

Toward an optimal sequence duration

Purpose

Evaluate links between overall quality of resting-state ASL and duration of acquisition (DOA):

- Is the longer the better ?
- Existence of an optimal duration ?
- Subject-level analysis

As the default mode network (DMN) characterizes resting-state, we assume DMN quality evolution over time defines quite well the quality of a resting-state acquisition over time. Hence we evaluate subjects DMN overlap with a reference over time.

Dataset

- 7 right-handed healthy male subjects (21-28 y.o.)
- Sequence : **24min30s**, 420vol., TR=3,5s, PLD=1,250s

The ASL time series are split in 46 parts of various durations from 2min to 24min30s with a step of 30s. Each of the 7x46 obtained sub-series are **independently** processed with the **same** typical preprocessing steps [1]

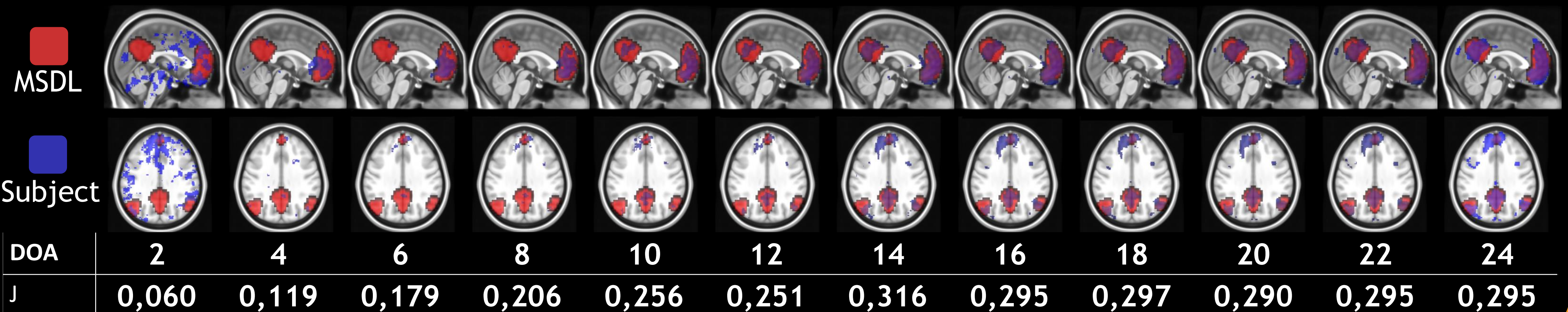
Methods I - Getting DMNs

- Seed-based analysis with a prefrontal cortex seed to exhibit the DMN
- Implies $7 \times 46 = 322$ $rmaps_{doa,subj}$ of correlation
- We use $o(2)$ -FDCR estimator $\hat{r}_{adj.} = \hat{r} \left(\frac{1-\hat{r}}{2n} \right)$ as $\hat{r}_{adj.}$ bias is supposed negligible for the given n volumes
- We test positive correlation at 1% FWER-corrected

Methods II - Evaluation

- We compute Jaccard's index $J_{doa,subj}$ (overlap) between tested $rmaps_{doa,subj}$ and a reference DMN (from MSDL [2])
- 7 J_{subj} and a global J is computed for all DOA with non-parametric local regression LOESS
- We evaluate a **tendency over time**

