Concepts of multilevel, longitudinal, and mixed models: Group 3

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1 Introduction

The data set results from a longitudinal observational study, the aim of which is to study the post-operative evolution of the cognitive status of elderly hipfracture patients and their pre-operative cognitive status, and to study the effects of housing situation and age on these evolutions. The physical ability is measured using the MMSE (Mini Mental State Examination) score, with values between 0 and 30, where low values correspond to a bad cognitive condition, while high scores correspond to high cognitive condition of the patient. The pre-operative cognitive status is measured through the so-called 'neuro-status' which is a binary indicator for being neuro-psychiatric.

- id: patient identification number
- age: age of the patient at entry
- neuro: neuro-psychiatric status of the patient (1: neuro-psychiatric, 0: not neuro-psychiatric)
- mmse: MMSE score
- time: day after operation at which the MMSE score has been measured (1, 3, 5, 8, or 12)
- housing: the housing situation prior to the hip fracture (1: alone, 2: with family or partner, 3: nursing home)

2 Data exploration

Considering the completeness of the data, it can be observed that 5 persons' housing situation is unknown. Additionally, there was some dropout over time as show in Table 1. The column "Nb" shows the number of respondent at each time instance. The column "Return" shows the number of respondents that participated at time t while they did not participate at time $t-1$; there is, for instance, one respondent that did not participate at $time = 1$ while he did participate at $time = 3$. The column "Dropout" shows the number of respondents that did not participate at time t while they did participate at time $t-1$. It can be seen than many drop out at $time = 12$. The other columns show how the patient characteristics change over time as patients are added or lost from the study. Overall, there is not much variation which might indicate that the dropout of patients is not related to MMSE or patient characteristics. We will thus assume dropout is completely random.

Table 1: Dropout and patient characteristics over time.

Time	Nb	Return	Dropout	Mean age	% neuro-psychiatric	Housing			
						%alone	%family/ partner	%nursing home	%NA
1	58	0	0	78.71	31.03	29.31	39.66	22.41	8.62
3	57	1	2	78.18	33.33	29.82	38.60	22.81	8.77
5	59	2	0	78.59	32.20	28.81	38.98	23.73	8.47
8	52	0	7	77.88	30.77	28.85	36.54	25.00	9.62
12	38	0	14	77.82	28.95	31.58	34.21	23.68	10.53

Figure 1 shows the average evolution of MMSE over time (Loess curves) for groups of patients with different housing and/or neuro-psychiatric status. Patients that are not neuro-psychiatric seem to have higherMMSE that stays reasonably constant over time (except for nursing home patients). MMSE seems to go up over time for nursing home patients (but they are the smallest group), and down for neuro-spychiatric patients that live with their family or partner (or unknown housing). MMSE for neuro-psychiatric patients that live alone might have a quadratic evolution over time.

Figure 2 shows all patient profiles. There is quite a lot of variation between the patients' evolution. The non-psychiatric patients are also under-represented (except in the nursing home group).

The last variable that is explored, is the age. The loess curves in Figure 3 show that age might be negatively correlated with MMSE.

