

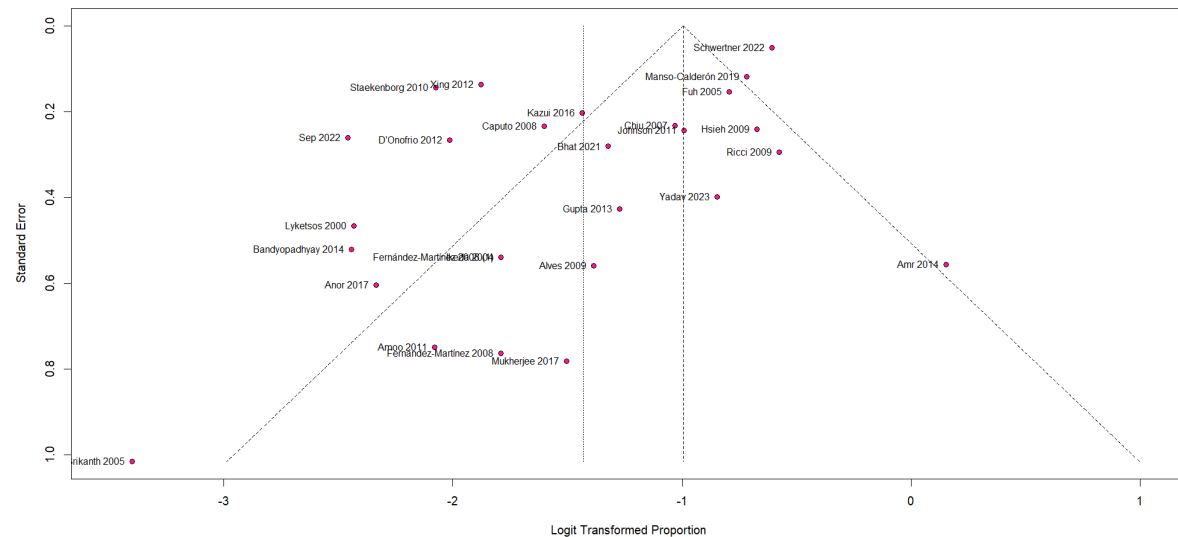
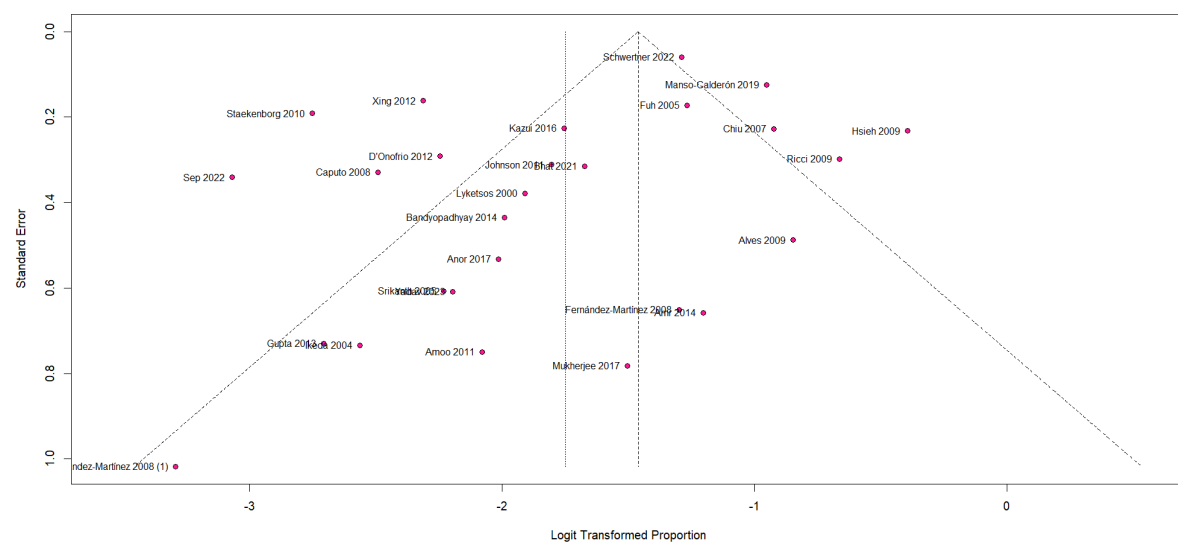
Supplementary Table S1 Search strategies

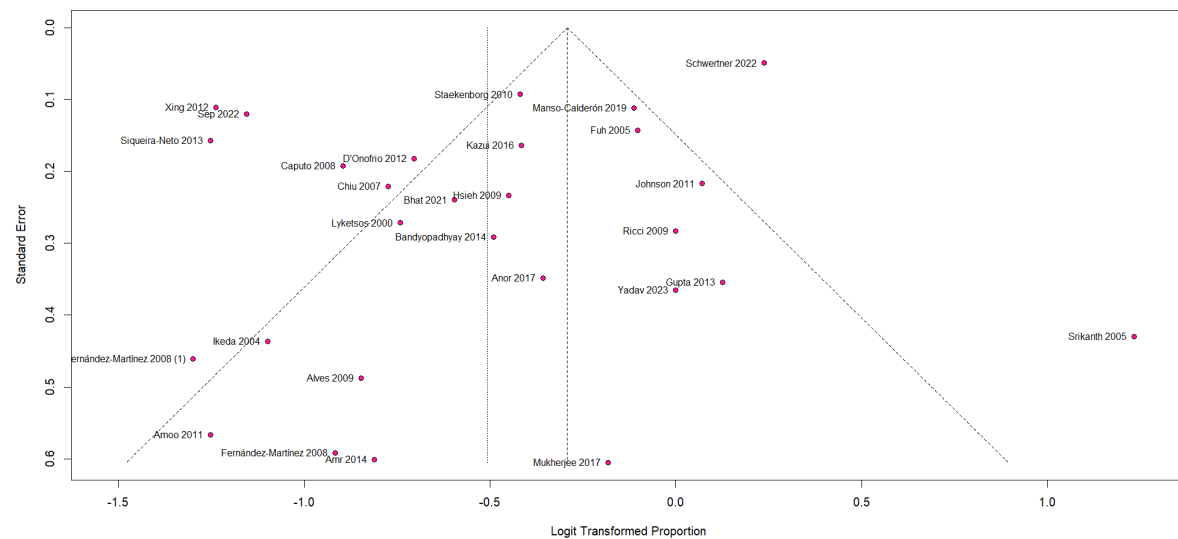
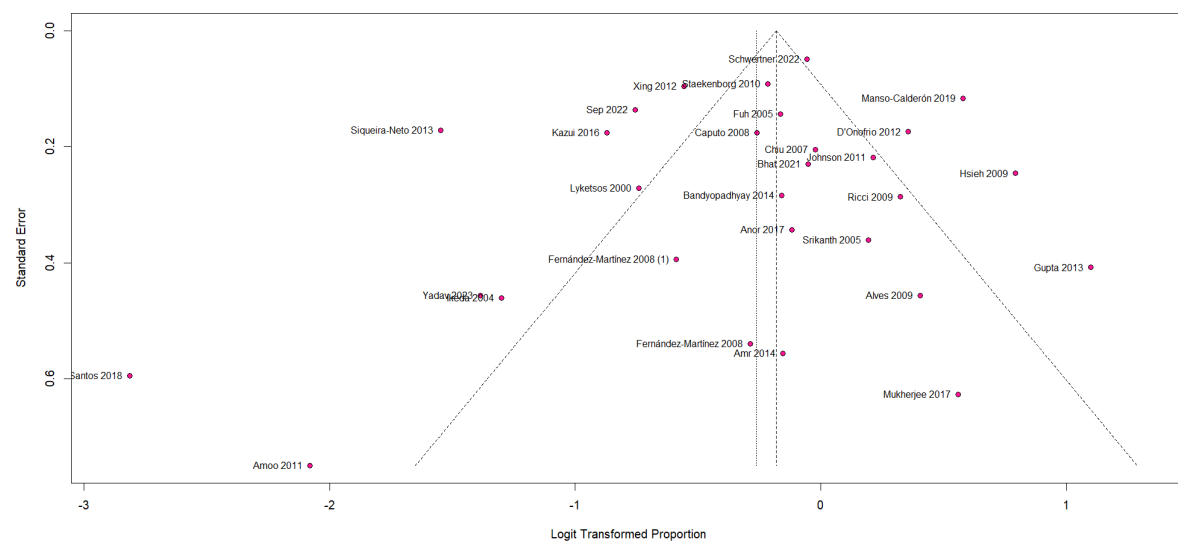
Database	Search strategy
PubMed	("vascular cognitive impairment" OR "vascular dementia" OR VaD OR VCI) AND ("neuropsychiatric symptoms" OR "neuropsychiatric inventory" OR " Behavioral and psychological symptoms of dementia" OR BPSD OR NPS)
Embase	((("vascular cognitive impairment"):ti,ab,kw OR ("vascular dementia"):ti,ab,kw OR (VaD):ti,ab,kw OR (VCI):ti,ab,kw) AND ((("neuropsychiatric symptoms"):ti,ab,kw