

Helge Jörn Zöllner

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My research as postdoctoral fellow is focused on the detection of brain metabolites using conventional and edited magnetic resonance spectroscopy. My particular interest is to develop and standardize methods to detect low-concentration metabolites, such as the main inhibitory neurotransmitter GABA, ascorbate, glutamine, and glutathione.

I have also been involved in various studies applying those methods to investigate metabolic changes in the healthy and diseased brain. These studies were focused on hepatic encephalopathy, Parkinsons Disease, and Fibromyalgia.

Recently, I have been involved in the development of the open-source MRS data analysis toolbox Osprey. This project is focused on the standardization of processing and quantification of MRS data, as well as investigating the performance of the underlying algorithms to better understand the modeling process. During this effort I did also develop an R-based toolbox for transparent data visualization SpecVis which is freely available on GitHub.

Education/Training

- 10/19–Now **Postdoctoral Fellow**, *The Russell H. Morgan Department of Radiology and Radiological Science*, Johns Hopkins University School of Medicine, Baltimore.
Methodological development of advanced edited MRS
Supervisor Richard E. A. Edden
- 2016–2019 **PhD**, *Institute of Clinical Neuroscience and Medical Psychology*, Heinrich Heine University, Düsseldorf.
Thesis: Investigations in patients with hepatic encephalopathy by magnetic resonance imaging and spectroscopy, (magna cum laude)
Supervisor Prof. Dr. Alfons Schnitzler
- 2013–2015 **M.Sc.**, *Medical Physics*, (grade: 1.2), Heinrich Heine University, Düsseldorf.
Thesis: Comparison of quantitative watermapping methods in the human brain by MRI, Department for Diagnostic and Interventional Radiology, (grade: 1.3)
Supervisor Prof. Dr. Hans-Jörg Wittsack
- 2010–2015 **B.Sc.**, *Medical Physics*, (grade: 1.7), Heinrich Heine University, Düsseldorf.
Thesis: Investigation of relaxation times of typical brain metabolites at 3 T, Department for Diagnostic and Interventional Radiology, (grade: 1.15)
Supervisor Prof. Dr. Hans-Jörg Wittsack

Research Activity

Peer-reviewed original publications

2021

H. J. Zöllner, M. Povazan, S. C. N. Hui, S. Tapper, R. A. E. Edden, and G. Oeltzschner. Comparison of different linear-combination modeling algorithms for short-TE proton spectra. *NMR in Biomedicine*, n/a(n/a):e4482, 2021. _eprint: <https://onlinelibrary.wiley.com/doi/pdf/10.1002/nbm.4482>

J. Stabinska, A. Ljimini, H. J. Zöllner, E. Wilken, T. Benkert, J. Limberg, I. Esposito, G. Antoch, and H.-J. Wittsack. Spectral diffusion analysis of kidney intravoxel incoherent motion MRI in healthy volunteers and patients with renal pathologies. *Magnetic Resonance in Medicine*, n/a(n/a), 2021. _eprint: <https://onlinelibrary.wiley.com/doi/pdf/10.1002/mrm.28631>

S. Tapper, M. Mikkelsen, B. E. Dewey, H. J. Zöllner, S. C. N. Hui, G. Oeltzschner, and R. A. E. Edden. Frequency and phase correction of J-difference edited MR spectra using deep learning. *Magnetic Resonance in Medicine*, 85(4):1755–1765, 2021. _eprint: <https://onlinelibrary.wiley.com/doi/pdf/10.1002/mrm.28525>

H. J. Zöllner, G. Oeltzschner, A. Schnitzler, and H.-J. Wittsack. In silico GABA+ MEGA-PRESS: Effects of signal-to-noise ratio and linewidth on modeling the 3 ppm GABA+ resonance. *NMR in Biomedicine*, 34(1):e4410, 2021. _eprint: <https://onlinelibrary.wiley.com/doi/pdf/10.1002/nbm.4410>

