fact that dysmetria was so severe as to preclude completion of this aspect of cube draw / copy.

8. Cube Copy:

Administration: The examiner instructs the subject: "Please copy the cube shown on page 2." (No time limit)

Scoring: Allocate a maximum score of 12 points, that is, 1 point for each line drawn. Deduct 1 point if the image is not 3-dimensional. Deduct 1 point for each missing line. Deduct 1 point for each additional line drawn >12.

Examples:

	<p>Correct copy. Allocate 12 points.</p>
	<p>Incorrect copy. Score 10 points for the 10 lines drawn. 3-dimensional concept attempted; no deduction.</p>
	<p>Incorrect copy. Score 10 points for the 10 lines drawn. 3-dimensional concept attempted; no deduction. No deduction for the apparent motor difficulties.</p>

9. Verbal recall

Administration: The examiner instructs the subject: "What were the words that I asked you to learn earlier?"

(Subject recalls the words learned previously. Use cues and multiple choice alternatives if needed).

Scoring: Spontaneous recall of each word earns three points per word. Category cue recall earns 2 points per word and recall with multiple choice earns 1 point per word.

Example: A participant recalls the following words with the following help and receives a total score of 6+2+1 = 9 points

	Flower	Robert	Courage	Speak	Yellow	Subtotal
Spontaneous Recall	[X]	[]	[]	[]	[X]	[6]
Category Cue	[]	[X]	[]	[]	[]	[2]
Multiple choice	[]	[]	[X]	[Not recalled with multiple choice]	[]	[1]

10. Similarities

Administration: The examiner instructs the subject: "How are the following words alike; what is the same about them?" (Provide one example, then test items).

Note: If subject provides answer that is partially correct (indicated with **Q**) then ask "Can you think of something more conceptual about them that they have in common or that makes them similar?" – If subject now gives a 2 point answer, score 2 points.

Scoring: Correct (best possible answer) = a conceptual answer (2 points), partially correct but not best possible = 1 point, incorrect answer or no answer = 0 points.

Scoring key and sample answers:

Nose-Ear

2 points	Senses (used for, part of) senses Sensory (receptors; parts; points) organs used to sense things Two of the five senses
1 point	Facial (parts, features); (parts of; on) your face (Q) Features of mammals Body parts, parts of the body (Q) (part of, on) your head
0 points	Provide body with smell and hearing (Q) Can breathe through nose and mouth Face; head (Q) Help you breathe and hear (or any other difference)

Sheep-Elephant

2 points	Animals; mammals; herbivores Members of the animal (kingdom, family) Quadrupeds
1 point	Both have (four legs, a tail), have four legs and a tail (names shared physical features) (Q) Can be tamed Both are (powerful, strong, muscular, fast)
0 points	You see them at the zoo (Circus, others) Belong to same species Are wild; live in the wild Are found in nature One has wool, the other has thick skin One is big, the other is small Or any other differences

Lake-River

2 points	Bodies of water Water
1 point	(Both are) cold, wet Q You can swim in them (play, exercise) Q Drink them Q
0 points	Both are blue One is large, the other is small One is long, the other is round One stands still, the other is flowing Or any other differences

Airplane - Motorcycle

2 points	(Means, Forms, Modes) of transportation; both transport people (Means, Forms, Modes) of (travel, traveling); For (travel, traveling) Vehicle; Conveyances Way of getting from one place to another Take you (places, somewhere); Carry you to a destination
1 point	Ride in both (Q) Both move (Q) Both used for pleasure or recreation Both cover a distance Have to be (steered, driven, operated), (Q) (Drive, steer, operate) them (Q) Carry (people, things) (Q)
0 points	Both have (motors, engines, seats, steering wheel, or other common details) (Q) (Run on, require) (gasoline, fuel) (Q) They are expensive Both mechanical (Q) Plane is for the air, motorcycle is for the street Plane has wings / flies, motorcycle has wheels / drives (or any other differences)

11. Go No-Go

Administration: The examiner instructs the subject: "I am going to tap the table. When I tap once, raise your finger then put it back down again. When I tap twice, don't do anything. Here are two examples to make sure you understand what I mean. (Tap once, then twice). Are you ready? Here we go".

(The intervals between the tap conditions are paced at 1 per second. The 2-tap condition has a very short inter-tap interval on the order of milliseconds that clearly distinguishes it from the 1-tap condition)."

Scoring: Notate errors of commission and omission. 0 errors = score the maximum 2 points. 1 omission or commission error = score 1 point. 2 or more errors = score 0 points.

12. Affect

Administration: The examiner observes the participants behavior and interaction during the test. Examiner assesses if the behaviors indicated on the scoring sheet are present. This may be supplemented by inquiring about these symptoms from the patient and / or caregiver.

Scoring: Score 6 points if none of the behaviors listed are present. Deduct one point for each behavior present.

Example: If participant presents with "difficulty with focusing attention or mental flexibility" but does not present any of the other items listed then subject earns 6-1 = 5 points.