Quality control for the FDG-PET studies in patients with disorders of consciousness

CSG PET workshop

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Data quality checks - PET acquisition

- Confounding factors
  - Blood sugar / Glycemia
    - Should be < 120
  - Arousal
    - Patient should be awake
  - Least possible stimulation during glucose uptake
    - Lights off, no stimulation unless sleeping
  - Neural inflammation might bias glucose uptake

- Should be assured by following a proper protocol! → Estelle

Boullaard et al., 2009

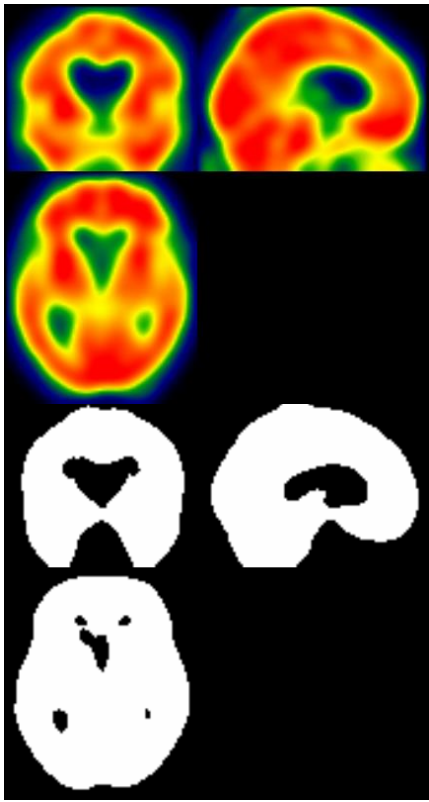
Data quality checks – PET data analysis

- Single subject analysis
  - Healthy Control group
    - Larger is better (>20 subjects)
    - On the same scanner
  - Bad segmentation could bias SPM maps
    - For single subject analysis it is sometimes unavoidable
      - Will underestimate hypometabolic areas

- Group analysis
  - Healthy Control group
  - Subjects with bad masks/segmentation should be excluded

