



## CAUTION: False Positives in Polio Survivors with Post-Polio Sequelae Who Are Given Mental Status Examinations.

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In our 38+ years of studying and treating more than 6,000 polio survivors, the most prominent and disabling Post-Polio Sequelae is **fatigue**. This fatigue is not just physical but what polio survivors describe as "brain fatigue." In the 1990 International Post-Polio Survey, between 70% and 96% of respondents having fatigue also reported difficulty with *concentration, focusing attention, mind wandering, memory, thinking quickly* and *word finding*; 77% reporting moderate to severe difficulty with these cognitive tasks (1). Importantly, these reported impairments were seen in polio survivors in their 40s and never were associated with dementia.

**LABORATORY FINDINGS:** Our studies have uncovered a relationship between fatigue, impairment of brain activation and cognitive symptoms:

- 1) Subjects reporting severe fatigue and word finding difficulty had clinically abnormal or significantly lower Animal Naming Test scores as compared to subjects with mild fatigue (2);
- 2) Slowed performance on the most difficult tests of attention and information processing speed were associated with lower scores on word finding tests (3);
- 3) A significant inverse relationship between Animal Naming Test scores and plasma prolactin suggests that a reduction in brain dopamine secretion is related to impaired naming ability and support decreased dopamine secretion, possibly secondary to poliovirus damage to the basal ganglia, underlying not only fatigue and impaired attention but also word finding difficulty (4).
- 4) Polio survivors report a "tip-of-the-tongue" phenomenon characterized by difficulty naming familiar objects and people (sometimes even family members), difficulty that increases as fatigue worsens (5). This complaint is similar to that in Parkinson's disease patients who also report "tip-of-the-tongue" word finding difficulty well as "excessive" and sometimes disabling fatigue. Parkinson's patients and polio survivors are similar in that both have damage to dopamine producing neurons.

**CLINICAL IMPLICATIONS:** The association between subjective and measured impairment of cognitive functions with "brain fatigue" supports the hypothesis that symptoms of post-polio brain fatigue are related to a decrease in dopamine release, causing a reduction in brain activation, and are **not** symptoms dementia (1-4). Therefore, administration of in-office mental status testing (such as the Mini-Mental State Examination) to polio survivors may **artificially reduce** polio survivors' scores and unnecessarily frighten them with the possibility of having dementia. Any decreased mental status examination test scores on items where concentration and word finding are required (e.g., MMSE items 2, 4, 5, 6, 10) should be reported with caveats including the patients' subjective level of fatigue during testing, time of day, their history of subjective concentration and word finding difficulties and whether they experienced the "tip-of-the-tongue" phenomenon during testing.

## REFERENCES

1. Bruno, R.L., et al. (1991). Polioencephalitis, stress and the etiology of Post-Polio Sequelae. *Orthopedics*; 14: 1269-1276.
2. Bruno, R.L., Zimmerman, J.R. (2000). Word finding difficulty as a Post-Polio Sequelae. *American Journal of Physical Medicine and Rehabilitation*; 79: 343-348.
3. Bruno, R.L., et al. (1995). The pathophysiology of a central cause of postpolio fatigue. *Annals of the New York Academy of Sciences*; 753: 257-275.
4. Bruno, R.L., et al. (1996). Polioencephalitis and the Brain Fatigue Generator model of post-viral fatigue syndromes. *Journal of Chronic Fatigue Syndrome*; 2: 5-27.
5. Mayeux, R., Matison, R., & Rosen, J. (1981). Tip-of-the tongue anomia in Parkinson's Disease. *Neurology*; 31: 102.

## MMSE Example -


# Mini-Mental State Examination (MMSE)

Patient's Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Instructions: Ask the questions in the order listed.**

**Score one point for each correct response within each question or activity.**

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day of the week? Month?"
5		"Where are we now: State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible. Number of trials: _____
5		"I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, ...) Stop after five answers. Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.)  <div style="text-align: center;">  </div>
30		<b>TOTAL</b>