*Conclusion:* This result might be an indication that postural stiffness is indeed increased, resulting in a higher resistance against the mediolateral push. Further investigation is needed to see whether EMG and kinematic data show similar effects.

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## P30

**Automatic volumetric segmentation of the endolymphatic space calibrated to radiological grading of the endolymphatic hydrops—J. Gerb [a,b,*], B. Ertl-Wagner [c], M. Dieterich [a,d,b,e], V. Kirsch [a,d,b] ([a] LMU München, Department of Neurology, München, Germany, [b] LMU München, German Center for Vertigo and Balance Disorders DSGZ, München, Germany, [c] The Hospital for Sick Children, Department of Radiology, Toronto, Canada, [d] LMU München, Graduate School of Systemic Neuroscience (GSN), München, Germany, [e] LMU München, Munich Cluster for Systems Neurology (SyNergy), München, Germany)**

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*Introduction:* Delayed intravenous contrast agent enhanced magnet resonance imaging (ivMRI) of the endolymphatic space (ELS) of the inner ear permits the in vivo non-invasive verification of the endolymphatic hydrops (Brandt and Dieterich, 2017). However, current quantification methods of the ELS are cumbersome and experience-dependent Nakada et al., 2014. Here, we propose an automated segmentation method of the endolymphatic space, which is easy to use and experience-independent.

*Methods:* 138 patients with recurring dizziness attacks (73 females, aged 20–84 years, mean age: 50.3 ± 15.1 years) underwent a delayed MRI of the ELS, performed on a 3T Scanner, 4 h after the intravenous injection of gadobutrol (Brandt and Dieterich, 2017). The data was graded by two experienced double-blinded radiologists (Baráth et al., 2014). Preprocessing included (i) cropping the inner ear within the FLAIR and CISS datasets and (ii) registration using a probabilistic atlas of the outer shell of the inner ear (Kirsch, 2018). The automated segmentation pipeline includes (i) contrast normalization and enhancement of the FLAIR sequence, (ii) separation of endolymphatic and perilymphatic fluid by using two types of local thresholding algorithms in a three dimensional, volumetric approach in which every voxel is compared to its surroundings multiple times, (iii) classification of the ELS as either Endolymph Fluid [EF] or Non Endolymph Fluid [NEF], (iv) further enhancement by different types of image-morphological operations and (v) three-dimensional probability mapping of the ELS, which can then be visualised as a grey-scale volume of the inner ear with higher voxel-value signifying more EF-classifications of that voxel while lower values show more NEF-classifications.

*Results:* The EF volume ranged from not detectable ($<10\ mm^3$) to one extreme case of $>100\ mm^3$ with average values ranging between 20 $mm^3$ and 60 $mm^3$. Statistical analysis showed a positive correlation between detected EF-volumes and clinical radiological grading. The volumetric segmentation allowed for a higher spatial resolution in comparison to stack – based segmentation approaches. The resulting probability map can be converted into a histogram which then can be used in various mathematical models.

*Discussion:* Current manual or semi-automated quantification methods of the ELS are cumbersome and experience-dependent (Brandt and Dieterich, 2017; Nakada et al., 2014). Radiological grading is slice-based and is a somewhat indirect approach of assessing the amount of endolymphatic fluid (Baráth et al., 2014). With the method we described here it"s possible to directly calculate the amount of endolymphatic fluid without any manual or semi-manual segmentation in a fast and reproducible way. This allows for easier assessment of endolymphatic hydrops and can be used in future vestibular research.