OR ("neuropsychiatric inventory"):ti,ab,kw OR (" Behavioral and psychological symptoms of dementia"):ti,ab,kw OR (BPSD):ti,ab,kw OR (NPS):ti,ab,kw)
Web of Science	("vascular cognitive impairment" OR "vascular dementia" OR VaD OR VCI) AND ("neuropsychiatric symptoms" OR "neuropsychiatric inventory" OR " Behavioral and psychological symptoms of dementia" OR BPSD OR NPS)

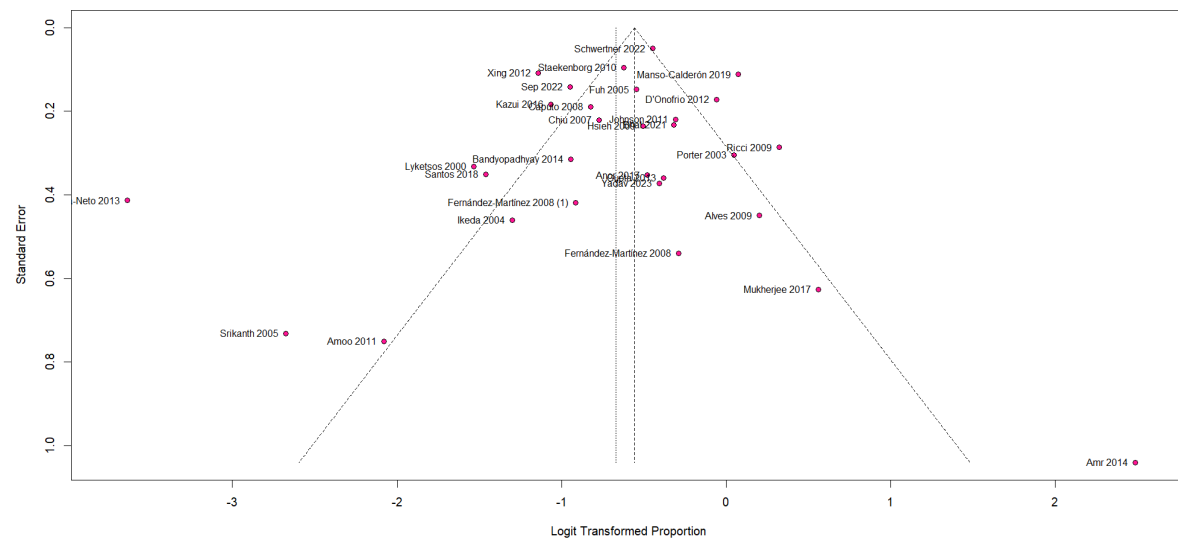
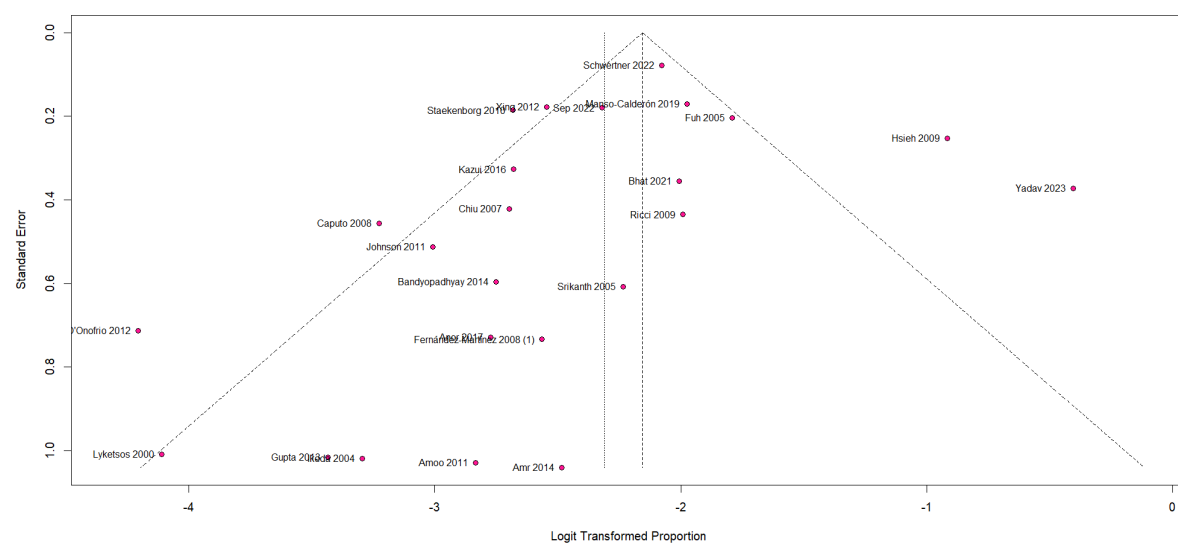
Supplementary Table S2 Quality assessment of the included studies

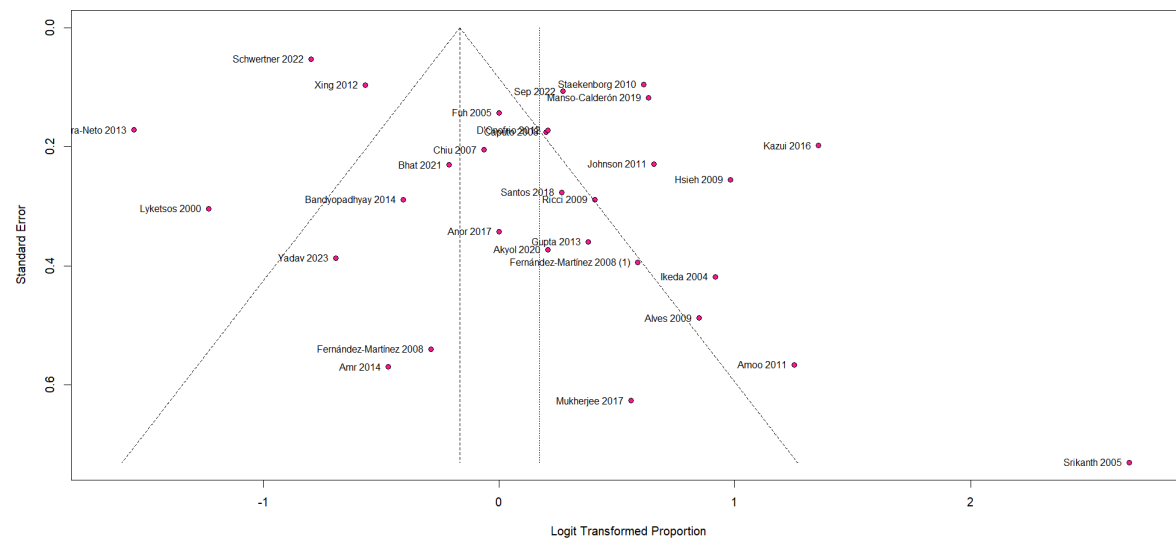
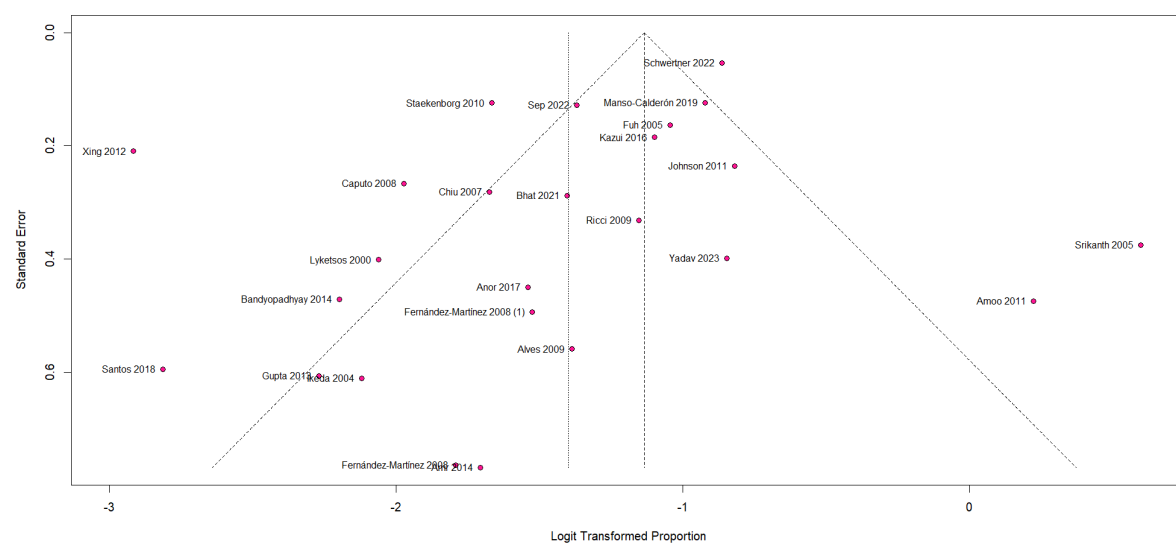