2020

I. Mawla, E. Ichesco, H. J. Zöllner, R. A. E. Edden, T. Chenevert, H. Buchtel, M. D. Bretz, H. Sloan, C. M. Kaplan, S. E. Harte, G. A. Mashour, D. J. Clauw, V. Napadow, and R. E. Harris. Greater Somatosensory Afference with Acupuncture Increases Primary Somatosensory Connectivity and Alleviates Fibromyalgia Pain via Insular GABA: A Randomized Neuroimaging Trial. *Arthritis & Rheumatology*, n/a(n/a), 2021. _eprint: <https://onlinelibrary.wiley.com/doi/pdf/10.1002/art.41620>

S. D. Pizzi, R. Franciotti, A. Ferretti, R. A. E. Edden, H. J. Zöllner, R. Esposito, G. Bubbico, C. Aiello, F. Calvanese, S. L. Sensi, A. Tartaro, M. Onofri, and L. Bonanni. High γ -Aminobutyric Acid Content Within the Medial Prefrontal Cortex Is a Functional Signature of Somatic Symptoms Disorder in Patients With Parkinson's Disease. *Movement Disorders*, 35(12):2184–2192, 2020. _eprint: <https://onlinelibrary.wiley.com/doi/pdf/10.1002/mds.28221>

G. Oeltzschner, H. J. Zöllner, S. C. N. Hui, M. Mikkelsen, M. G. Saleh, S. Tapper, and R. A. E. Edden. Osprey: Open-source processing, reconstruction & estimation of magnetic resonance spectroscopy data. *Journal of Neuroscience Methods*, 343:108827, Sept. 2020

M. Povazan, M. Mikkelsen, A. Berrington, P. K. Bhattacharyya, M. K. Brix, P. F. Buur, K. M. Cecil, K. L. Chan, D. Y. Chen, A. R. Craven, K. Cuypers, M. Dacko, N. W. Duncan, U. Dydak, D. A. Edmondson, G. Ende, L. Ersland, M. A. Forbes, F. Gao, I. Greenhouse, A. D. Harris, N. He, S. Heba, N. Hoggard, T.-W. Hsu, J. F. A. Jansen, A. Kangarlu, T. Lange, R. M. Lebel, Y. Li, C.-Y. E. Lin, J.-K. Liou, J.-F. Lirng, F. Liu, J. R. Long, R. Ma, C. Maes, M. Moreno-Ortega, S. O. Murray, S. Noah, R. Noeske, M. D. Noseworthy, G. Oeltzschner, E. C. Porges, J. J. Prisciandaro, N. A. J. Puts, T. P. L. Roberts, M. Sack, N. Sailasuta, M. G. Saleh, M.-P. Schallmo, N. Simard, D. Stoffers, S. P. Swinnen, M. Tegenthoff, P. Truong, G. Wang, I. D. Wilkinson, H.-J. Wittsack, A. J. Woods, H. Xu, F. Yan, C. Zhang, V. Zipunnikov, H. J. Zöllner, R. A. Edden, and P. B. Barker. Comparison of Multivendor Single-Voxel MR Spectroscopy Data Acquired in Healthy Brain at 26 Sites. *Radiology*, 295(1):191037, Feb. 2020. Publisher: Radiological Society of North America (RSNA)

2019

H. J. Zöllner, M. Butz, M. Jördens, N.-D. Füllenbach, D. Häussinger, B. Schmitt, H.-J. Wittsack, and A. Schnitzler. Chemical exchange saturation transfer imaging in hepatic encephalopathy. *NeuroImage: Clinical*, 22:101743, Mar. 2019. Publisher: Elsevier

M. N. Preising, B. Görg, C. Friedburg, N. Qvartskhava, B. S. Budde, M. Bonus, M. R. Toliat, C. Pflieger, J. Altmüller, D. Herebian, M. Beyer, H. J. Zöllner, H.-J. Wittsack, J. Schaper, D. Klee, U. Zechner, P. Nürnberg, J. Schipper, A. Schnitzler, H. Gohlke, B. Lorenz, D. Häussinger, and H. J. Bolz. Biallelic mutation of human SLC6A6 encoding the taurine transporter TAUT is linked to early retinal degeneration. *The FASEB Journal*, page fj.201900914RR, July 2019. Publisher: Federation of American Societies for Experimental BiologyBethesda, MD, USA

