TIME IS BRAIN?

A SYSTEMATIC REVIEW AND META ANALYSIS ON PROGRESSIVE ATROPHY IN TLE

CACIAGLI, BERNASCONI, WIEBE, KOEPP, BERNASCONI, BERNHARDT (minor revisions) NEUROLOGY

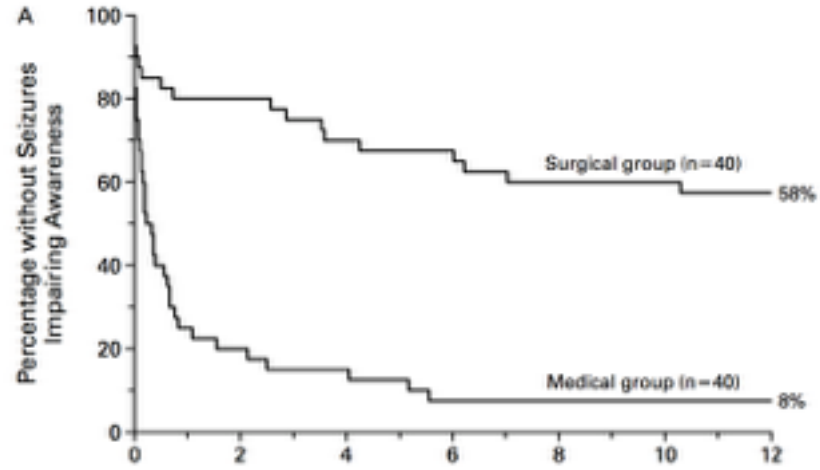
MICA-MNI.GITHUB.IO

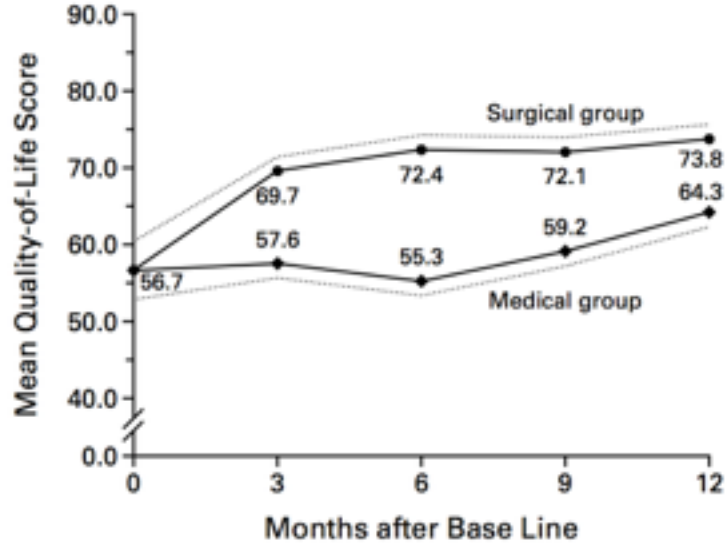
TEMPORAL LOBE EPILEPSY (TLE)

MOST COMMON DRUG-RESISTANT EPILEPSY IN ADULTS

SURGERY MOST EFFECTIVE TREATMENT

SURGERY HIGHLY UNDERUTILIZED AND ~20 YEARS PASS UNTIL OPERATION





Wiebe et al. (2001) NEJM

IS TLE A PROGRESSIVE DISORDER?