Example with subject FEC

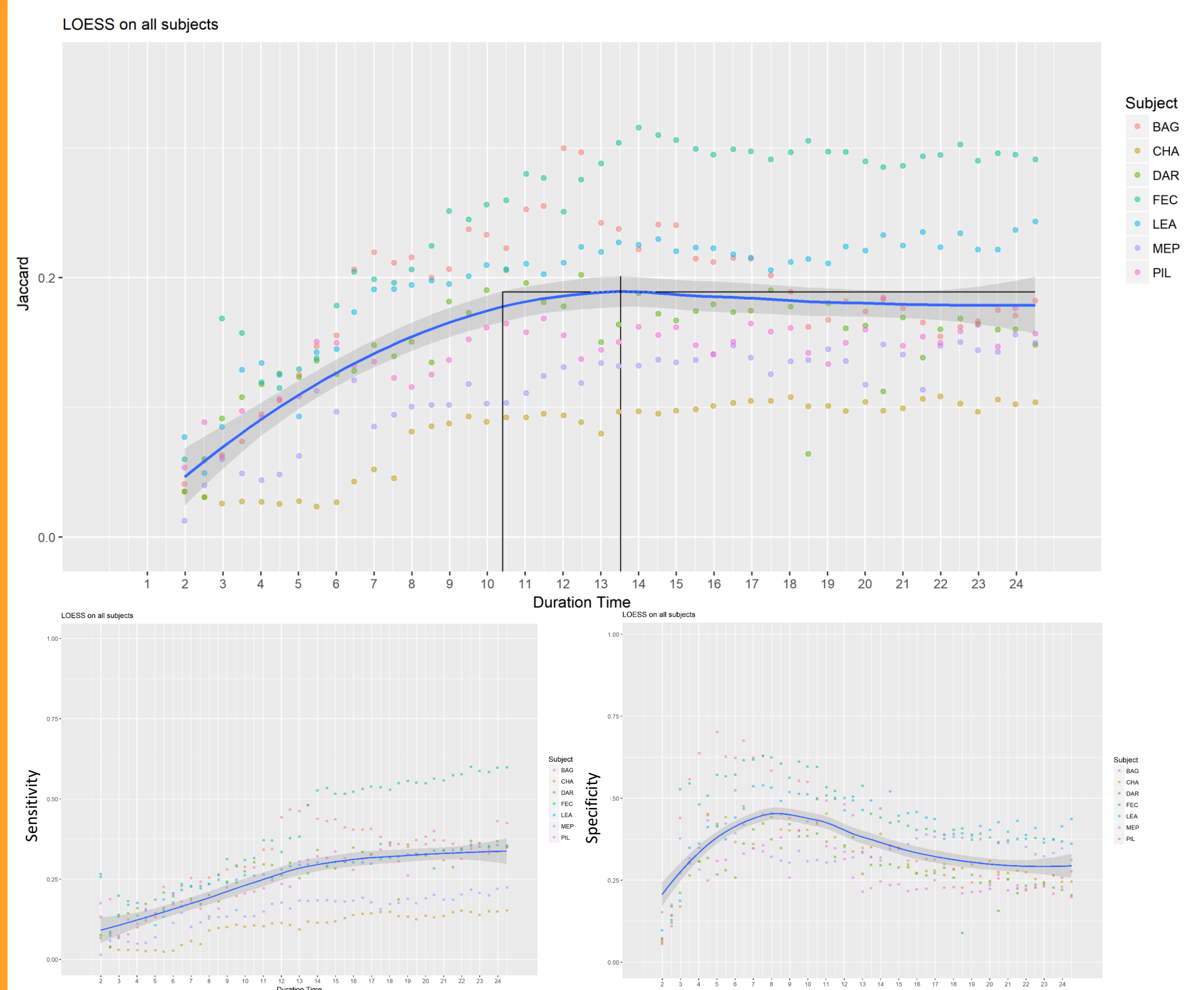


Conclusion

Quality of resting-state ASL seems to increase over time then stabilize after 10min of acquisition. To confirm our results, we plan to explore the behavior of other networks the same way.

Furthermore, many factors like parameters of the sequence (especially the TR and the PLD) or the reference choice could influence the minimal DOA to reach maximal acquisition quality.

Results



- Every J_{subj} increases until around 10-14min and then they stabilize except :
 - Subject MEP J_{mep} only increases over time
 - Subject BAG J_{bag} increases until 12min, and then decreases
- Considering the LOESS on $J_{doa,subj}$, J reaches its maximum at 13min30s but on average, J is not significantly different from 10min30s to the longest duration of 24min30s