3 Methodology and results

4 Conclusion

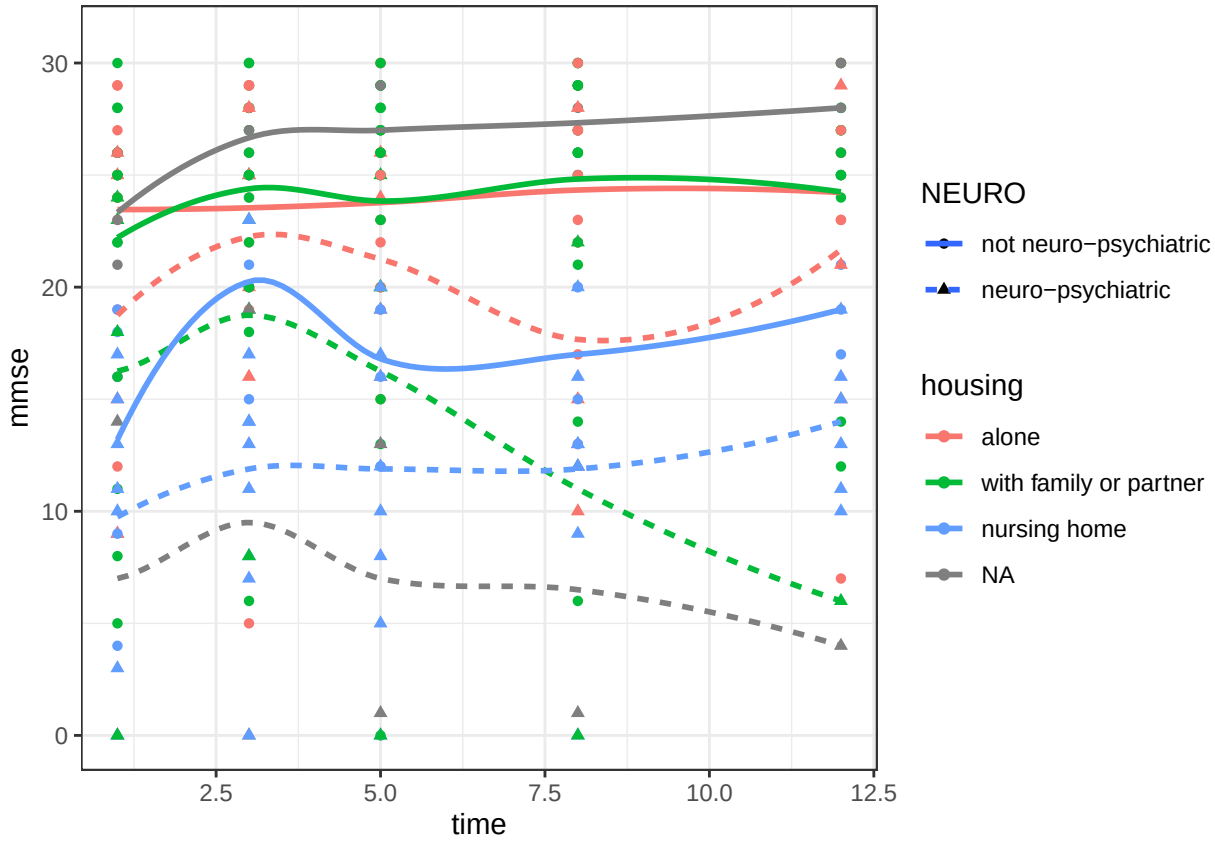

Figure 1: MMSE over time for all patient profiles, including smoothed curves.