LONGER DURATION RELATED TO COGNITIVE DECLINE

REDUCED CHANCES OF SEIZURE CONTROL

MRI-BASED ASSESSMENTS OF PROGRESSION

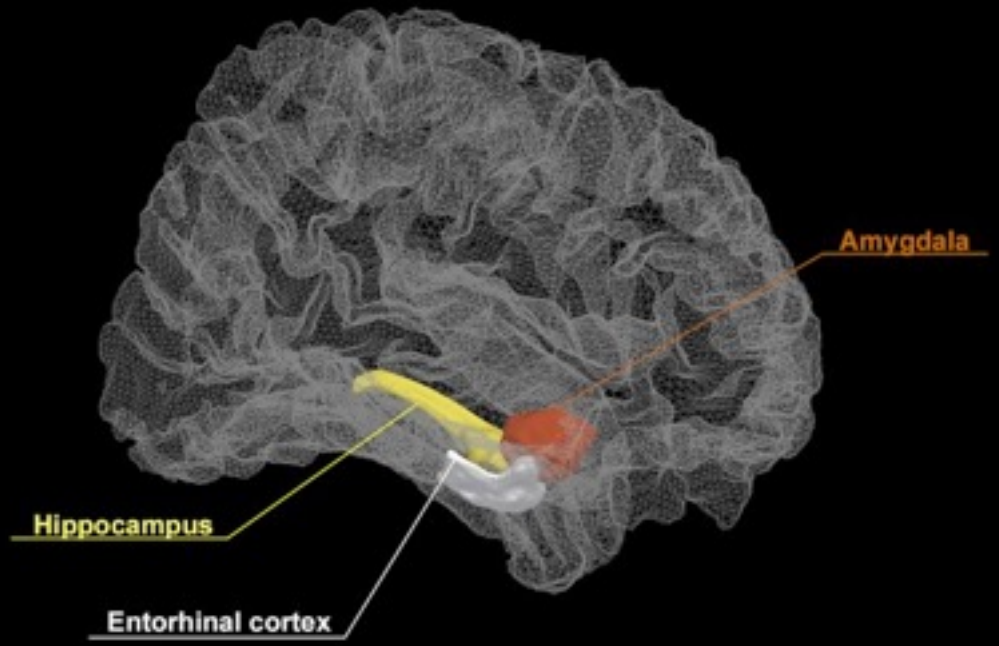
QUANTITATIVE
INDICES OF ANATOMY

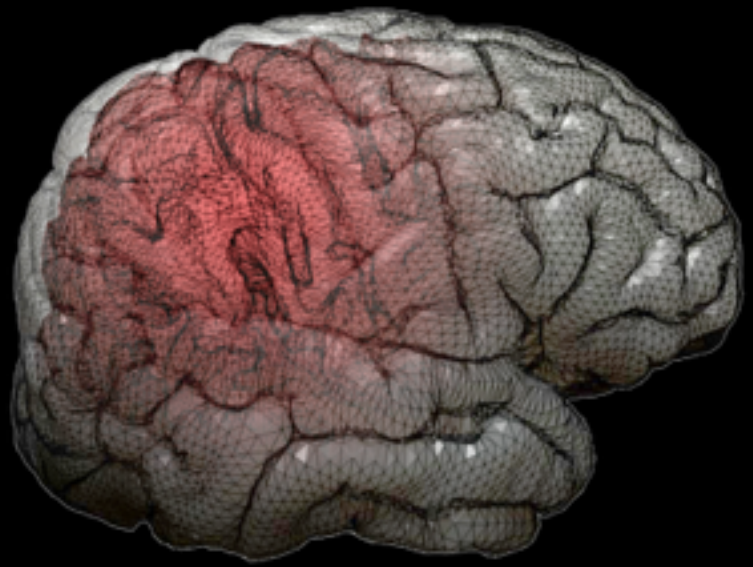
VOLUMETRY,
VBM, CORTICAL THICKNESS

SEVERAL STUDIES IN TLE
SUGGEST PROGRESSION

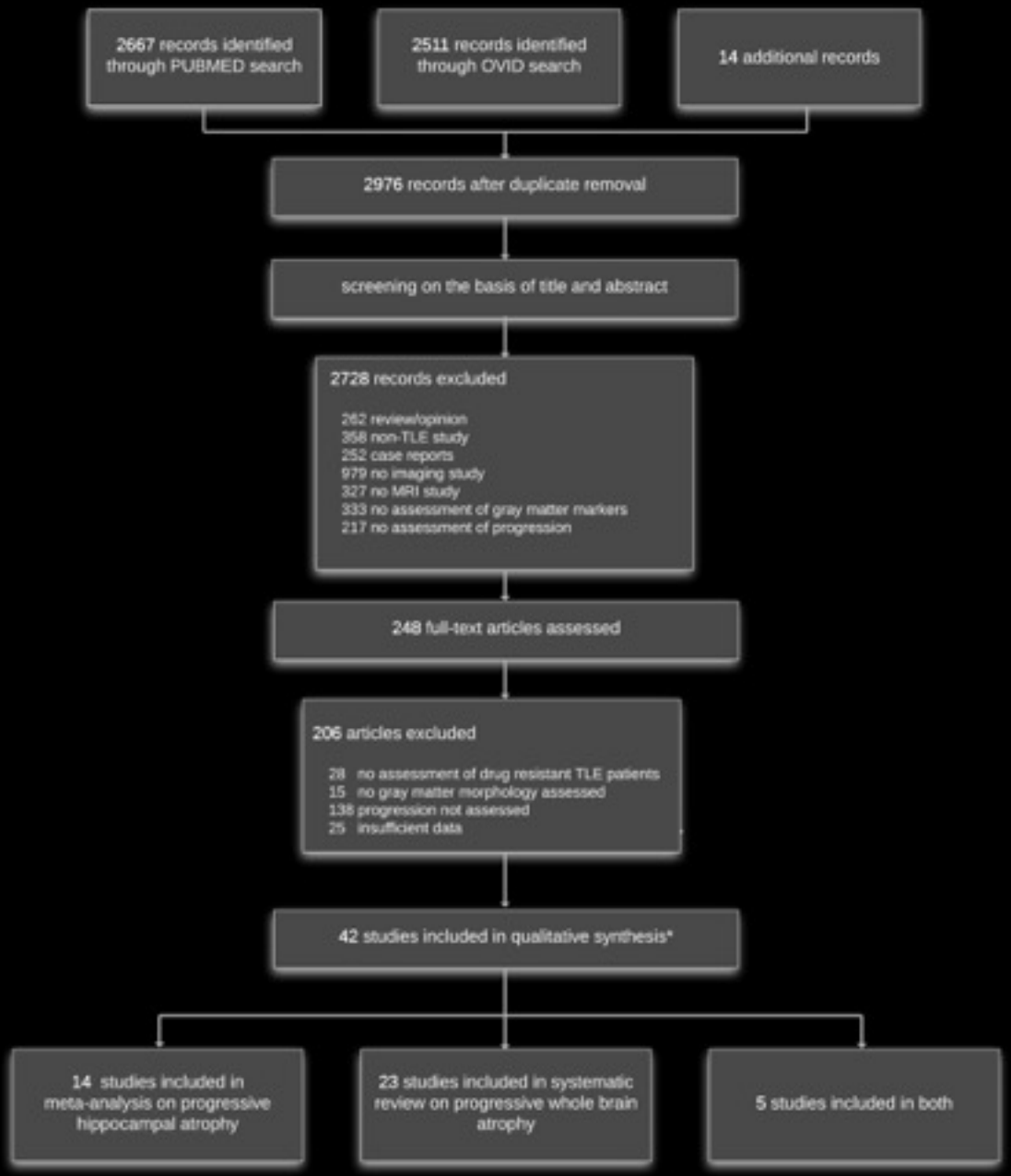
FINDINGS ARE NOT WITHOUT
CONTROVERSY

SYSTEMATIC REVIEWS