M. Mikkelsen, D. L. Rimbault, P. B. Barker, P. K. Bhattacharyya, M. K. Brix, P. F. Buur, K. M. Cecil, K. L. Chan, D. Y.-T. Chen, A. R. Craven, K. Cuypers, M. Dacko, N. W. Duncan, U. Dydak, D. A. Edmondson, G. Ende, L. Ersland, M. A. Forbes, F. Gao, I. Greenhouse, A. D. Harris, N. He, S. Heba, N. Hoggard, T.-W. Hsu, J. F. Jansen, A. Kangarlu, T. Lange, R. M. Lebel, Y. Li, C.-Y. E. Lin, J.-K. Liou, J.-F. Lirng, F. Liu, J. R. Long, R. Ma, C. Maes, M. Moreno-Ortega, S. O. Murray, S. Noah, R. Noeske, M. D. Noseworthy, G. Oeltzschner, E. C. Porges, J. J. Prisciandaro, N. A. Puts, T. P. Roberts, M. Sack, N. Sailasuta, M. G. Saleh, M.-P. Schallmo, N. Simard, D. Stoffers, S. P. Swinnen, M. Tegenthoff, P. Truong, G. Wang, I. D. Wilkinson, H.-J. Wittsack, A. J. Woods, H. Xu, F. Yan, C. Zhang, V. Zipunnikov, H. J. Zöllner, and R. A. Edden. Big GABA II: Water-referenced edited MR spectroscopy at 25 research sites. *NeuroImage*, 191:537–548, May 2019. Publisher: Academic Press

2018

H. J. Zöllner, M. Butz, G. Kircheis, S. Klinker, D. Häussinger, B. Schmitt, A. Schnitzler, and H.-J. Wittsack. Ammonia-weighted imaging by chemical exchange saturation transfer MRI at 3 T. *NMR in Biomedicine*, 31(9):e3947, July 2018. Publisher: Wiley-Blackwell

G. Oeltzschner, H. J. Zöllner, M. Jonuscheit, R. S. Lanzman, A. Schnitzler, and H.-J. Wittsack. J-difference-edited MRS measures of -aminobutyric acid before and after acute caffeine administration. *Magnetic Resonance in Medicine*, 2018. Publisher: Wiley-Blackwell

- 2017 M. Mikkelsen, P. B. Barker, P. K. Bhattacharyya, M. K. Brix, P. F. Buur, K. M. Cecil, K. L. Chan, D. Y. Chen, A. R. Craven, K. Cuypers, M. Dacko, N. W. Duncan, U. Dydak, D. A. Edmondson, G. Ende, L. Erslund, F. Gao, I. Greenhouse, A. D. Harris, N. He, S. Heba, N. Hoggard, T. W. Hsu, J. F. Jansen, A. Kangarlu, T. Lange, R. M. Lebel, Y. Li, C. Y. E. Lin, J. K. Liou, J. F. Lirng, F. Liu, R. Ma, C. Maes, M. Moreno-Ortega, S. O. Murray, S. Noah, R. Noeske, M. D. Noseworthy, G. Oeltzschner, J. J. Prisciandaro, N. A. Puts, T. P. Roberts, M. Sack, N. Sailasuta, M. G. Saleh, M. P. Schallmo, N. Simard, S. P. Swinnen, M. Tegenthoff, P. Truong, G. Wang, I. D. Wilkinson, H.-J. Wittsack, H. Xu, F. Yan, C. Zhang, V. Zipunnikov, H. J. Zöllner, and R. A. Edden. Big GABA: Edited MR spectroscopy at 24 research sites. *NeuroImage*, 159:32–45, 2017. ISBN: 1095-9572 (Electronic) 1053-8119 (Linking)

- 2016 G. Oeltzschner, A. Schnitzler, F. Wickrath, H. J. Zöllner, and H.-J. Wittsack. Use of quantitative brain water imaging as concentration reference for J-edited MR spectroscopy of GABA. *Magnetic Resonance Imaging*, 34(8):1057–1063, Oct. 2016