Author	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	RATING
Akyol 2020	YES	YES	NR	YES	NO	NA	NA	NA	YES	NA	YES	NA	NA	YES	FAIR
Alves 2009	YES	YES	NO	YES	NO	NA	NA	NA	YES	NA	YES	YES	NA	NO	FAIR
Amoo 2011	YES	YES	YES	YES	NO	NA	NA	NA	YES	NA	YES	NA	NA	NO	FAIR
Amr 2014	YES	YES	NR	YES	NO	NA	NA	NA	YES	NA	YES	NR	NA	NO	FAIR
Anor 2017	YES	YES	NO	YES	NO	NA	NA	NA	YES	NA	YES	NR	NA	YES	FAIR
Bandyopadhyay 2014	YES	YES	NR	YES	NO	NA	NA	NA	YES	NA	YES	NR	NA	NO	FAIR
Bhat 2021	YES	YES	NO	YES	NO	NA	NA	NA	YES	NA	YES	NR	NA	NO	FAIR
Caputo 2008	YES	YES	YES	YES	NO	NA	NA	NA	YES	NA	YES	NR	NA	YES	FAIR
Chiu 2007	YES	NO	NR	NR	NO	NA	NA	NA	YES	NA	YES	NR	NA	NO	POOR
D'Onofrio 2012	YES	YES	NR	YES	NO	NA	NA	NA	YES	NA	YES	NR	NA	YES	FAIR
Fernández-Martínez 2008	YES	YES	NO	YES	NO	NA	NA	NA	YES	NA	YES	NR	NA	YES	FAIR
Fernández-Martínez 2008 (1)	YES	YES	NO	YES	YES	NA	NA	NA	YES	NA	YES	NR	NA	YES	FAIR
Fonseca 2008	YES	YES	NR	YES	NO	NA	NA	NA	YES	NA	YES	YES	NA	NA	
Fuh 2005	YES	YES	NO	YES	NR	NA	NA	NA	YES	NA	YES	NA	NA	YES	FAIR
Gupta 2013	YES	YES	NR	YES	NO	NA	NA	NA	YES	NA	YES	NR	NA	NO	FAIR
Hsieh 2009	YES	YES	NR	YES	NO	NA	NA	YES	YES	NA	YES	NO	NA	NO	FAIR
Ikeda 2004	YES	YES	YES	YES	NO	NA	NA	YES	YES	NA	YES	NO	NA	NO	FAIR
