

RESPONSIVENESS IN EPILEPSY SCALE (RES)

Modified from: Giacino JT, Kalmar K, Whyte J. 2004. The JFK Coma Recovery Scale–Revised: Measurement Characteristics and Diagnostic Utility. *Arch Phys Med Rehabil.* 85: 2020-2029

MEMORY

1. Ictal memory testing

At onset of seizure, ask the patient to remember the exact time, hour and minute “--:--” (e.g. 1:52 or 9:34) by saying to patient:

A. “Remember the time. It is --:--. Say --:--.”	Response:	Score
If at full hour (e.g. 2:00) say the time minus one minute (e.g. say “1:59” instead of “2”)	Repeats exact time correctly	5
	Says partly correct time	4
	Other words	3
	Unintelligible vocalization	2
	Orients towards examiner	1
	No response	0

Immediately after return to baseline (see Level 1), say to patient:

B. “What did I ask you to remember before?”	Fully correct time, no prompt	4
If they do not give a time, then offer prompt:	Partly correct time, no prompt	3
“I asked you to remember a time before.	Fully correct time, prompted	2
What was the time?”	Partly correct time, prompted	1
	No response, or no time	0

2. Interictal memory testing

Do only in patients after ictal memory testing, at least 6 hours after the most recent seizure (or longest available seizure-free interval). Measure time between items 1.A and 1.B above by video review. Use the same time delay here between items 2.A. and 2.B. Again, ask the patient to remember the exact time, hour and minute “--:--” (e.g. 1:52 or 9:34) by saying to patient:

A. “Remember the time. It is --:--. Say --:--.”	Response:	Score
If at full hour (e.g. 2:00) say the time minus one minute (e.g. say “1:59” instead of “2”)	Repeats exact time correctly	5
	Says partly correct time	4
	Other words	3
	Unintelligible vocalization	2
	Orients towards examiner	1
	No response	0

During delay, ask pt to name months forwards/backwards once, then talk with them. Then say:

B. “What did I ask you to remember before?”	Fully correct time, no prompt	4
If they do not give a time, then offer prompt:	Partly correct time, no prompt	3
“I asked you to remember a time before.	Fully correct time, prompted	2
What was the time?”	Partly correct time, prompted	1
	No response, or no time	0

LEVEL 1 – 3 TESTING

Interictal testing: Perform Levels 1 and 2 and Motor Exam on patient once at baseline, at least 6 hours after the most recent seizure (or longest available seizure-free interval). Note that unlike Memory testing (above), interictal testing for Levels 1 and 2 should be done **before** ictal testing.

Ictal testing: Perform ictal Memory Testing (above) first.

Then perform Level 1-3 testing continuously throughout the ictal and postictal periods until the seizure is over (clinically and electrically) and until the patient succeeds in completing Level 1 with same score as interictal testing (within 2 points on TOTAL score for Level 1).

LEVEL 1

If scores less than 3 on any two consecutive items on Level 1 then move to Level 2

Questions/Commands:	Response:	Score:
1.1 “What’s your name?”	Full name	5
If does not give full name, follow up with	First or last only	4
What is your last/first name?	Other words	3
	Unintelligible vocalization	2
	Orients towards examiner	1
	No response	0
 1.2 “What’s the name of this place?”	 Full name of hospital	 5
	Any hospital	4
	Other words	3
	Unintelligible vocalization	2
	Orients towards examiner	1
	No response	0
 1.3 “What’s the year?”	 Correct year	 5
	Any year	4
	Other words	3
	Unintelligible vocalization	2
	Orients towards examiner	1
	No response	0
 1.4 <i>Stand directly in front of the patient and then do the following:</i>		
"Am I touching my ear right now?" (touch it)	All correct*	4
"Am I touching my nose right now?" (don't touch it)	Yes/no responses*	3
"Am I touching my nose right now?" (touch it).	Other vocalization	2
"Am I touching my ear right now?" (don't touch it).	Orients or gestures	1
(*saying yes/no, nodding, or thumbs up/down are all acceptable)	No response	0

1.5 “What do you call this?” (show a pen)	Says “pen”	4
	Says other intelligible word	3
	Unintelligible vocalization	2
	Orients or gestures	1
	No response	0
1.6 “What do you call this?” (show a watch)	Says “watch”	4
	Says other intelligible word	3
	Unintelligible vocalization	2
	Orients or gestures	1
	No response	0
1.7 “Touch your nose”	Touches nose	4
	Touches other part of face	3
	Points to other part of body	2
	Orients towards examiner	1
	No response	0
1.8 “<u>Touch</u> your <u>right ear</u> with <u>two fingers</u>”	All 5 elements correct	4
	3-4 elements correct	3
	1-2 elements correct	2
	Orients towards examiner	1
	No response	0

REPEAT LEVEL 1 TESTS until seizure is over. Then continue to repeat Level 1 in postictal period until all responses have returned to baseline (within 2 points of TOTAL interictal score).

