

Folstein M F, Folstein S E & McHugh P R. "Mini-Mental State": a practical method for grading the cognitive state of patients for the clinician. *J. Psychiat. Res.* 12:189-98, 1975.

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Cognition is impaired in many psychiatric disorders. The Mini-Mental State (MMS) Examination is a quantitated brief practical screening battery for the assessment of cognition by clinicians. The examination assesses orientation, memory, concentration, language, and motor skills. Test-retest and interrater reliability are high. It significantly correlates with the Wechsler intelligence scales. Cognitively impaired diagnostic groups scored lower than others. Scores improved as cognition improved with treatment. The MMS Examination is a reliable and valid brief cognitive battery suitable for clinical use. [The *SC7*® and *SSC7*® indicate that this paper has been cited in over 1,205 publications, making it the most-cited paper published in this journal.]

The Birth of the MMS

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November 7, 1989

The cognitive aspects of the mental state examination were first taught to me by Dr. Maurice Victor and his faculty in the Department of Neurology at the Cleveland Metropolitan General Hospital. Victor and Dr. Simon Horenstein particularly were interested in mental phenomena and conducted thorough mental state examinations at the bedside. They had been trained by Denny-Brown to quantify the sensory and motor examination, but, for them, quantification of the cognitive state was reserved for formal psychological testing.

At the New York Hospital-Westchester Division (NYH-WD), Victor's method for assessing the cognitive state was reinforced by Paul R. McHugh, the clinical director at NYH-WD and my teacher of psychiatry. In 1970 NYH-WD cared for patients who remained for long periods and could be tested on many occasions. Three wards of geriatric patients eventually came under my care. It was on these wards that the Mini-Mental State (MMS) Examination was born to Susan E. Folstein and me, with McHugh as the obstetrician. Here is the story of its conception and birth; there has been little subsequent development.

In 1972 Susan was pregnant with our first child and was a second-year resident in psychiatry at NYH-WD. On morning walk rounds, I would ask her to report on the patients' mental states. Her reports

were accurate and concise concerning vital signs and the presence or absence of delusions, hallucinations, and depression. However, the cognitive state was not systematically or quantitatively reported. I was always asking for more information. Finally, she said, "Just write down the way you want it." That night we conceived the MMS Examination.

I included those items that had been clinically useful to me and that could be scored with little interpretation. The weighting of the scores was completely intuitive. We had no grant, no training in psychometrics or statistics, no power analysis, and no factor analysis—just the confidence of youth. On many occasions I have been reminded that the MMS is uninterpretable because it includes heterogeneous factors, has ceiling and floor effects, and is too insensitive. All of these criticisms are correct, but the test works.

The process was simple. Susan used the MMS on the ward over the next week, and we saw that the scores had clinical utility. We tested stable patients several times and found that the test score stayed the same; we tested patients recovering from delirium and found that the MMS scores improved with the mental state. When she was tired of collecting data, we began to try to analyze them. Dr. Armand Loring showed me J.P. Guilford's *Psychometric Methods*,¹ which explained reliability, validity, and the correlation coefficient. We then took our data to the Bourne Laboratory, where McHugh and Gerry Smith had one of the first Hewlett Packard programmable calculators. Only after the work was completed did we review the literature. Unfortunately, we did not note the similarity of some of the MMS items to M. Roth's text,² and this is a good time to acknowledge it. We presented a very rough draft of our conceived composition to McHugh for delivery. He put it into English and pointed out the significance of what we had done. After many drafts, we sent it to one of the few American psychiatric journals that was, at that time, devoted to research, the *Journal of Psychiatric Research*. Fortunately, the reviewers instructed us to add interrater reliability.

It continues to amaze us that the particular combination of items in the MMS, conceived in one night, is so useful to clinicians and epidemiologists in many countries.³ Other similar cognitive batteries have been published; the only difference between them and the MMS is the inclusion of a few lines to tap language and praxis. One possible reason for its popularity is that it is free. When discussing the possibility of copyright, McHugh said, "That would be like copyrighting the Babinski sign." But we should at least have recovered the cost of reprints!

1. Guilford J P. *Psychometric methods*. New York: McGraw-Hill, 1936. (Cited 370 times since 1945.)
2. Blessed G, Tomlinson B E & Roth M. The association between quantitative measures of dementia and degenerative changes in the cerebral grey matter of elderly subjects. *Brit. J. Psychiat.* 114:797, 1968. (Cited 745 times.)
3. Jongbloed L, Stacey S & Brighton C. Stroke rehabilitation: sensorimotor integrative treatment versus functional treatment. *Amer. J. Occup. Ther.* 43:391-7, 1989.

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