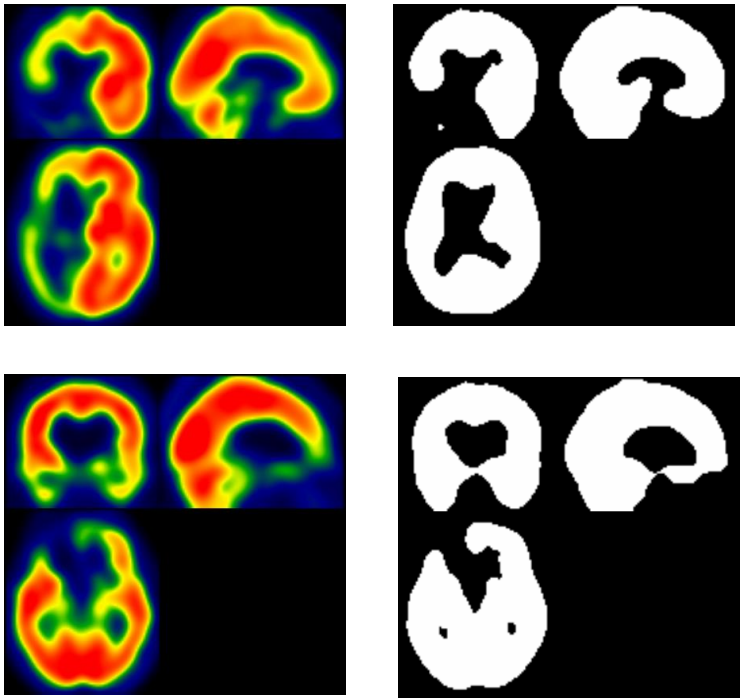
Raw data

Mask



Bad segmentation

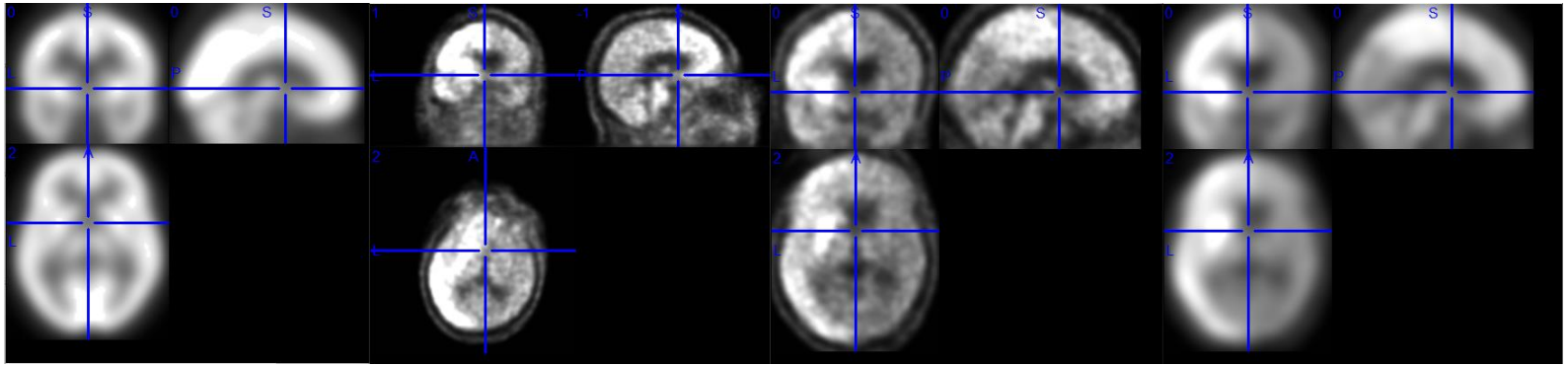
Raw data



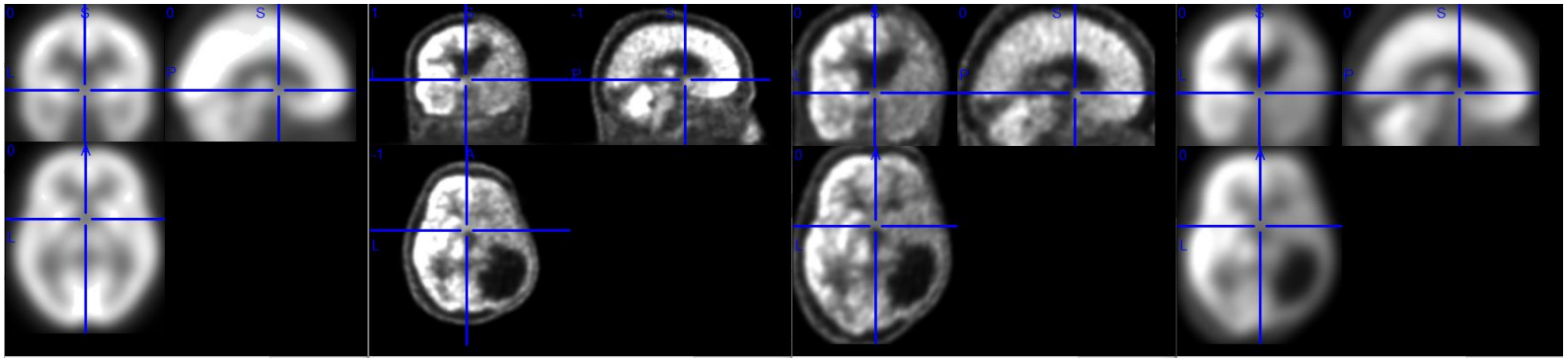
Mask

Bad normalization

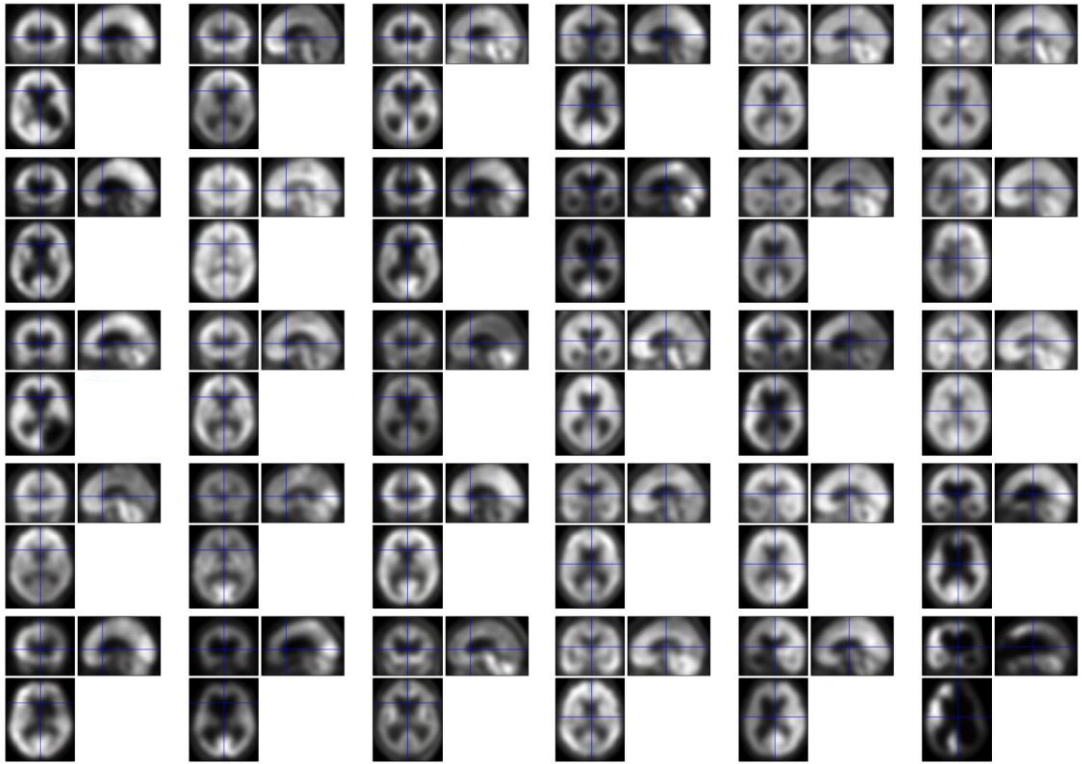
Template | PET Image (native space) | Normalized PET image (w) | Smoothed PET image (sw)



Template | PET Image (native space) | Normalized PET image (w) | Smoothed PET image (sw)



Bad normalization



Importance of good segmentation - group analysis

- After fitting your model evaluate:
  1. Mask image = voxels actually considered
     - it should look like the brain volume
  2. RPV image = independent "resolution element"
     - it should be relatively smooth in the brain tissue, except in some specific places, e.g. ventricles or brainstem
  3. the ESS image = unexplained variance in the model
     - model should fit in the brain

- Lesion/heterogeneous images negatively affect the GLM, as the model may not be fitting there
  - Leads to: large extent with lots of unexplained signal and inflated smoothness estimates

- Consult experienced SPM user or developer for help.

  Big thanks to **Dr. Christophe Phillips & Dr. Mohamed Ali Bahri**!

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Thank you for your attention.

Questions?

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