Immediately on return to baseline, complete **Memory testing** (above) and then **Motor Exam**

MOTOR EXAM

Test items:	Response:	Score:
M.1 Hold patient’s R arm 18 inches off bed, release it and say “Hold up your arm while I count to 3: 1..2..3”	Holds up >3s	2
	Holds up <3s	1
	Drops immediately	0
M.2 Hold patient’s L arm 18 inches off bed, release it and say “Hold up your arm while I count to 3: 1..2..3”	Holds up >3s	2
	Holds up <3s	1
	Drops immediately	0
M.3 Hold patient’s R leg 18 inches off bed, release it and say “Hold up your leg while I count to 3: 1..2..3”	Holds up >3s	2
	Holds up <3s	1
	Drops immediately	0
M.4 Hold patient’s L leg 18 inches off bed, release it and say “Hold up your leg while I count to 3: 1..2..3”	Holds up >3s	2
	Holds up <3s	1
	Drops immediately	0

Describe motor responses aloud while performing testing of each limb (in case off camera)

LEVEL 2

Level 2 is done only if patient scores less than 3 on any two consecutive items on Level 1. Complete all two Level 2 items regardless of score.

Test items:	Response:	Score:
1. Place a tennis ball on <i>dorsal</i> surface of patient's hand and roll across index finger and thumb, without touching undersurface of hand. Ask patient, " Take the ball. " Test each hand one time.	Correct both sides	3
	Correct one side	2
	Ball held but dropped	1
	No response	0

A correct response meets BOTH of the following criteria:

1. The wrist must rotate and the fingers should extend as the ball is moved along the dorsal surface of the hand.
2. The ball is held without dropping it.

2. Hold a hand mirror 4-6 inches in front of patient's face and say " Look at the mirror " while moving the mirror slowly 45 degrees to the right and left of the midline.	Correct both sides	3
	Correct one side	2
	Equivocal response	1
	No response	0

Describe patient response out loud during testing e.g. "Looked left, looked right" or "Looked left, did not look right" (Note that eyes often cannot be seen on camera)

A correct response is when eyes follow the mirror for 45 degrees in one direction *without loss of fixation*.

If scores 2 or better on ANY Level 2 items then proceed to Level 1.

If scores 0-1 on ALL items in Level 2 then proceed to Level 3.

LEVEL 3

Level 3 is only done if patient scores 0-1 on ALL items of Level 2.

Test items:	Response:	Score:
1. Present visual threat by passing finger 1 inch in front of patient's right and then left eye. Do not touch eyelashes or create breeze.	Correct both sides	2
	Correct one side	1
	No response	0

Describe patient response out loud during testing e.g. "Blinked left, blinked right" or "Blinked left, did not blink right" (Note that eyes often cannot be seen on camera)

Correct response is eyelid flutter or blink.

2. Apply pressure to nailbed (press handle of reflex hammer on cuticle for 2 seconds). One trial for each hand.	Localizes	4
	Withdraws	3
	Postures	2
	Winces or vocalizes	1
	No response	0

NOTE: ITEM 2 (nail pressure) SHOULD ONLY BE DONE ONCE AT MOST PER SZ

Describe patient response out loud during testing e.g. "Moved left, moved right" or "Moved left, did not move right" (Note that hands might not be seen on camera)

Localizes = a non-stimulated limb must locate and make contact with point of stimulus

Withdraws = isolated non-stereotyped flexion withdrawal of limb away from stimulus

Postures = stereotyped flexion or extension posturing

Best of above responses to *ANY* extremity is used for score.

PROCEED TO LEVEL 2

Analysis by Seizure and Analysis by Patient

Since we often found the level of responsiveness to be very different among seizures within the same patient, we felt it was more appropriate to include all seizures as separate data points in group analyses in the paper (“Analysis by Seizure” below). For comparison, where possible we also repeated the statistical analyses by first pooling the average results within each patient and then treating each patient as an individual data point (“Analysis by Patient” below).

