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VISUALIZING THE SHRINKING BRAIN:
LONGITUDINAL MR STUDIES
IN THE SPECTRUM OF COGNITIVE DECLINE

Jasper Daniël Sluimer

The studies described in this thesis were carried out in the Image Analysis Center of the department of Radiology, and the Alzheimer Center of the department of Neurology at the VU University Medical Center.

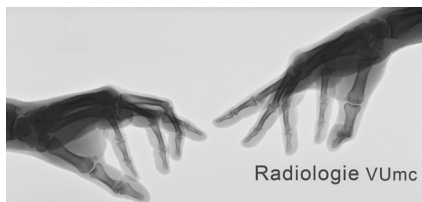
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Image Analysis Center



Voor mijn naasten

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Longitudinal MR Studies
in the Spectrum of Cognitive Decline**

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad Doctor aan
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op gezag van de rector magnificus
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in het openbaar te verdedigen
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'Always look on the bright side of life'

Brian, 33 AD

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List of Abbreviations

3D	3-dimensional
A β ₁₋₄₂	Beta-amyloid 1-42
AAL	Automated Anatomical Labeling
AD	Alzheimer's disease
ANOVA	Analysis of variance
APOE	Apolipoprotein E genotype
ASL	Arterial spin labeling
BET	Brain extraction tool
CDR	Clinical dementia rating
CI	Confidence interval
CSF	Cerebrospinal Fluid
CV	Coefficient of variation
DBC	Differential bias correction
DLB	Dementia with Lewy bodies
dof	Degrees of freedom
FAST	FMRIB's Automated Segmentation Tool
FDR	False discovery rate
FLAIR	Fluid attenuation inversion recovery
FLIRT	FMRIB's Linear Image Registration Tool
FSL	FMRIB Software Library
FTLD	Frontal-temporal lobar degeneration
FWHM	Full-width at half maximum
GM	Grey matter
HR	Hazard ratio
IDL	Interface Description Language
LP	Lumbar puncture
MCI	Mild Cognitive Impairment
MMSE	Mini-mental state examination
MNI-152	Montreal neurological institute-152 (standard brain image)
MP-RAGE	Magnetization prepared rapid acquisition gradient echo

MRI	Magnetic Resonance Imaging
MTA	Medial temporal lobe atrophy
NBV	Normalized Brain Volume
NFT	Neurofibrillary tangles
NINCDS-ADRDA	National Institute of Neurological and Communicative Diseases and Stroke/Alzheimer's Disease and Related Disorders Association
NINDS-AIREN	National Institute of Neurological Disorders and Stroke and Association Internationale pour la Recherche et l'Enseignement en Neurosciences
NYU	NYU paragraph recall tests
PBVC	Percentage Brain Volume Change (whole-brain atrophy rate)
PET	Positron Emission Tomography
P-tau ₁₈₁	Tau phosphorylated at threonine-181
ROI	Region of interest
SIENA	Structural Image Evaluation using Normalisation of Atrophy
SIENAX	Structural Image Evaluation using Normalisation of Atrophy Cross-sectional
SPAM	Statistical probability anatomical maps
SPECT	Single Photon Emission Computed Tomography
SPM	Statistical Parametric Mapping
SPSS	Statistical Package for the Social Sciences
VaD	Vascular dementia
VAT	Visual association test
VBM	Voxel-based morphometry
WM	White matter