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## P31

**Investigating autonomic brain regions with naturalistic stimuli: An fMRI Study—T. Thäßler [a,b,*], C. Thiel [b,c], P. Sörös [a,c] ([a] Universität Oldenburg, Universitätsklinik für Neurologie, Oldenburg, Germany, [b] Universität Oldenburg, Biologische Psychologie, Oldenburg, Germany, [c] Universität Oldenburg, Research Center Neurosensory Science, Oldenburg, Germany)**

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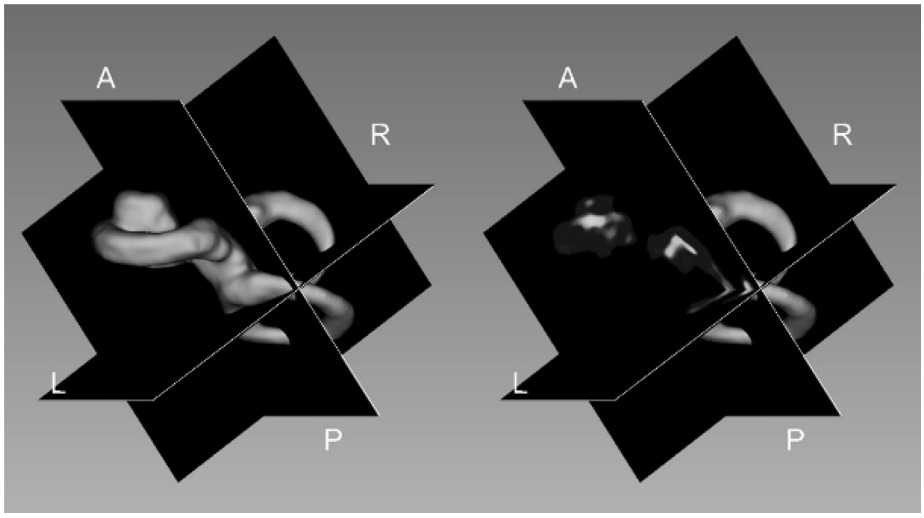
**Figure 1.**



*Introduction:* The autonomic nervous system is under control of cortical and subcortical brain regions. One area repeatedly found to be involved in autonomic and especially cardiac regulation is the insular cortex. It is part of the central autonomic network (CAN), together with the medial prefontal and anterior cingulate cortices, amygdala, hippocampus and thalamus. Many different approaches have been used to elicit autonomic responses in experimental settings. The aim of this study was to investigate if naturalistic stimuli such as movies might constitute a suitable alternative in autonomic fMRI research.

*Methods:* We used data of 14 healthy volunteers who watched a shortened 2 h version of the movie Forrest Gump during fMRI and simultaneous photoplethysmograph recording (data provided by the Studyforrest research group). Pleth pulse data was used to obtain heart rate (HR) and heart rate variability (HRV) regressors for the general linear model (GLM) analysis. For additional analysis, we considered the fMRI data as acquired during resting state, since no specific task was involved in the movie paradigm. We chose one movie segment for independent component and subsequent resting state network analysis.

*Results:* GLM analysis on the group level revealed a significant negative correlation between HR and activity in the left frontal pole, bilateral paracingulate gyri, ACC, amygdala, hippocampus, planum polare, orbitofrontal cortex, left temporal pole and fusiform cortex ($Z \geqslant 3.1$, $p \leqslant 0.001$), as well as left posterior cingulate and precentral gyri ($Z \geqslant 3.1$, $p \leqslant 0.01$). Significant insular activity correlating with HR and HRV was found in some subjects after second-level analysis. Components reflecting insular cortex activity showed positive functional connectivity with the anterior, posterior and paracingulate as well as frontal areas and negative connectivity with left precentral and postcentral gyri.

*Discussion:* The negative association between HR and brain activation in orbitofrontal and cingulate regions as well as amygdala and hippocampus is consistent with the existent literature. Nevertheless, significant insular activity after second-level GLM analysis did not recur on the third level. This implicates a great interindividual variability in autonomic response, possibly leading to distorted or inconclusive findings when examined on a group-level. Results from connectivity analysis confirmed functional associations of the insula with the cingulate and precentral gyri. All in all, we were able to obtain interpretable results in both task-related and resting state designs. Naturalistic stimuli might thus constitute a promising and convenient method to investigate autonomic responses by fMRI. Further research is needed to validate our results and investigate the applicability for subjects of different health status and age.