Here we provide both Analysis by Seizure and Analysis by Patient for comparison for each of the major results found in the paper.

Initial ictal impairment in partial seizures

Scores of the three items (Memory A, Item 1.1 and Item 1.2) were highly correlated with each other.

Analysis by Seizure:

Memory A vs Item 1.1, $r=0.681$, $P<0.001$; Item 1.1 vs Item 1.2, $r=0.935$, $P<0.001$; Memory A vs Item 1.2, $r=0.711$, $P<0.001$

Analysis by Patient:

Memory A vs Item 1.1, $r=0.809$, $P<0.001$; Item 1.1 vs Item 1.2, $r=0.865$, $P<0.001$; Memory A vs Item 1.2, $r=0.842$, $P<0.001$

The number of seizures with and without EEG changes between Item 1.1=5 and Item 1.1=0 groups were significantly different.

Analysis by Seizure:

Chi-square = 13.07, $p = 0.005$

Analysis by Patient:

Chi-square analysis was not feasible since most patients had seizures both with and without EEG changes so patients could not be logically placed in either category.

Later ictal impairment in partial seizures

The lowest consciousness score had a negative correlation with seizure duration.

Analysis by Seizure:

$r=-0.558$, $p<0.001$

Analysis by Patient

$r=-0.095$, $p<0.770$

Note: since lowest consciousness score and durations varied widely from seizure to seizure within individual patients, correlation analysis across patients is not the most logical approach.

The lowest consciousness scores of seizures with EEG changes was significantly lower compared to those without EEG changes.

Analysis by Seizure:

With EEG changes, 0.49 ± 0.06 ; without EEG changes, 0.997 ± 0.003 ($t= 3.884$, $p<0.001$, two-tailed t-test)

Analysis by Patient:

Again, this analysis was not feasible since most patients had seizures both with and without EEG changes, so patients could not be logically placed in either category.

Seizures showing fully impaired function on Item 1.1 (score = 0) had mean lowest consciousness scores that were significantly lower than in seizures with initially spared function (Item 1.1 score = 5).

Analysis by Seizure:

Seizures showing fully impaired function on Item 1.1 (score = 0) had a mean lowest consciousness score of 0.27 ± 0.02 . Seizures with initially spared function (Item 1.1 score =5) had a mean lowest consciousness score of 0.90 ± 0.06 ($t=8.518$, $p<0.001$, two-tailed t-test).

Analysis by Patient:

This analysis could only be performed on the small subset of patients who had consistent scores of either 0 or 5 on Item 1.1 for all seizures ($n = 4$ for each group).

Patients showing fully impaired function on Item 1.1 (score = 0) had a mean lowest consciousness score of 0.27 ± 0.04 . Patients with initially spared function (Item 1.1 score = 5) had a mean lowest consciousness score of 0.88 ± 0.04 ($t=9.831$, $p<0.001$, two-tailed t-test).

Postictal recovery time

Recovery time in partial seizures had a significant negative correlation with lowest consciousness score.

Analysis by Seizure:

$r=-0.504$, $p=0.003$

Analysis by Patient:

$r=-0.701$, $p=0.024$

RES memory performance

Ictal Memory A was significantly lower than interictal Memory A.

Analysis by Seizure:

Ictal Memory A = 0.60 ± 0.06 , interictal Memory A = 1.00 ± 0.00 ($t=3.029$, $p=0.010$, two-tailed paired t-test)

Analysis by Patient:

Ictal Memory A = 0.60 ± 0.15 , interictal Memory A = 1.00 ± 0.00 ($t=2.558$, $p=0.034$, two-tailed paired t-test)

Ictal Memory A scores for seizures with initial severe impairment on RES (Item 1.1=0) was lower than Memory A scores for seizures with Item 1.1=5.

Analysis by Seizure:

Ictal Memory A scores for seizures with initial severe impairment on RES (Item 1.1=0) averaged 0.26 ± 0.11 ; this was lower than Memory A scores for seizures with Item 1.1=5, which had average scores of 0.91 ± 0.07 ($t=5.312$, $p<0.001$, two-tailed t-test).

Analysis by Patient:

Ictal Memory A scores for seizures with initial severe impairment on RES (Item 1.1=0) averaged 0.20 ± 0.11 ; this was lower than Memory A scores for seizures with Item 1.1=5, which had average scores of 0.95 ± 0.05 ($t=6.301$, $p<0.001$, two-tailed t-test).