superior longitudinal fasciculus and external capsule were no longer statistically different. **Conclusions:** DBSI is an MRI-based approach to assess neuroinflammation. Referencing to a normal population provides a means of anchoring the signal so as to determine 'abnormal' CR levels as a measure of neuroinflammation, independent of effects of normal aging. This analysis strategy should be extended to grey matter.

IC-P-178 COMPARING HIPPOCAMPAL EFFECT SIZE BETWEEN ALZHEIMER'S DISEASE AND HEALTHY CONTROLS USING OLDER AND NEWER VERSIONS OF SPM AND FREESURFER

Rachael Deardorff[1], Colin Groot[2], Kody Zalewski[3], Rik Ossenkoppele[4], Christine Mac Donald[3], John D. West[5], Beth C. Mormino[6], Andrew J. Saykin[1,5], Paul K. Crane[3], Shannon L. Risacher[5], *[1]Indiana University School of Medicine, Indianapolis, IN, USA; [2]Alzheimer Center and Department of Neurology, Amsterdam Neuroscience, VU University Medical Center, Amsterdam, Netherlands; [3]University of Washington, Seattle, WA, USA; [4]Department of Radiology and Nuclear Medicine, Amsterdam Neuroscience, VU University Medical Center, Amsterdam, Netherlands; [5]Indiana Alzheimer Disease Center, Indianapolis, IN, USA; [6]Stanford University School of Medicine, Palo Alto, CA, USA. Contact e-mail: radear@iu.edu*

Background: The increasing number of neuroimaging software applications and settings available has left researchers with the need to determine reproducibility between collaborating sites and methods that optimize study effect size. Our goal was to compare hippocampal values from multiple versions and settings within SPM and Freesurfer across three sites. **Methods:** Voxel based morphometry (VBM) was performed on T1-weighted MPRAGE images at the Indiana University School of Medicine (IUSM) from 20 cognitively normal older adults (CN) and 20 Alzheimer's (AD) patients from the ADNI dataset with SPM versions 8 and 12 using DARTEL and prior alignment to a standardized template with or without modulation. We also ran Freesurfer v5.3 and v6 on the same individuals. Bilateral mean hippocampal gray matter values (from VBM) and volumes (Freesurfer) were extracted and effect size (Cohen's d) of CN>AD were calculated using SPSS v24, covaried for age, sex, and ICV. Finally, VU University Medical Center processed images from 20 CN and 19 AD patients using SPM8 and SPM12 with DARTEL and modulation, and the University of Washington processed these same scans using Freesurfer v5.3 and v6. Results were compared to those from IUSM. **Results:** The largest VBM effect size for CN>AD was observed using either SPM8 new segment or SPM12 segment (Cohen's d = 2.18; Table 1). Hippocampal volume from Freesurfer v5.3 had a higher effect size (Cohen's d = 2.01) than Freesurfer v6 (Cohen's d = 1.83). Hippocampal grey matter values were highly correlated between sites

Table 1
Hippocampal Effect Sizes for CN>AD (Cohen's d)

SPM Version	Modulated	Alignment	DARTEL	Cohen's D
SPM8 Segment	No	Yes	Yes	1.899
SPM8 Segment	Yes	Yes	Yes	2.103
SPM8 New Segment	No	Yes	Yes	1.984
SPM8 New Segment	Yes	Yes	Yes	2.185
SPM12 Old Segment	No	Yes	Yes	1.899
SPM12 Old Segment	Yes	Yes	Yes	2.103
SPM12 Segment	No	Yes	Yes	1.984
SPM12 Segment	Yes	Yes	Yes	2.185