Johnson 2011	YES	YES	NR	NO	NO	NA	NA	YES	YES	NA	YES	NO	NA	NO	FAIR
Jung 2016	YES	YES	NR	YES	NO	NA	NA	YES	YES	NO	YES	NO	NA	YES	GOOD

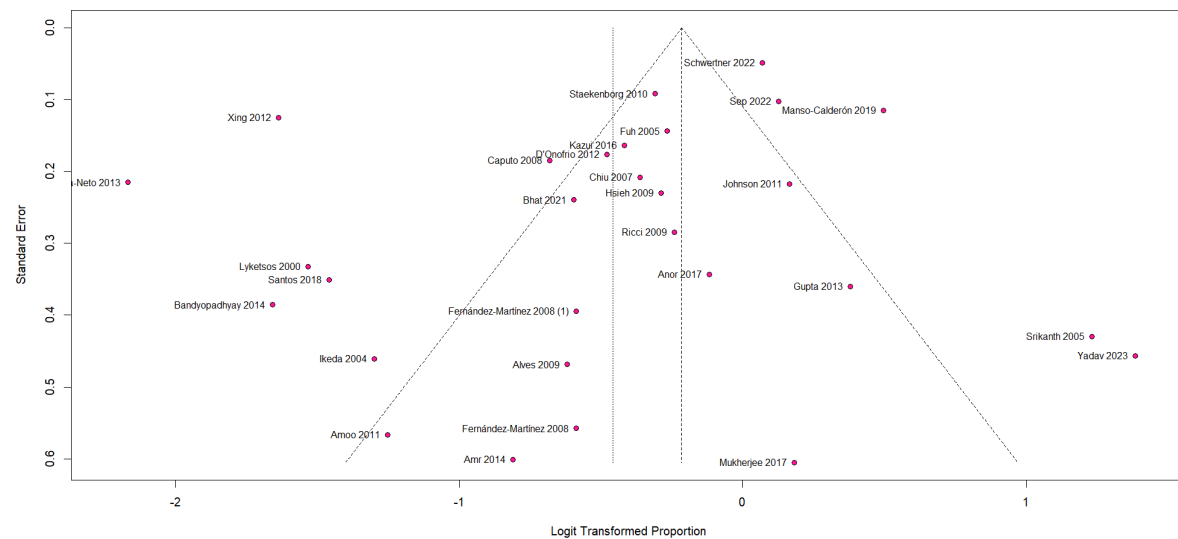
Kazui 2016	YES	YES	NR	YES	NO	NA	NA	YES	YES	NA	YES	NO	NA	NO	FAIR
Kim 2013	YES	YES	NA	YES	NO	NA	NA	YES	YES	NO	YES	YES	NA	NO	GOOD
Lyketsos 2000	YES	YES	NR	YES	NO	NA	NA	YES	YES	NA	YES	NO	NA	NO	FAIR
Manso-Calderón 2019	YES	YES	NR	NO	NO	NA	NA	YES	YES	NO	YES	NO	NA	NO	FAIR
Mukherjee 2017	YES	YES	NR	YES	NO	NA	NA	YES	YES	NA	YES	NO	NA	NO	FAIR
Perri 2016	YES	YES	NA	YES	NO	NA	NA	NA	YES	NO	YES	NO	NA	NO	FAIR
Porter 2003	YES	YES	NR	NO	NO	NA	NA	YES	YES	NA	YES	NO	NA	NO	POOR