Oral presentations

- 2019 H. J. Zöllner, M. Butz, G. Oeltzschner, M. S. Jördens, N.-D. Füllenbach, D. Häussinger, H.-J. Wittsack, and A. Schnitzler. J-edited MR spectroscopy in Patients with Hepatic Encephalopathy. In *5th International Symposium on GABA and Advanced MRS*, Park City, United States, 2019

G. Oeltzschner, H. J. Zöllner, and R. A. Edden. Open-source processing, reconstruction & estimation of MRS data. In *5th International Symposium on GABA and Advanced MRS*, Park City, United States, 2019

- 2017 H. J. Zöllner, A. Schnitzler, and H.-J. Wittsack. Simulations of MEGA-PRESS spectra to achieve quality criteria for GABA quantification. In *4th International Symposium on MRS of GABA*, Leuven, Belgium, 2017

H. J. Zöllner, M. Butz, G. Kircheis, S. Klinker, A. Schnitzler, and H.-J. Wittsack. Investigations On The Influence Of Ammonia On Chemical Exchange Saturation Transfer (CEST) Imaging of Protein. In *deLIVER - Technology in Hepatology*, Düsseldorf, Germany, 2017

- 2016 H. J. Zöllner, M. Jonuscheit, R. S. Lanzman, H.-J. Wittsack, and G. Oeltzschner. Caffeine effects on human brain metabolites measured by J-edited in vivo MR spectroscopy. In *33rd Annual Meeting of the European Society for Magnetic Resonance in Medicine and Biology (ESMRMB)*, Vienna, Austria, 2016

Poster presentations

- 2020 H. J. Zöllner, S. Tapper, S. C. N. Hui, P. B. Barker, R. A. Edden, and G. Oeltzschner. Linear-combination modeling of GABA-edited MEGA-PRESS at 3T: Evaluating different modeling strategies. In *29th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*, 2021

- 2020
H. J. Zöllner, G. Oeltzschner, M. Povazan, and R. A. Edden. Leveraging large publicly available datasets to benchmark new 1H-MRS modeling methods against established algorithms. In *28th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*, 2020
- G. Oeltzschner, H. J. Zöllner, and R. A. Edden. Osprey: Open-Source Processing Reconstruction & Estimation of Magnetic Resonance Spectroscopy Data. In *28th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*, 2020
- 2019
J. Hentschel, F. Distelmaier, D. Klee, H. J. Zöllner, M. Nastainczyk-Wulf, T. Bartolomaeus, E. Jäger, D. Wiczorek, S. Redler, and R. Jamra. A deleterious synonymous SCL25A12 variant in a boy with severe epileptic encephalopathy. In *European Human Genetics Conference*, Gothenburg, Sweden, 2019
- H. J. Zöllner, M. Butz, M. S. Jördens, N.-D. Füllenbach, D. Häussinger, H.-J. Wittsack, and A. Schnitzler. J-edited cerebral MR spectroscopy in Patients with Hepatic Encephalopathy. In *27th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*, Montreal, Canada, 2019
- J. Stabinska, A. Lijmani, E. Bechler, C. Tell, H. J. Zöllner, H.-J. Wittsack, and A. Müller-Lutz. CEST MRI with dual-echo readout for the functional assessment of transplanted kidney in vivo: a preliminary study. In *27th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*, Montreal, Canada, 2019
- E. Bechler, H. J. Zöllner, and H.-J. Wittsack. Analysis of different phase unwrapping methods to optimize QSM in the abdomen. In *27th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*, Montreal, Canada, 2019
- 2018
H. J. Zöllner, A. Schnitzler, and H.-J. Wittsack. Simulations of MEGA-PRESS spectra to achieve quality criteria for GABA quantification. In *26th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*, Paris, France, 2018
- H. J. Zöllner, M. Butz, G. Kircheis, S. Klinker, D. Häussinger, H.-J. Wittsack, and A. Schnitzler. Ammonia-weighted imaging by chemical exchange saturation transfer(CEST) MRI - at 3 T. In *26th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*, Paris, France, 2018
- M. Povazan, ..., G. Oeltzschner, H. J. Zöllner, R. A. Edden, and P. B. Barker. Multi-vendor, multi-site comparison of 1H-MRS PRESS data acquired at 25 research sites. In *26th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*, Paris, France, 2018
- 2017
H. J. Zöllner, M. Butz, G. Kircheis, D. Häussinger, H.-J. Wittsack, and A. Schnitzler. Ammonia Influenced Chemical Exchange Saturation Transfer MR Imaging In Hepatic Encephalopathy. In *23rd Annual Meeting of the Organization for Human Brain Mapping (OHBM)*, Vancouver, Canada, 2017
- M. Mikkelsen, ..., Georg Oeltzschner, ..., H. J. Zöllner, and R. A. Edden. Integrative analysis of GABA-edited MRS data acquired at 19 research sites. In *25th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*, Honolulu, USA, 2017