CAN SYNTHESIZE EVIDENCE, BUT
ARE ABSENT IN THE FIELD





PRISMA SCHEME



SYSTEMATIC REVIEW:
STUDY DESIGN VARIABILITY

DIFFERENT REGIONS ASSESSED
HIPPOCAMPUS: 19
WHOLE-BRAIN: 28

CROSS-SECTIONAL > LONGITUDINAL STUDIES:
HIPPOCAMPUS: 18/1
WHOLE-BRAIN: 25/3

CROSS-SECTIONAL:
DURATION/SEIZURE CORRELATIONS: 92%/63%
NO/VARIABLE AGE CORRECTION: 47%/53%

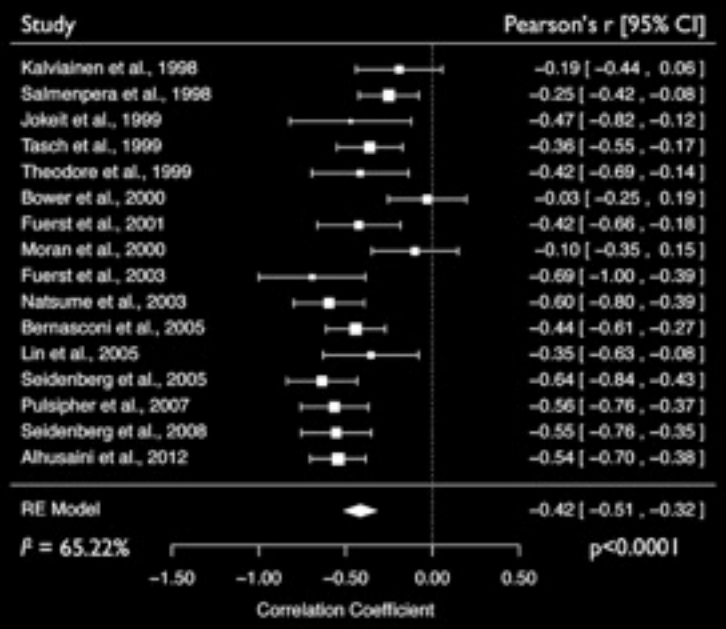
LONGITUDINAL:
SINGLE COHORT/MULTI-COHORT: 3/1