Ricci 2009	YES	YES	NR	YES	NO	NA	NA	YES	YES	NA	YES	NO	NA	NO	FAIR
Santos 2018	YES	YES	NR	YES	NO	NA	NA	YES	YES	NA	YES	NO	NA	NO	FAIR
Schwertner 2022	YES	YES	NR	NO	NO	NA	NA	YES	YES	NA	YES	NO	NA	YES	FAIR
Sep 2022	YES	YES	NR	YES	NO	YES	YES	YES	YES	YES	YES	NO	YES	NO	GOOD
Siqueira-Neto 2013	YES	YES	NR	YES	NO	NA	NA	YES	YES	NA	YES	NO	NR	NO	FAIR
Srikanth 2005	YES	YES	NR	YES	NO	NA	NA	YES	YES	NA	YES	NO	NA	NO	FAIR
Staekenborg 2010	YES	YES	NR	YES	NO	NA	NA	YES	YES	NA	YES	NO	NA	YES	GOOD
Xing 2012	YES	YES	NR	YES	NO	NA	NA	YES	YES	NA	YES	NO	NA	YES	GOOD
Yadav 2023	YES	YES	NR	YES	NO	NA	NA	NA)	YES	NA	YES	NO	NA	NO	POOR

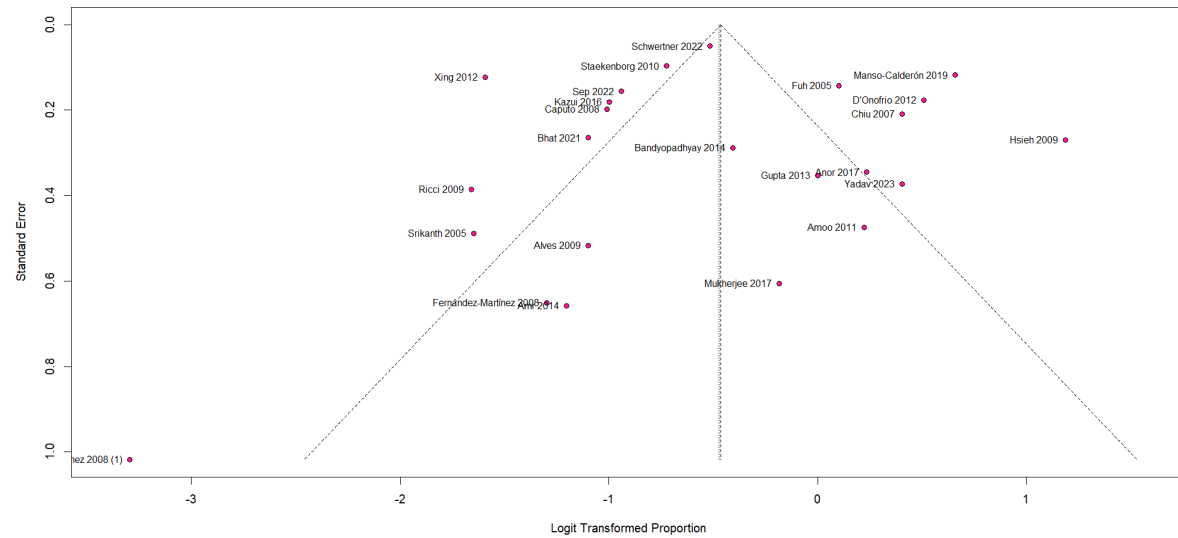
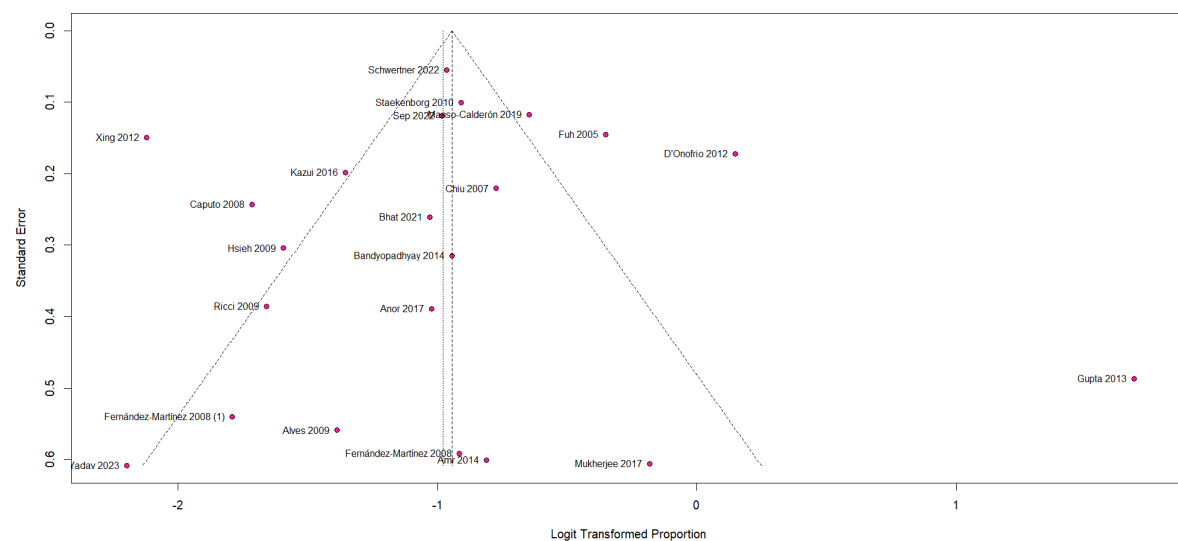
Supplementary Figure S1 Funnel plots for each NPI domain**A. Delusions****B. Hallucinations**

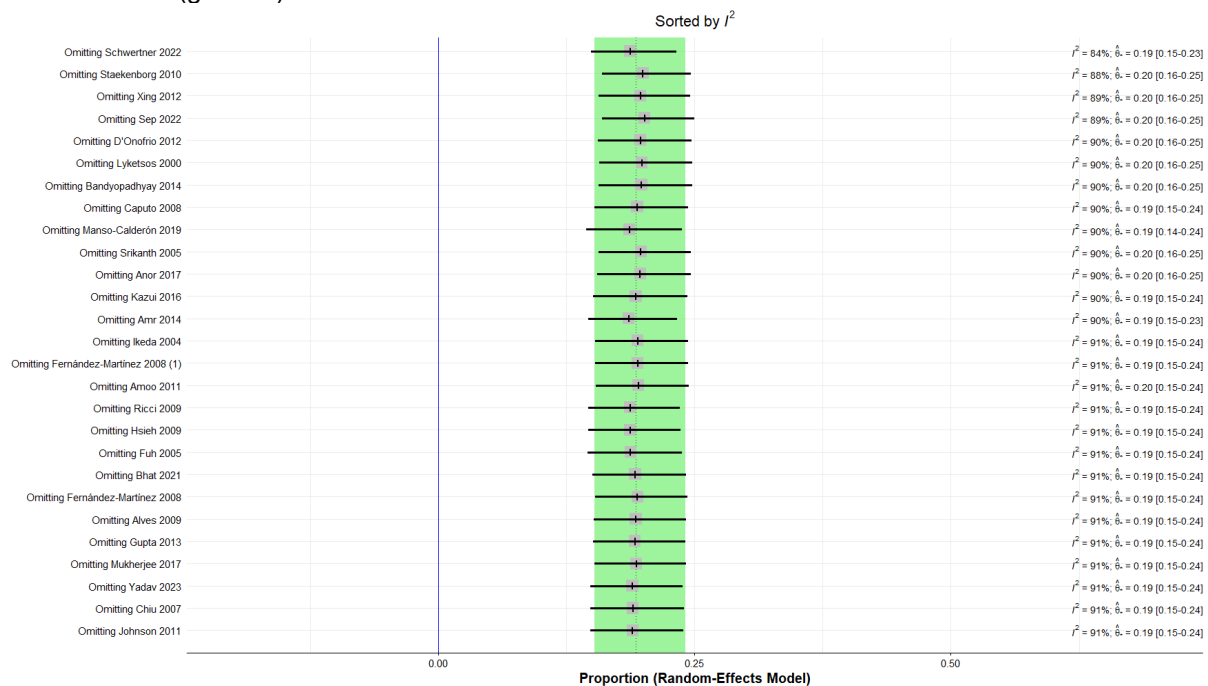
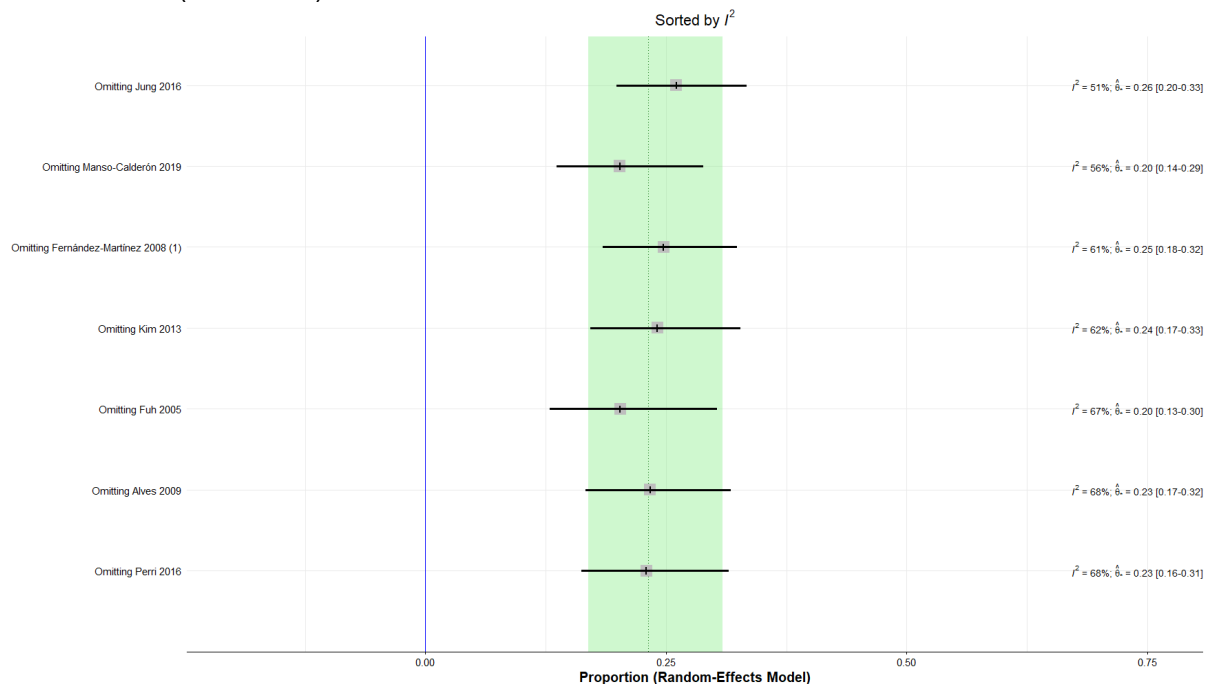
C. Agitation/Aggression**D. Depression/Dysphoria**

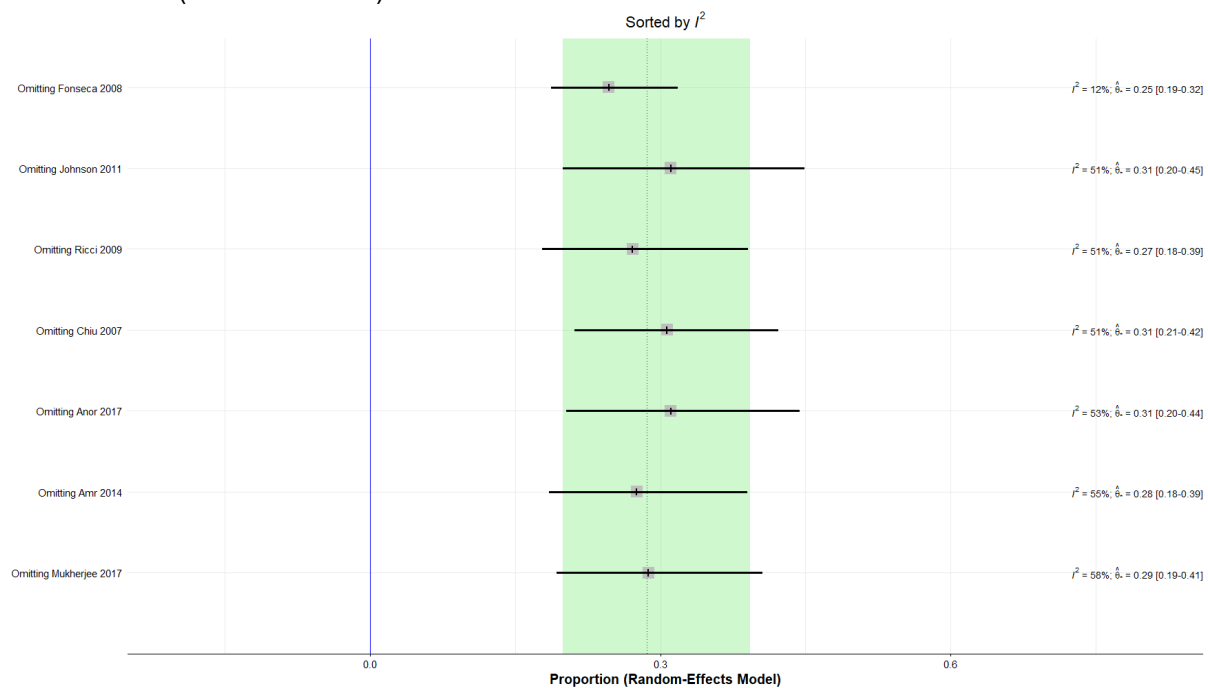
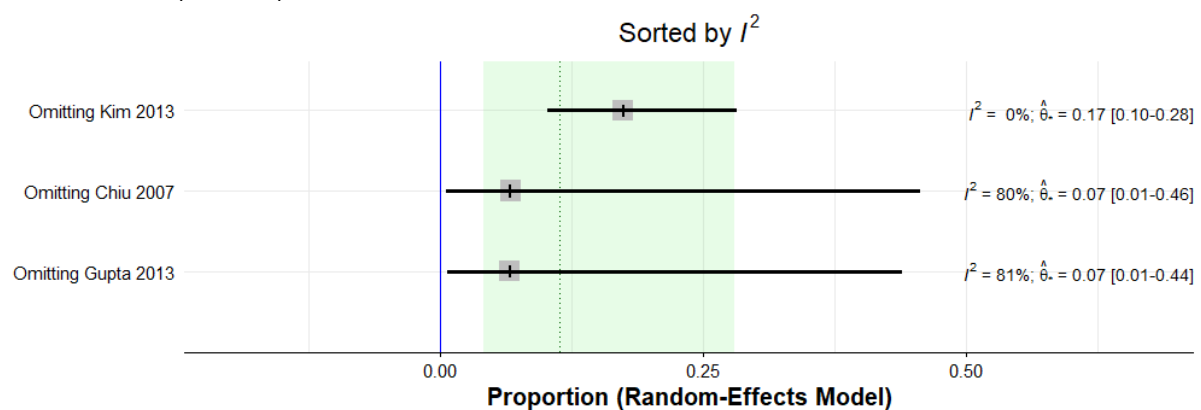
E. Anxiety**F. Elation/Euphoria**

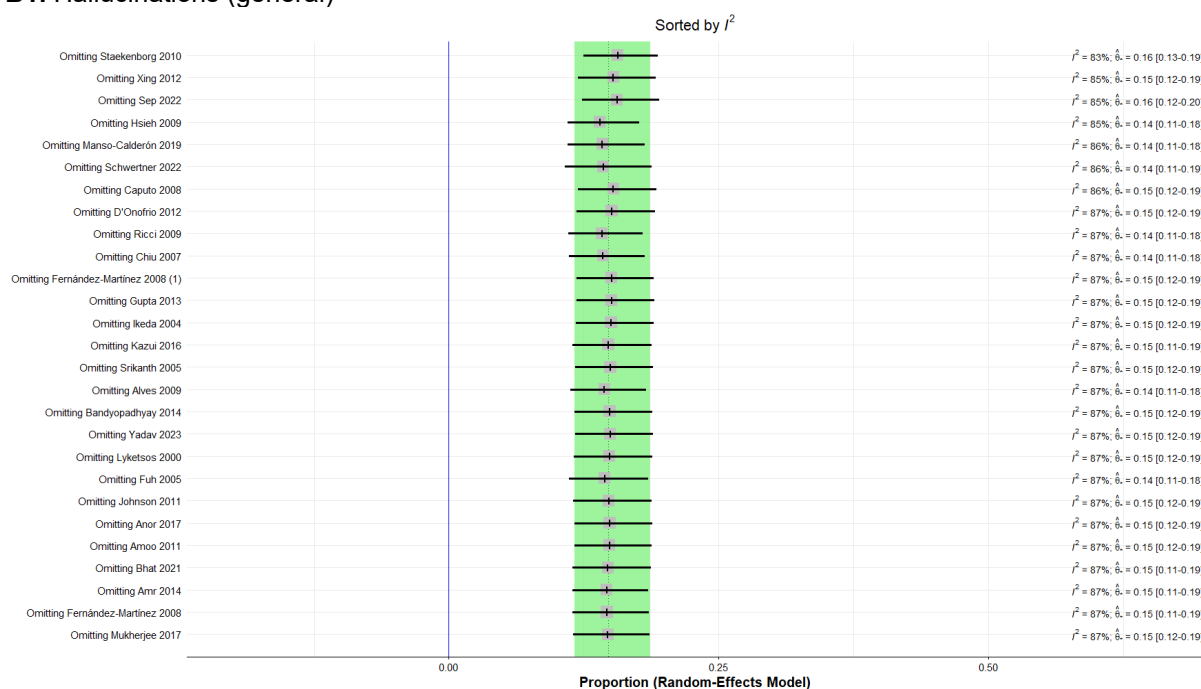
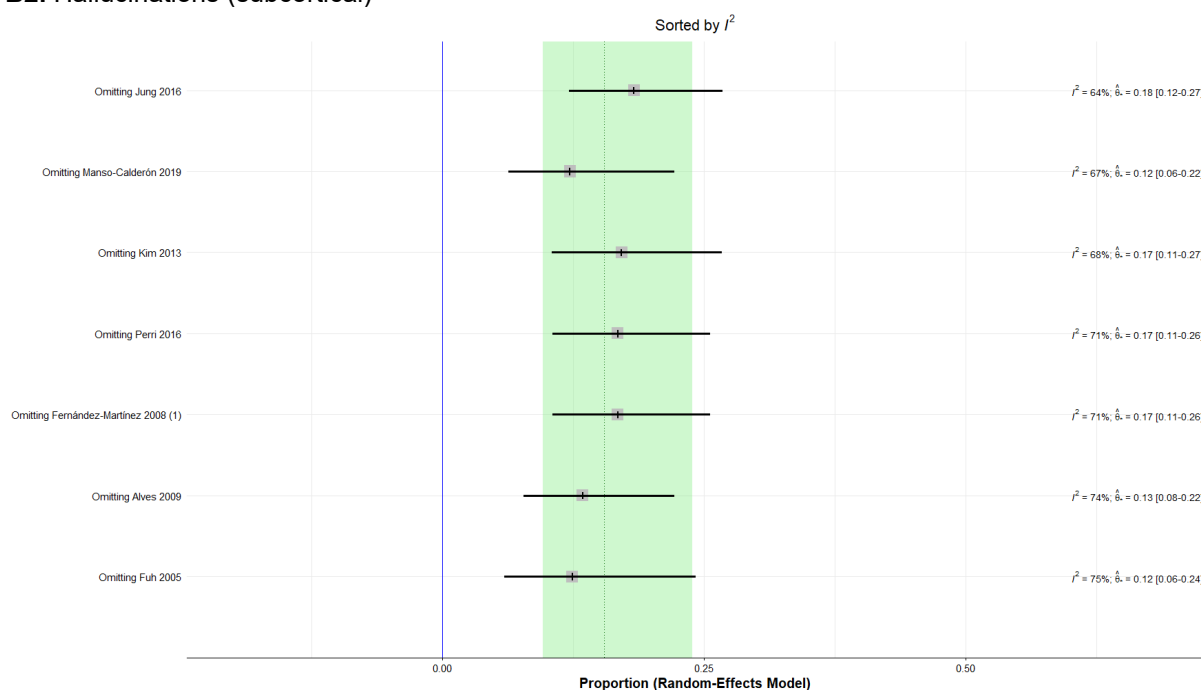
G. Apathy/Indifference**H. Disinhibition**

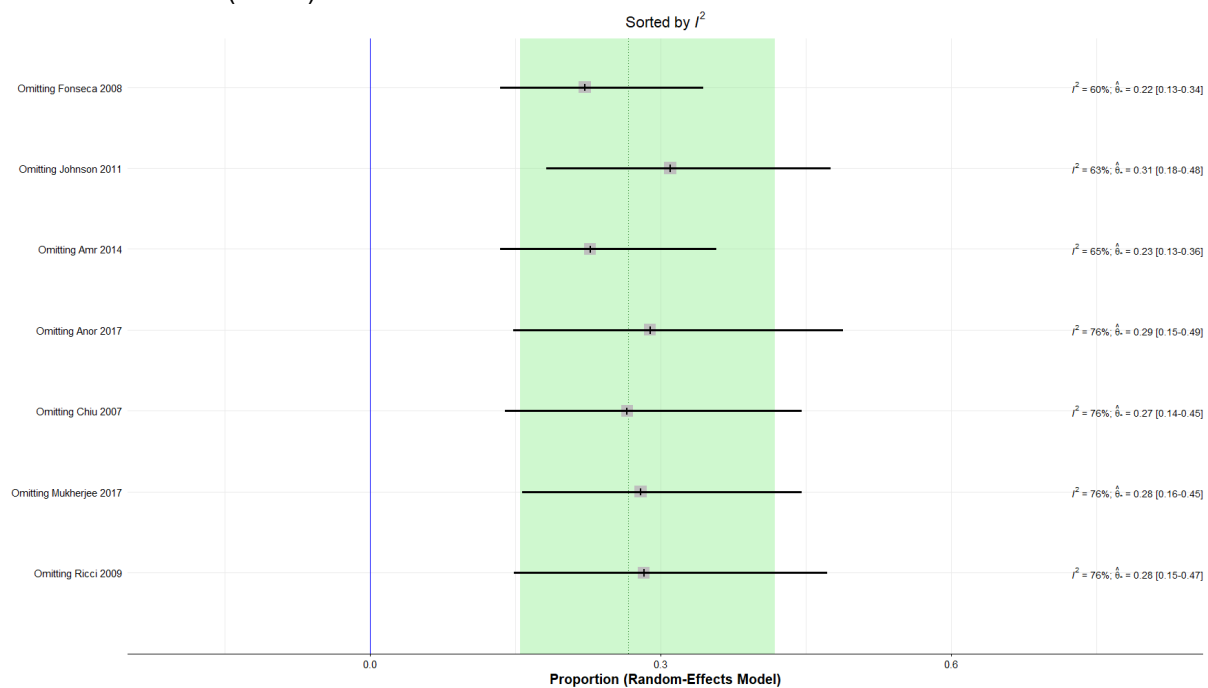