- 2016 H. J. Zöllner, G. Oeltzschner, F. Wickrath, H.-J. Wittsack, and A. Schnitzler. Wassergehaltskartierung des menschlichen Gehirns Vergleich quantitativer magnetresonanztomographischer Methoden. In *47th Annual Meeting of the Deutsche Gesellschaft für Medizinische Physik (DGMP)*, Würzburg, Germany, 2016

Recognition

Honors, Awards

- 2021 **ISMRM Educational Stipend**, *29th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*.
- 2020 **ISMRM Educational Stipend**, *28th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*.
- 2018 **DAAD Travel Grant**, *26th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM)*, Paris, France.
- 2016 **HERA Travel Grant**, *33rd Annual Meeting of the European Society for Magnetic Resonance in Medicine and Biology (ESMRMB)*.

Professional Skills / Proficiency

- Strong MR scanner operation on Siemens (3 T)
MR data acquisition of healthy subjects and clinical populations of various ages
MR protocol design, sequence optimization, acquisition, and analysis of conventional and edited MRS and metabolic MR imaging
MRS analysis with major packages LCModel, Tarquin, and jMRUI
MATLAB software development and application/optimization of MATLAB based MRI and MRS tools SPM, Gannet, Osprey, and FID-A
- Good Analysis of structural and metabolic images using FSL and ANTS
Data presentation using Grammar of Graphics (R)
Linear-mixed model analysis (R)
Statistical analysis (R,SPSS)

Organizational Activities

Professional Societies

- 2019-present International Society for Magnetic Resonance in Medicine (ISMRM)
2016-present European Society for Magnetic Resonance in Medicine and Biology (ESMRMB)

Journal reviewers

- 2020-present NMR in Biomedicine
2020-present MAGMA
2020-present Neurodegenerative Diseases
2019-present Frontiers In Aging Neuroscience

Conference organization

- 2020 Organizing committee, EDITINGSCHOOL, Virtual Workshop
2017 Organizing committee, deLIVER - Technology in Hepatology, Düsseldorf, Germany

Teaching Activities

Lectures

- 2020 EDITINGSCHOOL - Hands-On Osprey Session
- 2019 MRT Theoretischer Unterricht für MTRA Schüler
Science Track - VL Funktionelle Magnetresonanztomographie (fMRT)
- 2018 Science Track - VL Funktionelle Magnetresonanztomographie (fMRT)

Supervised students

- 2019 John Kallenberg, MSc
- 2018 Philipp Sidiropulos, MSc
- 2016 Marc Jonuscheit, BSc

Attended Workshops

- 2018 **EDITINGSCHOOL**, (*Workshop on theory and practice of spectral editing*) *The Johns Hopkins University School of Medicine.*
- 2016 **Tool-Kit of Cognitive Neuroscience: TMS**, *Donders Centre for Cognitive Neuroimaging.*

References

Prof. Dr. Richard A. E. Edden, *The Russell H. Morgan Department of Radiology and Radiological Science*, Johns Hopkins University School of Medicine.
raee2@jhu.edu

Prof. Dr. Alfons Schnitzler, *Institute of Clinical Neuroscience and Medical Psychology*, Medical Faculty, Heinrich Heine University Düsseldorf.
alfons.schnitzler@uni-duesseldorf.de

Prof. Dr. Hans-Jörg Wittsack, *Departement for Diagnostic and Interventional Radiology*, Medical Faculty, Heinrich Heine University Düsseldorf.
wittsack@uni-duesseldorf.de