

Cognitive test performance documentation MoBa Brain Health *Memoro Object Location Memory*

First and second-generation participants aged 16 years and older were invited to participate in the MoBa Brain Health Study November 2022 through February 2023.

The Norwegian Mother, Father and Child Cohort Study
(MoBa)

Version	Date	Performed by	Description
1.0	09.04.2026	Asta Håberg Tor Ivar Hansen	Original version

Instrument

1. Name of original instrument:

Memoro Object Location Memory

2. Description of original scale or selection of items used

Object location test modified from Silvermann and Eels (1002) and Evensmoen et al. (2015 and 2021). Participants are presented with a black frame around a white square with ten color drawings of living and nonliving everyday objects for 90 seconds. The objects are removed from the square and positioned below it. The participant is instructed to move the objects back to their original position. All objects need to be positioned within the square before the task is completed.

Variables:

*Obj_Loc_ImmRec_CorrectObjects: number of correctly positioned objects immediately after stimulus presentation

Obj_Loc_ImmRecall_SquaredError_transformed: total error of positioning of the objects squared after taking scaling, translation and rotation into account

* Primary variable

Metadata for this test is the automatically generated response object that contains all individual responses and their respective time stamps and data.

Sample metadata for a single response:

```
{"top":138,"left":51,"type":"input","trial":1,"deltaX":-4,"deltaY":-262,"element":"2","deltaTime":3932,"positions":[{"top":400,"left":20,"object":1}, {"top":138,"left":51,"object":2}, {"top":400,"left":610,"object":3}, {"top":400,"left":195,"object":4}, {"top":400,"left":270,"object":5}, {"top":400,"left":330,"object":17}, {"top":2,"left":88,"object":7}, {"top":400,"left":470,"object":8}, {"top":400,"left":540,"object":9}, {"top":400,"left":120,"object":10}], "timestamp":1666095392770,"pointerType":"mouse"}
```

3. Rationale for choosing the instrument:

Quick object location memory test without ceiling effect

4. Modifications:

NA

5. References

Evensmoen HR, Ladstein J, Hansen TI, Mølller JA, Witter MP, Nadel L, Håberg AK (2015). From details to large-scale: the representation of environmental positions follows a granularity gradient along the human hippocampal and entorhinal anterior-posterior axis. *Hippocampus* 1: 119-35

Evensmoen HR, Rimol LM, Winkler AM, Betzel R, Hansen TI, Nili H, Håberg A (2021). Allocentric representation in the human amygdala and ventral visual stream. *Cell Rep* 34(3):108658. doi: 10.1016/j.celrep.2020.108658.

Silverman and Eals (1992). Sex differences in spatial abilities: Evolutionary theory and data. J.H Barkow, L Cosmides, J Tooby (Eds.), *The Adapted Mind*, Oxford, New York, pp. 533-549