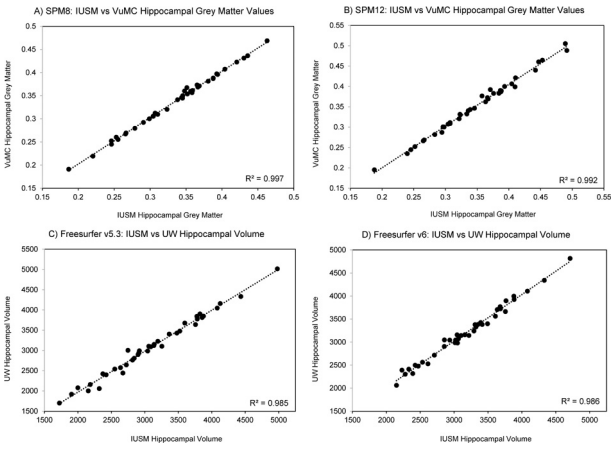


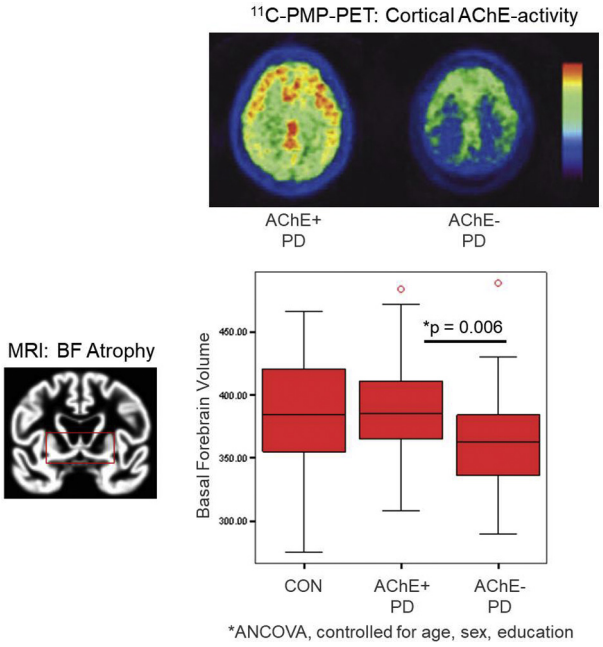
Fig 1. Association of Hippocampal Values from IUSM, VuMC (VBM), and UW (Freesurfer).

(Figure 1) for both versions of SPM (SPM8: $r^2 = 0.997$; SPM12: $r^2 = 0.992$) and both versions of Freesurfer (v5.3: $r^2 = 0.985$; v6: $r^2 = 0.986$). **Conclusions:** Hippocampal grey matter values from the newest version of the SPM segmentation (SPM8 New Seg or SPM12 Seg) was found to have the greatest effect size between AD and CN, while Freesurfer v5.1 showed a higher effect size than v6 for hippocampal volume. Overall, we found strong agreement across sites, which is reassuring for the robustness of these analytic pipelines. As software upgrades replace previous versions, widely-used image processing methods need to be carefully reassessed.

IC-P-179 INTERRELATION OF IN VIVO STRUCTURAL AND MOLECULAR IMAGING MARKERS OF CHOLINERGIC SYSTEM DEGENERATION IN PD-RELATED COGNITIVE DECLINE

Michel J. Grothe[1], Martijn Muller[2], Elvira Álvarez[3], Nicolaas I. Bohnen[4], Stefan J. Teipel[5], *[1]German Center for Neurodegenerative Diseases, Rostock, Germany; [2]University of Michigan, Ann Arbor, MI, USA; [3]German Center for Neurodegenerative Diseases, Rostock, Rostock, Germany; [4]Ann Arbor VA Medical Center, Ann Arbor, MI, USA; [5]Department of Psychosomatic Medicine, Rostock University Medical Center, Rostock, Germany. Contact e-mail: michel.grothe@dzne.de*

Background: Degeneration of cholinergic basal forebrain (cBF) neurons and ensuing cortical cholinergic depletion have been consistently linked to the cognitive deficits that arise in the course of both Alzheimer's Disease (AD) and Parkinson's Disease (PD). Neuroimaging biomarkers of cholinergic system degeneration include measurements of cBF structure on high-resolution structural MRI scans, as well as direct molecular imaging of cortical acetylcholinesterase (AChE)-activity by means of [11C]PMP-PET. Here we studied for the first time both cholinergic system markers and their relation with cognitive deficits within the same cohort of PD patients. **Methods:** We analyzed structural MRI, [11C]PMP-PET, and neuropsychological test data of 142 predominantly nondemented PD patients recruited at the University of Michigan (MoCA: 15-30, 26.0±2.5). We also included MRI and cognitive data from 52 age-matched controls, 11 of which also underwent [11C]PMP-PET scanning. cBF structure was assessed using cytoarchitectonic mappings of the cBF nuclei within an automated volumetry framework. Cortical AChE-activity was analyzed both as a continuous variable, as well as using a



dichotomous classification into hypo-/normo-cholinergic status based on control values. Cognitive test scores were z-transformed based on control values and used to derive global cognitive and domain-specific composite scores. Relations between cBF volume, cortical AChE-activity, and cognitive performance were studied using linear models. Specificity of the effects for cholinergic degeneration was assessed by comparison to hippocampal volume. **Results:** When stratifying PD patients according to cortical AChE-status, hypo-cholinergic patients showed significantly reduced cBF volumes compared to both normo-cholinergic patients ($p=0.006$) and controls ($p=0.04$), independent of age, gender and education (see Figure). Across all PD patients, reduced cBF volume was significantly associated with lower cortical AChE-activity ($p=0.003$), being most pronounced in anterior cingulate, temporal and posterior cortical areas. Hippocampal volume was not associated with continuous or dichotomous cortical AChE-activity. Both reduced cBF volume and cortical AChE-activity correlated with impaired global cognition (p's<0.001), mostly affecting the memory domain. In a combined regression model, AChE-activity and cBF volume, but not hippocampal volume, independently predicted cognitive performance. **Conclusions:** In-vivo neuroimaging markers of cholinergic system degeneration are promising tools for characterizing the distinct contributions of cholinergic system deficits to cognitive decline in neurodegenerative disease.