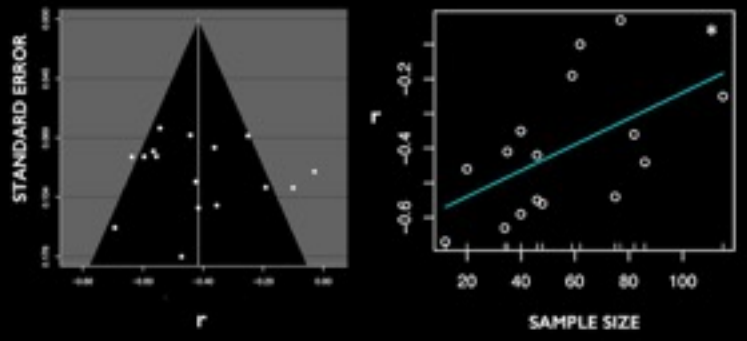
MORPHOMETRY:
MANUAL/AUTOMATED HIPPOCAMPAL VOLUMETRY: 13/6
VOLUMETRY/VBM/SURFACE-BASED: 11/5/11

META-ANALYSIS ON PROGRESSIVE ATROPHY IN HIPPOCAMPUS

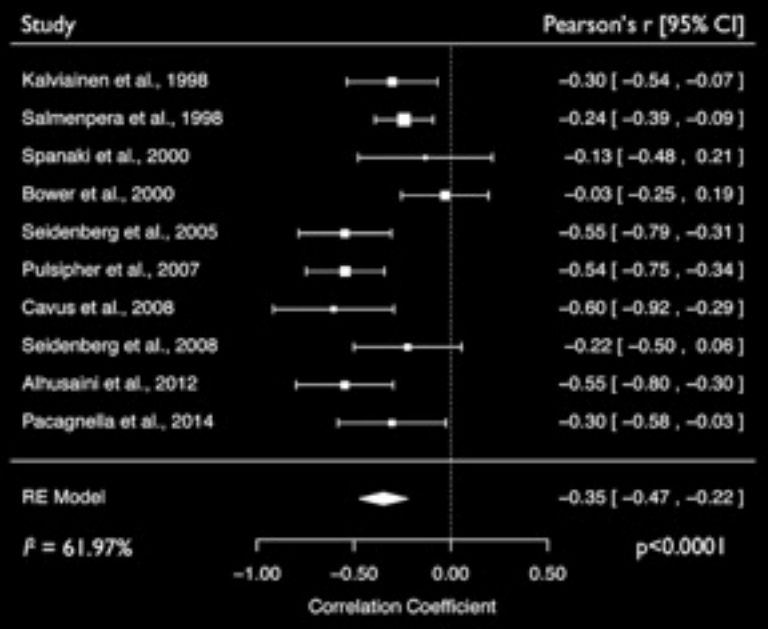
A IPSILATERAL

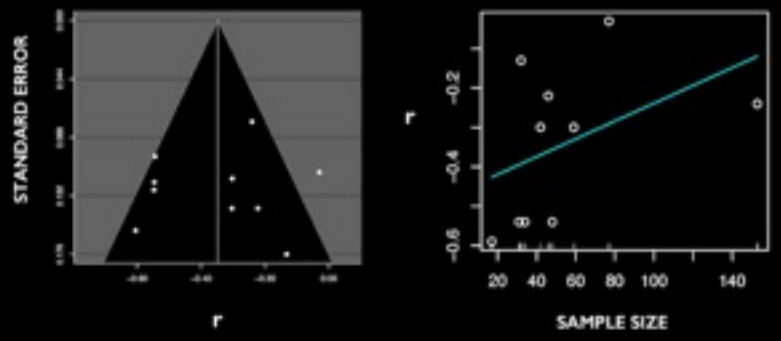
DURATION





SEIZURES





A CROSS-SECTIONAL STUDIES

	n	METHOD	MTL	EMTL	ETL	SC
MARSH 1997	14	MVOL	NO PROGRESSION	NO PROGRESSION	PROGRESSIVE ATROPHY	NOT ASSESSED
LEE 1998	27	AVOL	NOT ASSESSED	PROGRESSIVE ATROPHY	NOT ASSESSED	NOT ASSESSED
SALMENPERA 2000	36	MVOL	PROGRESSIVE ATROPHY	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
KELLER 2002	116	VBM	NO PROGRESSION	NO PROGRESSION	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY
NATSUME 2003	40	MVOL	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	PROGRESSIVE ATROPHY
BERNASCONI 2005	86	MVOL	PROGRESSIVE ATROPHY	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
BONILHA 2005	36	VBM	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY
SZABO 2006	40	MVOL	PROGRESSIVE ATROPHY	NOT ASSESSED	NOT ASSESSED	PROGRESSIVE ATROPHY
PULSIPHER 2007	48	AVOL	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	PROGRESSIVE ATROPHY
LIN 2007	30	CTX	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	NOT ASSESSED
BERNHARDT 2008	110	CTX	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	NOT ASSESSED
MCDONALD 2008A	21	CTX	NO PROGRESSION	NO PROGRESSION	PROGRESSIVE ATROPHY	NOT ASSESSED
MCDONALD 2008B	21	AVOL	NO PROGRESSION	NOT ASSESSED	NOT ASSESSED	PROGRESSIVE ATROPHY
SEIDENBERG 2008	46	AVOL	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	PROGRESSIVE ATROPHY
BERNHARDT 2009	121	CTX	PROGRESSIVE ATROPHY	NO PROGRESSION	PROGRESSIVE ATROPHY	NOT ASSESSED
BRAZDIL 2009	20	VBM	NO PROGRESSION	NO PROGRESSION	NO PROGRESSION	PROGRESSIVE ATROPHY