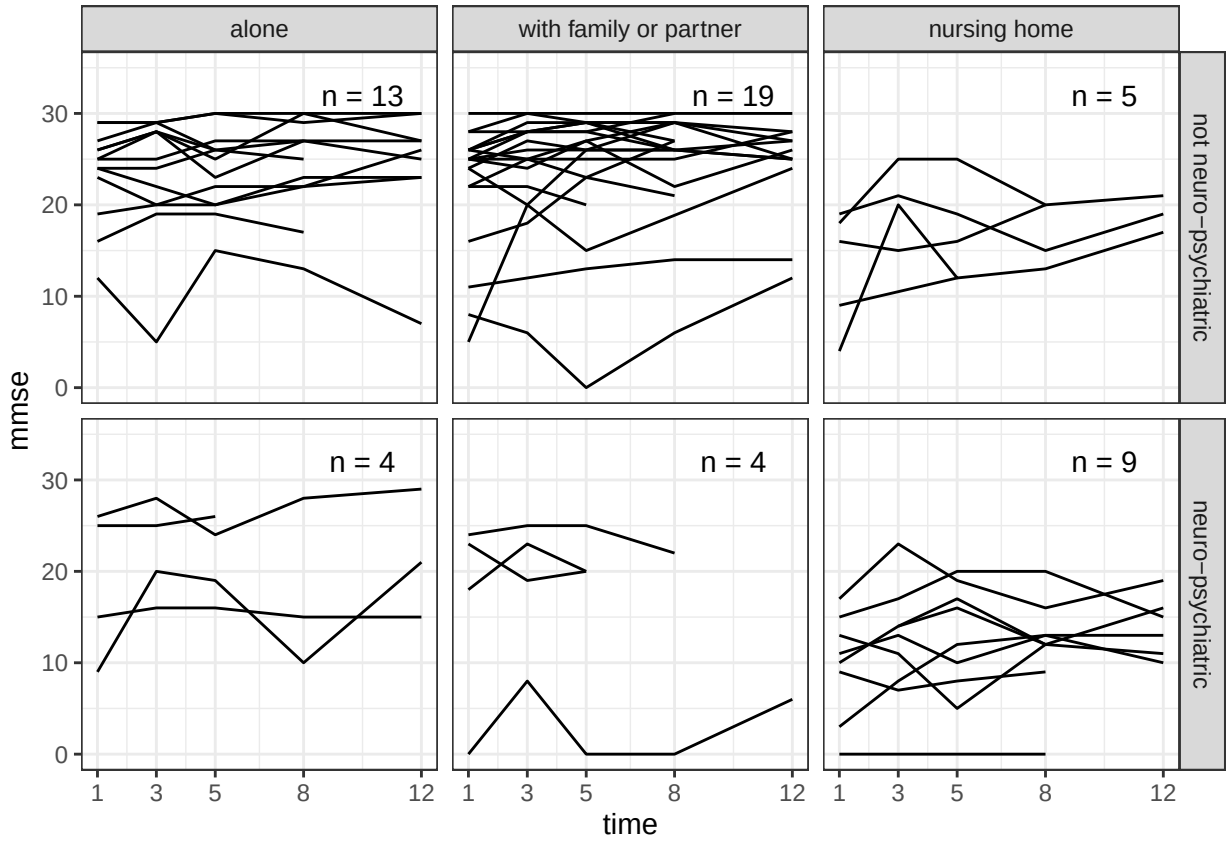

Figure 2: Patient profiles of MMSE over time.

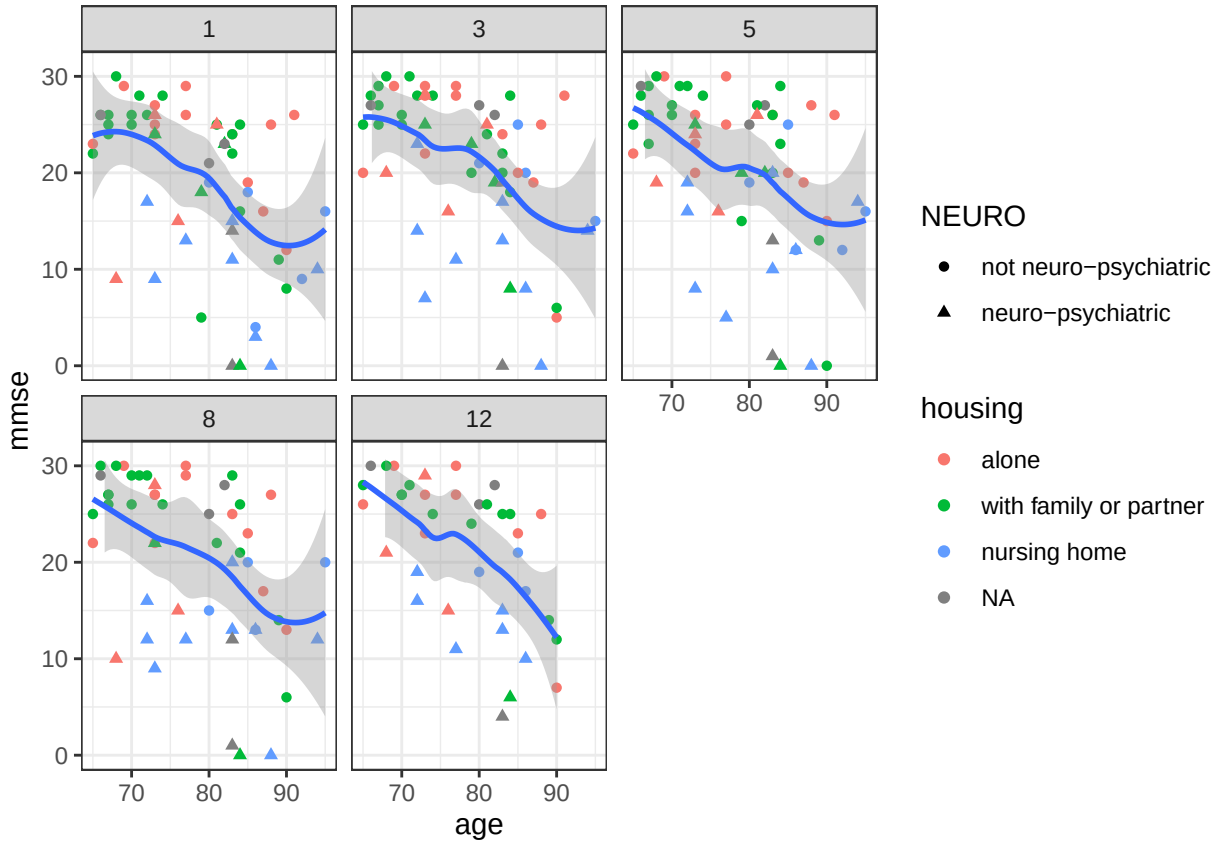

Figure 3: MMSE versus age. Facets show the time instances.