IC-P-180 QUANTITATIVE T1 IN ALZHEIMER'S DISEASE

Akshay Kohli[1,2], Andrew P. Merluzzi[1,2], Jennifer M. Oh[2], Sanjay Asthana[3,4], Sterling C. Johnson[3,4], Andrew L. Alexander[5], Steven Kecskemeti[5], Barbara B. Bendlin[2], *[1]Neuroscience Training Program, University of Wisconsin School of Medicine and Public Health, Madison, WI, USA; [2]Wisconsin Alzheimer's Disease Research Center, University of Wisconsin School of Medicine and Public Health, Madison, WI, USA; [3]VA Geriatric Research, Education and Clinical Center, William S. Middleton Memorial Veterans Hospital, Madison, WI, USA; [4]Wisconsin Alzheimer's Disease Research Center, Madison, WI, USA; [5]Department of Medical Physics, University of Wisconsin - Madison, Madison, WI, USA. Contact e-mail: akohli2@wisc.edu*

Background: T_1 mapping of the brain may offer advantages over traditional T1-weighted MRI as it is a more direct measure of the structural integrity of neural tissue. MPnRAGE allows for the simultaneous collection of a traditional T1-weighted image, as well as other images that can be used for accurate and precise estimation of T_1 (Kecskemeti et al., 2016). Here, we investigate the effect of age, sex, and MCI and dementia due to Alzheimer's disease on quantitative T_1 using MPnRAGE. **Methods:** Participants ($n = 65$, age $= 68.09 \pm 6.73$ years) from the Wisconsin Alzheimer's Disease Research Center (ADRC) clinically diagnosed with mild cognitive impairment (MCI) due to AD ($n=4$), dementia due to AD ($n = 6$), or normal cognition ($n = 55$) underwent MPnRAGE MRI. Quantitative T_1 maps were generated using multiple inversion recovery images acquired using MPnRAGE. T_1 maps were skull-stripped and segmented by tissue type, normalized to a 2x2x2 T_1-weighted MNI template, and smoothed to a 6x6x6 Gaussian kernel. Voxel-based analysis was conducted within MNI space on the resulting T_1 maps, and multiple regression analysis was employed in SPM12 to investigate the effects of age, sex, and disease status on quantitative T_1. **Results:** Multiple regression analysis of gray matter T_1 revealed significantly lower T_1 ($p<0.05$ FWE-corrected, $k > 10$) with older age in the hypothalamus, thalamus, left dorsal anterior cingulate cortex, bilateral insula, right parahippocampal gyrus, bilateral caudate, and inferior frontal gyrus. Subjects with MCI/Dementia had significantly lower T1 ($p<0.05$ FWE-corrected, $k > 10$) in the right inferior temporal gyrus, as well as the left occipitotemporal area, and right middle temporal gyrus. There were no significant differences in T_1 due to sex. **Conclusions:** This study tested the application of the novel MPnRAGE technique in healthy and clinical populations, as well as tested the extent to which quantitative T_1 differs in a population with AD. Future work will examine the utility of quantitative T_1 combined with other biomarkers to track disease progression.

IC-P-181 TRANSLOCATOR PROTEIN BINDING IS ELEVATED IN CLINICAL ALZHEIMER'S DISEASE BUT NOT IN IMPAIRED PATIENTS WITH SUSPECTED NON-AD PATHOPHYSIOLOGY

William Charles Kreisl, James Zou, Julia Klein, Krista Polly, Qolamreza Razlighi, Yaakov Stern, *Columbia University, New York, NY, USA. Contact e-mail: wck2107@cumc.columbia.edu*

Background: Neuroinflammation may be a primary contributor to Alzheimer's disease (AD) or a nonspecific response to neurodegeneration. ^{11}C-PBR28 is a second generation PET radioligand for the 18 kDa translocator protein (TSPO), which is overexpressed by activated microglia and correlates with severity and progression of AD. We sought to determine if TSPO binding differed between cognitively impaired patients with biomarker evidence of AD and impaired patients without evidence of amyloidopathy. **Methods:** Twenty-one patients meeting clinical criteria for amnestic mild cognitive impairment or mild AD who had AD-pattern of neurodegeneration on MRI underwent florbetaben PET. An age-matched group of amyloid-negative cognitive controls ($n = 15$) was also included. ^{11}C-PBR28 PET images were acquired 60-90 min post-injection. Standardized uptake value ratios were calculated using cerebellar gray-matter as a "pseudo-reference" region. **Results:**