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## P32

**Testing accelerated clustered sparse acquisition for improved language fMRI. A clinical case experience—P. Keil [a,*], C. Nettekoven [a], K. Weiss [b,c], T. Lichtenstein [c], R. Goldbrunner [a], D. Giese [c], C. Weiss Lucas [a] ([a] Uniklinik Köln, Allgemeine Neurochirurgie, Köln, Germany, [b] Phillips Healthcare, Hamburg, Germany, [c] Uniklinik Köln, Radiologie, Köln, Germany)**

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*Introduction:* Sparse sampling fMRI techniques may improve language mapping by introducing a silent period for stimulus presentation and/or response control. However, this leads to prolonged scanning times. Clustered sparse sampling protocols have been designed to increase the amount of data collected per time. To test the rapid clustered scanning protocol in a clinical setting, pilot data were acquired to test the hypotheses from a recent study in healthy subjects in a clinical setting.

*Methods:* A patient (28 yrs, male) with a right frontal anaplastic oligodendro-glioma WHO°III and unclear hemispheric dominance underwent task-related language fMRI prior to tumor surgery. MRI data were acquired on a 3 Tesla full body scanner using a 32 channel head coil (Ingenia, Philips Healthcare, Best, The Netherlands). *Sparse Sampling*: We applied the full standard sparse acquisition protocol (111 volumes, 22.2 min). *Clustered Sampling*: Simultaneous Multislice excitation pulses were employed for an acceleration factor of 2. Sensitivity Encoding (SENSE) acceleration was set to 1.8, resulting in a total acceleration factor of 3.6. The repetition time was 1.2 s. Three volumes were acquired, resulting in a total acquisition time of 3.6 s within one 12 s cycle. This increases the number of volumes acquired within the same timeframe threefold (111 volumes in 7.4 min). *Functional Task*: The picture naming task consisted of overtly naming a picture presented on screen. *Analysis*: All functional imaging data were preprocessed and statistically analyzed using the Statistical Parametric Mapping software package (SPM12 Wellcome Department of Imaging Neuroscience, London, UK). Overlap coefficients (Dice coefficient and Simpson coefficient) between the sparse and the clustered protocol were calculated. Euclidean distances (ED) between clusters were measured from 3D-coordinates of local maxima within the clusters. The Laterality Index (LI) was calculated based on the number of activated voxels.

*Results:* The sparse protocol was more sensitive to activation in the language-related areas, at the expense of scanning time. However, activation patterns were similar between both protocols. Dice overlap was 28% while Simpson overlap reached 77% ($p \leqslant 0.001$ unc.). Both clustered and sparse acquisition protocols depicted a slightly left-hemispheric language dominance with an LI of 32 for clustered acquisition and 29 for sparse acquisition. Complete tumor removal succeeded under general anesthesia, without causing functional deficits.

*Discussion:* While clustered acquisition did not achieve the same level of sensitivity to activation as the established long sparse protocol, we could show the within subject stability of results between our methods. This supports our initial findings in healthy subjects although confirmation in a larger sample of patients is needed.

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## P33

**Functional and structural brain correlates of expertise in volleyball—W. Stadler [a], K. Koch [b], A. Wohlschläger [c], J. Hermsdörfer [a,*] ([a] Technische Universität München, Lehrstuhl für Bewegungswissenschaft, München, Germany, [b] Technische Universität München, TUM NIC, München, Germany, [c] Technische Universität München, Neuroradiologie, München, Germany)**

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Numerous behavioural studies have shown that expert athletes outperform non-experts in predicting actions in their specific discipline (Williams et al., 2011, Appl Cogn Psychol). Still, when non-experts watch game sports, they might also engage in predicting movement outcomes and the question is whether they use a similar brain network for this purpose. Neural underpinnings of action prediction were found in cortical motor planning areas (Stadler et al., 2011, Human Brain Map) and cerebellar structures (Miall et al., 2007, PLoS Biol). Correspondingly, when experts anticipated the outcome of volleyball and tennis serves medial parts of the premotor and the parietal cortices were activated in addition to the cerebellum (Balser et al., 2014, Front Hum Neurosci). Moreover, intensive training of a motor skill has been shown to induce structural changes in