CHRIS Study

Neurological tests – Mini Mental State Examination

Version 1.1

24th April 2024

Authors: LB, MG

1. Introduction

This module stores results of the cognitive test Mini Mental State Examination (MMSE), part of the neurological tests set that were performed at the CHRIS study center.

Participants book a morning appointment at the CHRIS study center, ranging from 7.45 to 8.45 a.m. Each study participant is assigned a workflow at the reception. If there are ten study participants (maximum capacity), there are ten different workflows, marked with the letters from "A" to "K". The current workflow is as follows: A-B-C-D-E-F-G-H-I-K. All the workflows can be found in the documentation of CHRIS Baseline/General information/Administrative data, in the file named "Workflows at baseline assessment". The neurological tests set occurs always right after the interview and it is executed from the same operator conducting the interview.

The MMSE was developed to assess the cognitive state in a timely and concise manner, especially among elderly patients. The MMSE is divided into two parts, the first with oral questions on orientation, memory, and attention, with a maximum score of 21, the second part assesses the ability to name, follow instructions, write a grammatically correct sentence spontaneously, and copy a complex polygon, with a maximum score of nine. Since listening, reading, and writing capabilities are involved, patients with severely impaired hearing or vision may encounter extra difficulty that can be eased when feasible and allowed for in the scoring. If the item could not be performed due to a physical disability, the question was answered as "Not evaluable". The maximum total score is 30.

The first proposed cutoff to detect the presence of cognitive impairment was 24, then other versions with cutoffs specific for the education level were also suggested. German and Italian version of the test were already validated.

The MMSE questionnaire and the instruction for its administration are available at CHRIS Baseline/Neurological tests/Mini Mental State Examination (MMSE) and online (see References section).

2. History version changes

This cognitive test was in use since September 1st, 2014 and no version change occurred.

The cleaning process added the variables x0mm32 and x0mm33 on the total score and number of valid responses, respectively.

3. Data cleaning

1. The main CHRIS dataset was loaded.
2. Observations of the notes variable x0mmnote that regarded the olfactory test were shifted to the variable x0oln1.
3. If in the notes variable x0mmnote language problems or interruption of the test were reported, the observations of x0mm01-x0mm30 were set to "Unexpected missing" (-89) if they were "Not evaluable".
4. If instead the problems reported in x0mmnote were related to cognitive impairment, the observations of x0mm01-x0mm30 were set to "False" if they were "Not evaluable".

5. In case of refusal to perform a task, the observations of x0mm01-x0mm30 were set to “Prefer not to answer” (-87) if they were “Not evaluable”.
6. All the MMSE test variables, x0mm01-x0mm30, had their missing observations transformed into:
    a) “Not in use” (-98) if the participation occurred before the MMSE introduction on September 1st, 2014,
    b) “Unexpected missing” (-89) otherwise.
7. The number of valid responses (i.e. either “True” or “False”) between x0mm01-x0mm30 was computed and stored as x0mm33.
8. The sum of the true responses was then computed and stored as x0mm32. Such variable represents the MMSE total score.
9. The variable storing the notes additional information on the MMSE execution, x0mmnote, was translated and categorized when possible.
10. The baseline dataset was saved.

4. Advices for the analysis

The content of the nurse’s notes includes information on speech problems, writing difficulties, dyslexia, or refusal to run specific tasks, that did not fit in the available questions or needed a longer explanation.

Additional reports of cognitive or language problems are reported in the general interview notes variable x0_noteint.

Finally, the analyst should always take into account that the operator in charge of carrying out the neurological tests might have influenced how the participant reported their answers. The analyst should therefore adjust for the operator variable, x0_optestc, when possible.

5. References

Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res. 1975 Nov;12(3):189-198.

Franco-Marina F, García-González J, Wagner-Echeagaray F, Gallo J, Ugalde O, Sánchez-García S, García-Peña C. The Mini-mental State Examination revisited: Ceiling and floor effects after score adjustment for educational level in an aging Mexican population. *International Psychogeriatrics,* 2010, *22*(1), 72-81. DOI: 10.1017/S1041610209990822

Kukull WA, Larson EB, Teri L, Bowen J, McCormick W, Pfanschmidt ML. The mini-mental state examination score and the clinical diagnosis of dementia, Journal of Clinical Epidemiology, 1994; 47(9): 1061-1067. DOI: 10.1016/0895-4356(94)90122-8

Kochhann R, Varela JS, Lisboa CSM, Chaves MLF. The Mini Mental State Examination: Review of cutoff points adjusted for schooling in a large Southern Brazilian sample. Dement Neuropsychol, 2010 Jan-Mar; 4(1):35-41. DOI: 10.1590/S1980-57642010DN40100006

Metitieri T, Geroldi C, Pezzini A, Frisoni GB, Bianchetti A, Trabucchi M. The Itel-MMSE: an Italian telephone version of the Mini-Mental State Examination. International Journal of Geriatric Psychiatry, 2001; 16(2):166-167. DOI: 10.1002/1099-1166(200102)16:2<166::AID-GPS290>3.0.CO;2-M

MMSE manual and German text: https://docplayer.org/115626264-Mini-mental-status-exam.html

MMSE Italian text: https://corsi.unibs.it/sites/cdl/files/2021-07/MINI_MENTAL_STATE_EXAMINATIONfkt.pdf

MMSE scoring guidelines and MMSE English text: https://www.psychdb.com/cognitive-testing/mmse