6 High field single subject brain mapping of pelvic floor motor control. A 7-Tesla fMRI study

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Groenendijk I.M. [1], Luijten S. [1], Van Der Zwaag W. [2], Holstege J.C [3], Scheepe J. [1], De Zeeuw C. [4], Blok B. [1]

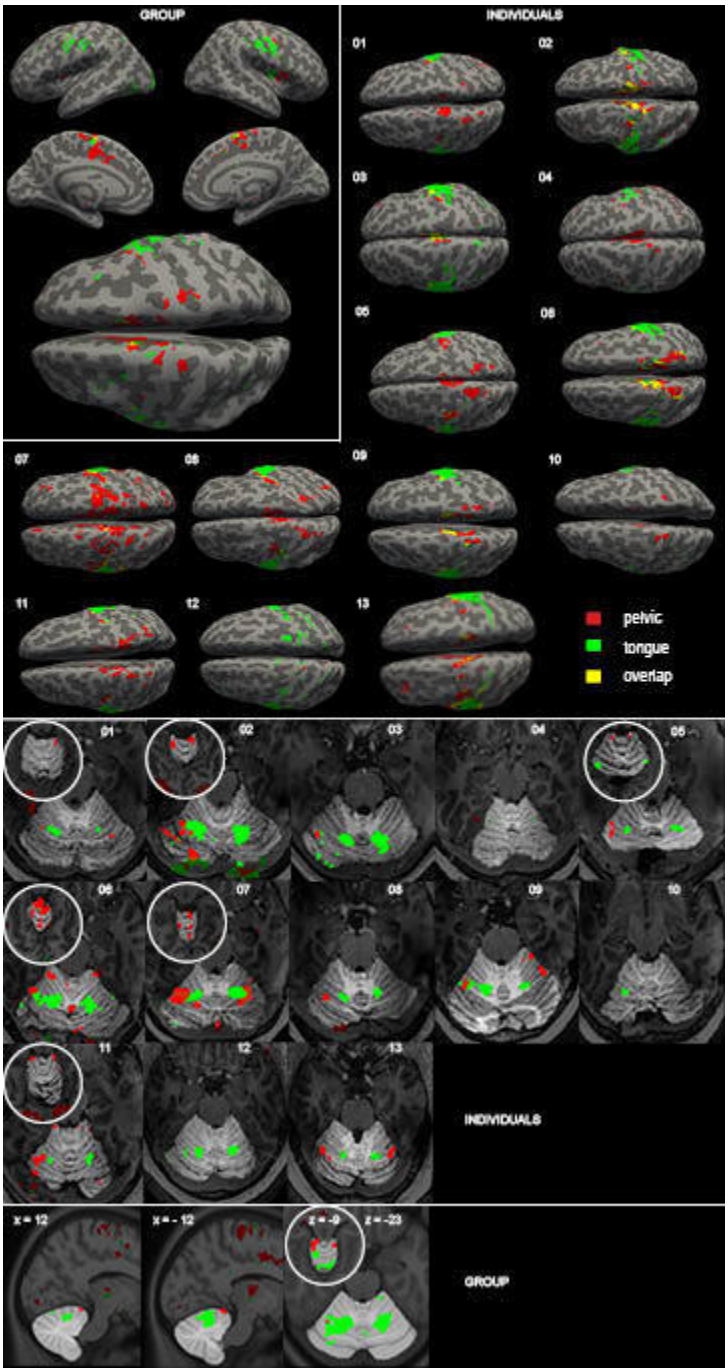
[1]Erasmus Medical Center, Dept. of Urology, Rotterdam, The Netherlands, [2]Spinoza Center for Neuroimaging, Dept. of Neuroimaging, Amsterdam, The Netherlands, [3]Erasmus Medical Center, Dept. of Neuroscience, Rotterdam, The Netherlands, [4]Netherlands Institute for Neuroscience, Dept. of Neuroscience, Amsterdam, The Netherlands

Introduction & Objectives: Pelvic floor disorders are highly prevalent in both men and women and the pathophysiology is in many cases still being explored. Evidence suggest that dysfunction of the nervous system may play an important role. The central innervation of the pelvic floor has been investigated extensively using PET, 1.5T and 3T fMRI. These techniques require group analysis which makes them less applicable in individuals. High resolution 7 Tesla fMRI led to a significant improvement in spatial resolution. The aim of this 7T fMRI study is to acquire the neural representations of pelvic floor motor control in the whole-brain. Furthermore, we aimed to demonstrate that the use of 7T fMRI in single subjects is valid for potential clinical use.

Materials & Methods: 17 healthy males (age 20-47) were scanned in a 7T MRI scanner (Philips Achieva), 4 subjects were excluded due to motion artefacts. All subjects completed the same scanning protocol consisting of 2 functional runs using a multiband echo planar imaging sequence (voxel size 1.77mm^3;matrix size 104x127; FOV 184x223mm^2; number of slices=70; TR/TE=2000/25ms) followed by a T1-weighted anatomical scan. The 2 motor tasks performed were repetitive pelvic floor contractions and as a control horizontal tongue movements. Activation maps were generated using General Linear Model. The threshold in single subject activation maps wasp < 0.05 FEW and in the group analyses p <0.005 uncorrected.

Results: During pelvic floor contractions and tongue movement activation was seen at specific clusters in the primary motor cortex (M1), the supplementary area, the anterior insula, putamen, thalamus, and in the cerebellum. Figure 1 shows the activation in the cortex and in the cerebellum in both single subjects and group analysis. Connectivity analysis demonstrated strong

correlation between cortical and subcortical areas during pelvic muscle contraction.



Conclusions: To our knowledge, this is the first study demonstrating that 7T fMRI can be used to consistently detect cortical and subcortical areas involved in pelvic floor muscle control in single subjects. This study allows further definition of the rain areas involved in pelvic floor function. Furthermore, 7T MRI analysis of individual patients might be possible in the near future.