KEMMOTSU 2011	36	CTX	NO PROGRESSION	NO PROGRESSION	PROGRESSIVE ATROPHY	NOT ASSESSED
ALHUSAINI 2012A	75	AVOL	PROGRESSIVE ATROPHY	NOT ASSESSED	NOT ASSESSED	PROGRESSIVE ATROPHY
ALHUSAINI 2012B	70	CSA	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	NO PROGRESSION	NOT ASSESSED
BERNHARDT 2012	36	SSA	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	PROGRESSIVE ATROPHY
KELLER 2012	62	AVOL	PROGRESSIVE ATROPHY	NO PROGRESSION	NOT ASSESSED	NO PROGRESSION
COAN 2014	118	VBM	NO PROGRESSION	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY
KELLER 2015A	87	VBM/MVOL	NO PROGRESSION	NOT ASSESSED	NOT ASSESSED	PROGRESSIVE ATROPHY
MORGAN 2015	33	AVOL	PROGRESSIVE ATROPHY	NOT ASSESSED	NOT ASSESSED	PROGRESSIVE ATROPHY
KELLER 2015B	115	CTX/SSA	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY

ANATOMICAL SCHEME

PROGRESSIVE ATROPHY

NO PROGRESSION

NOT ASSESSED

SYMBOLS

B LONGITUDINAL STUDIES

BERNHARDT 2009	18	CTX	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	NOT ASSESSED
COAN 2009	33	VBM	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY
BERNHARDT 2010	27	CTX	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	PROGRESSIVE ATROPHY	NOT ASSESSED

SENSITIVITY ANALYSIS

CONSISTENT FINDINGS WERE OBSERVED WHEN:

ONLY 1 PAPER PER RESEARCH GROUP WAS ASSESSED

ONLY PRESURGICAL COHORTS WERE ASSESSED

SUMMARY AND CONCLUSIONS

EXISTING LITERATURE OVERALL SUPPORTIVE OF PROGRESSION
IN HIPPOCAMPUS AND WHOLE BRAIN

FINDINGS MAY MOTIVATE EFFORTS FOR IMPROVED REFERRAL PATTERS

HOWEVER, THERE ARE LIMITATIONS IN LEVELS OF EVIDENCE:

CROSS-SECTIONAL STUDIES
CANNOT DIRECTLY TEST FOR PROGRESSION

SUBOPTIMAL AGE CONTROL

MULTI-COHORT LONGITUDINAL STUDIES NEEDED

ADEQUATELY POWERED AND ACCELERATED DESIGNS
WITH SHORT FOLLOW-UP TIMES CAN CIRCUMVENT NEED FOR TREATMENT

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