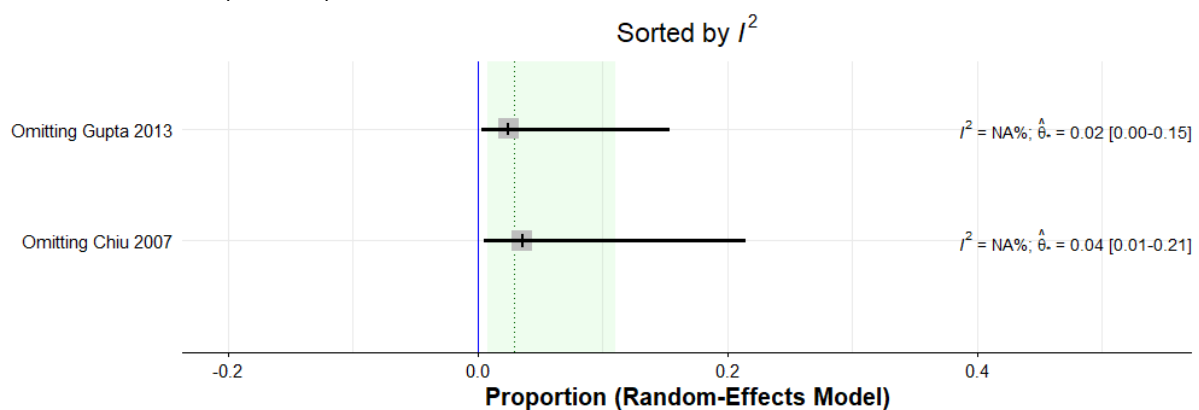
I. Irritability/Lability**J. Aberrant motor behavior**

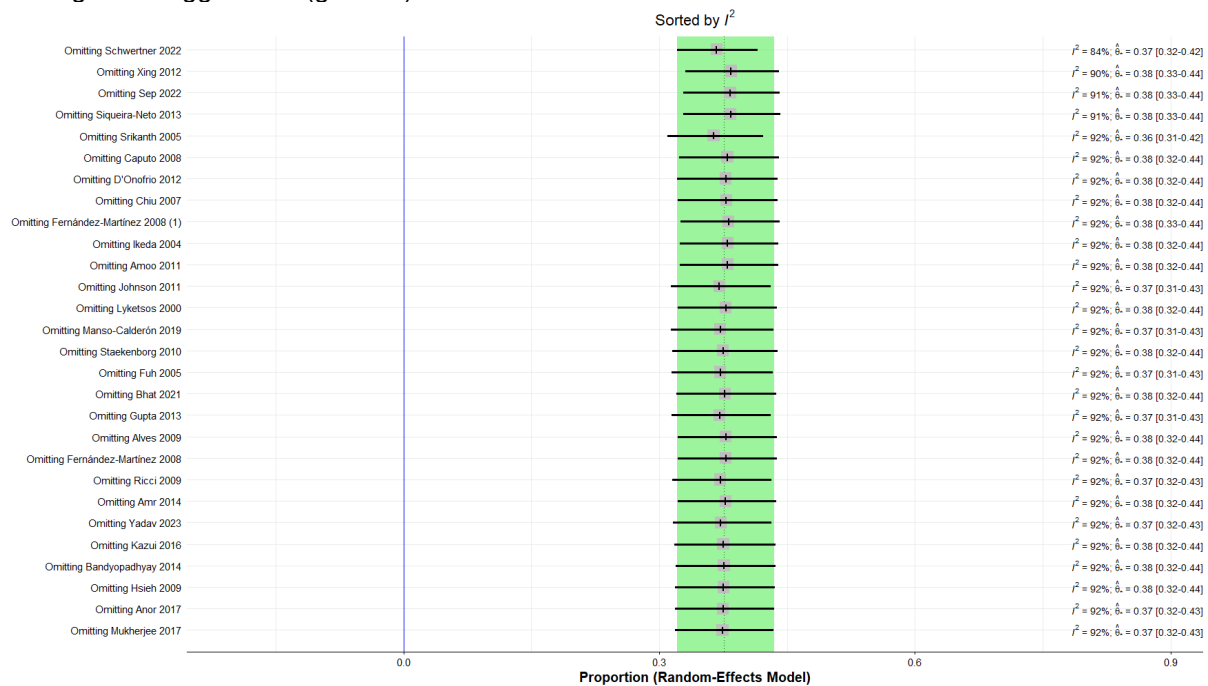
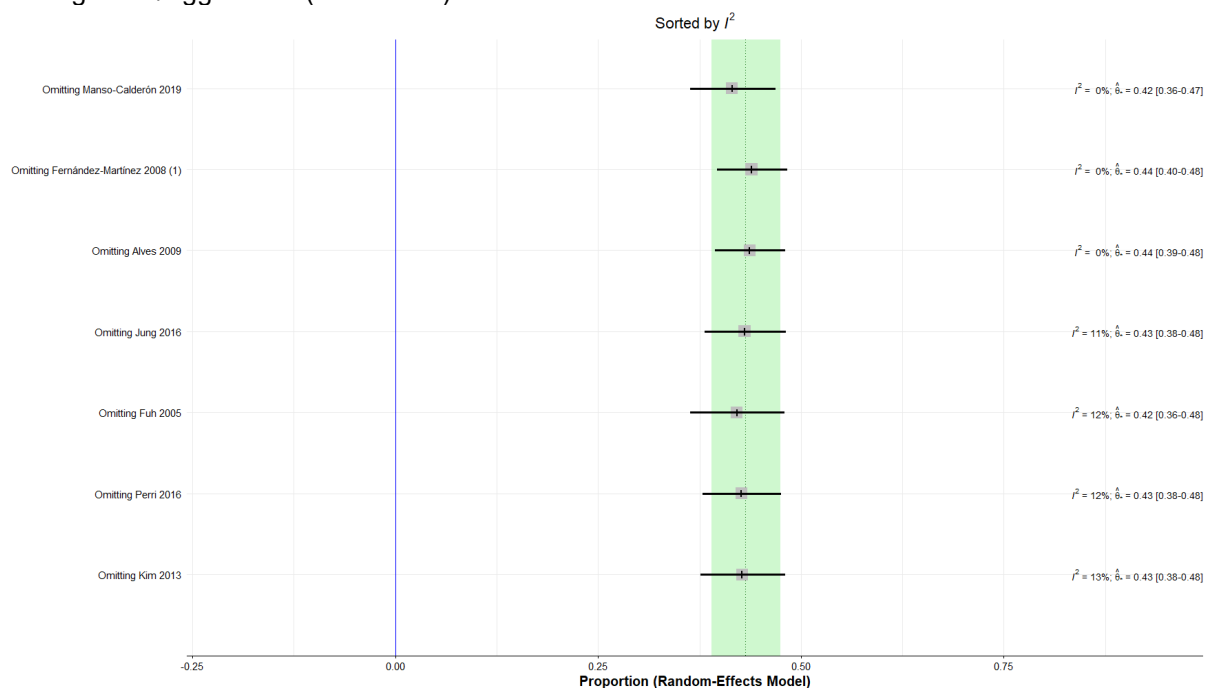
K. Sleep and nighttime disorders**L. Appetite and eating disorders**

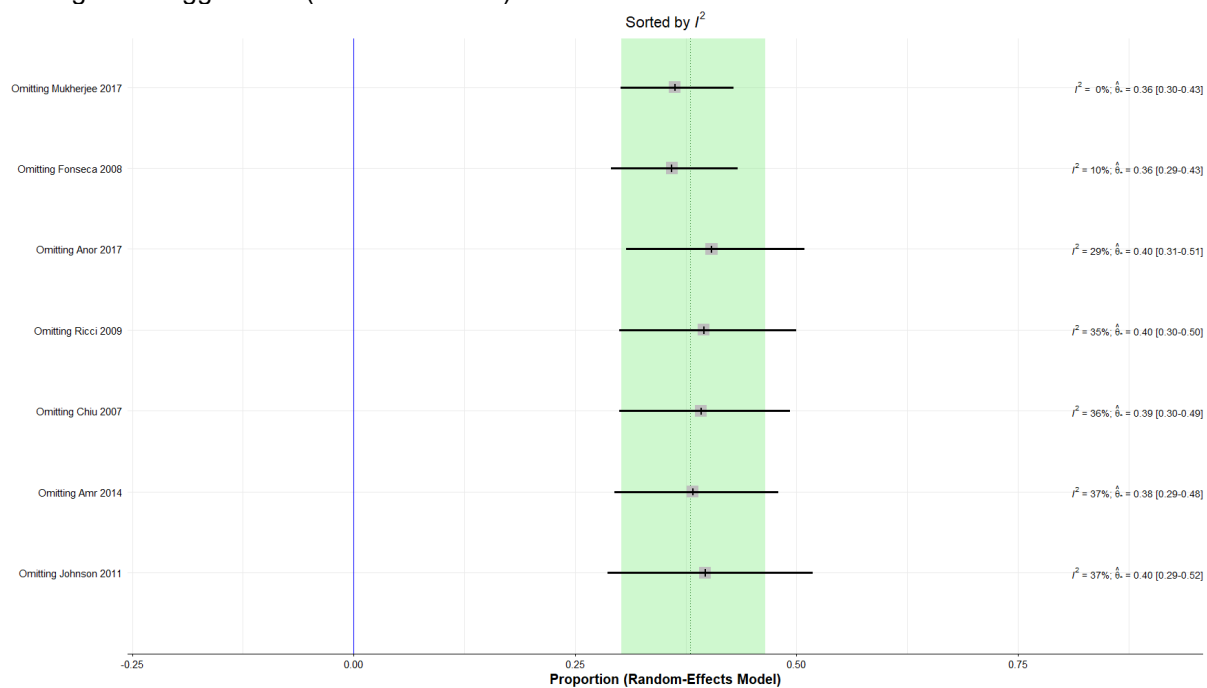
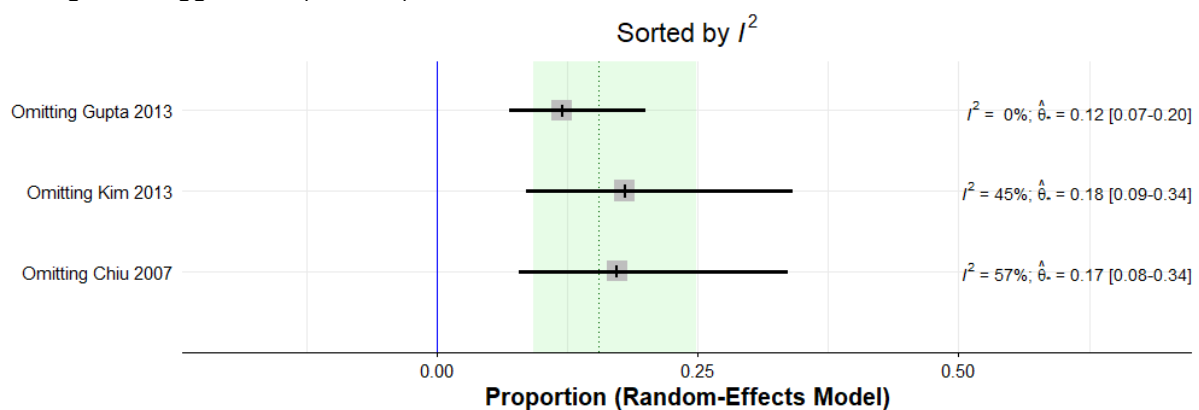
Supplementary Figure S2 Leave-one-out sensitivity analyses for each NPI domain and VCI group**A1. Delusions (general)****A2. Delusions (subcortical)**

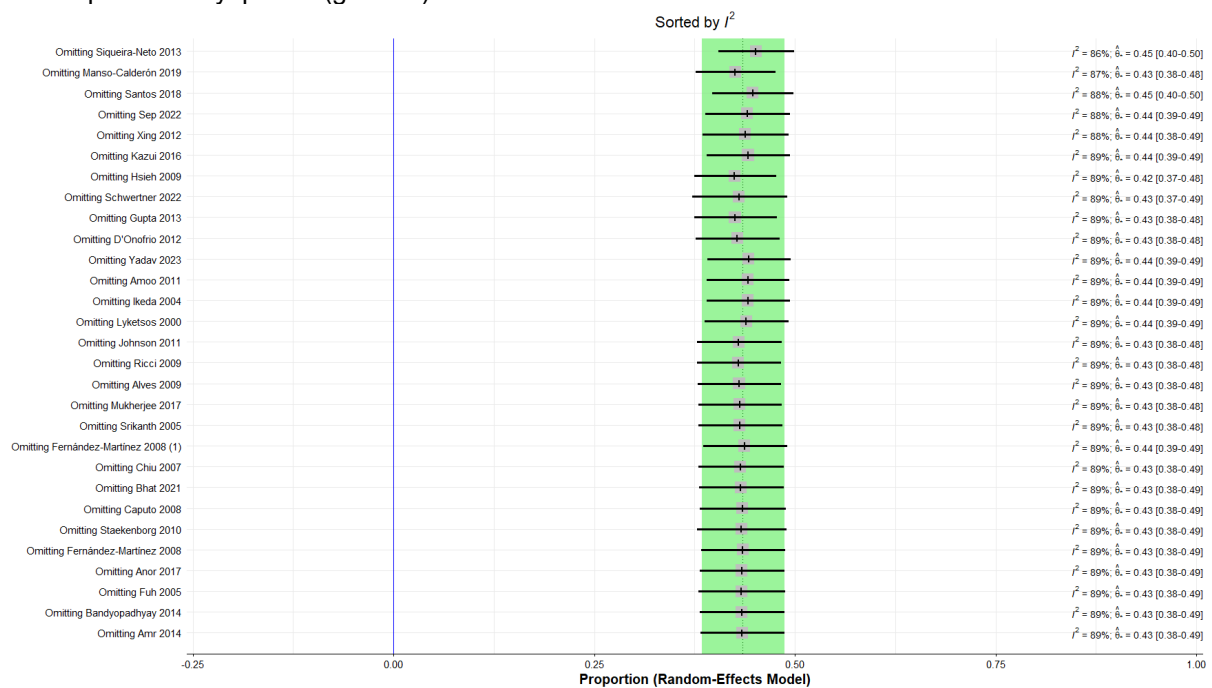
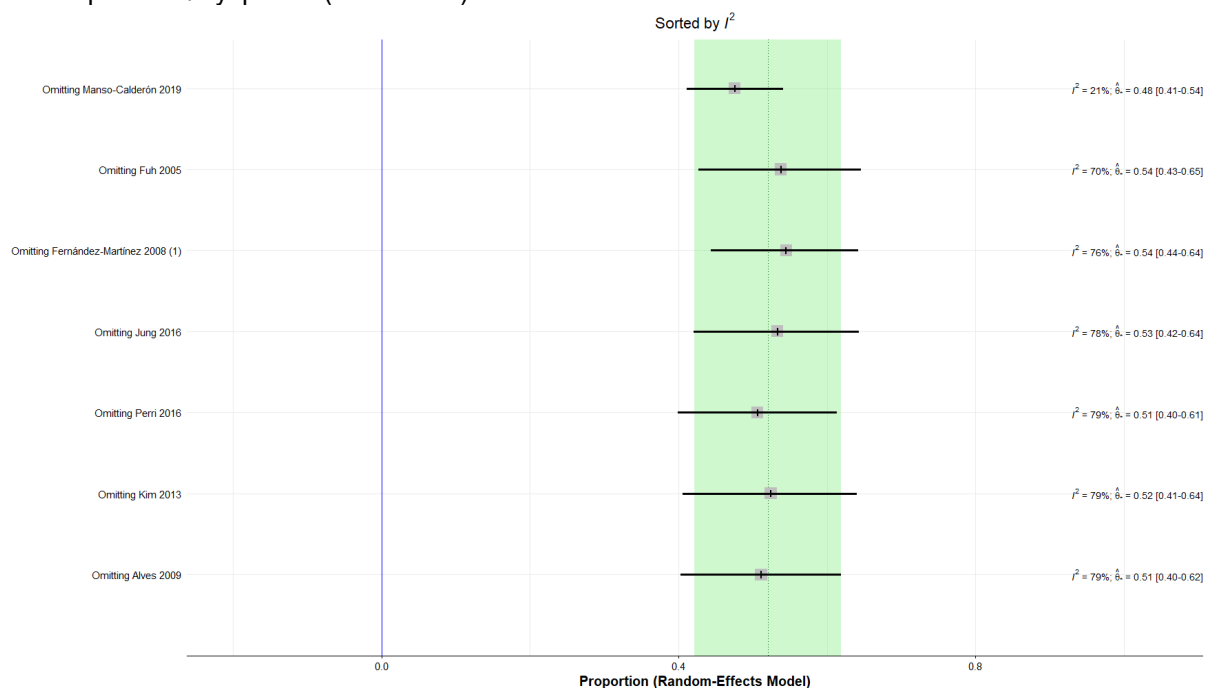
A3. Delusions (mixed dementia)**A4. Delusions (VCI-ND)**

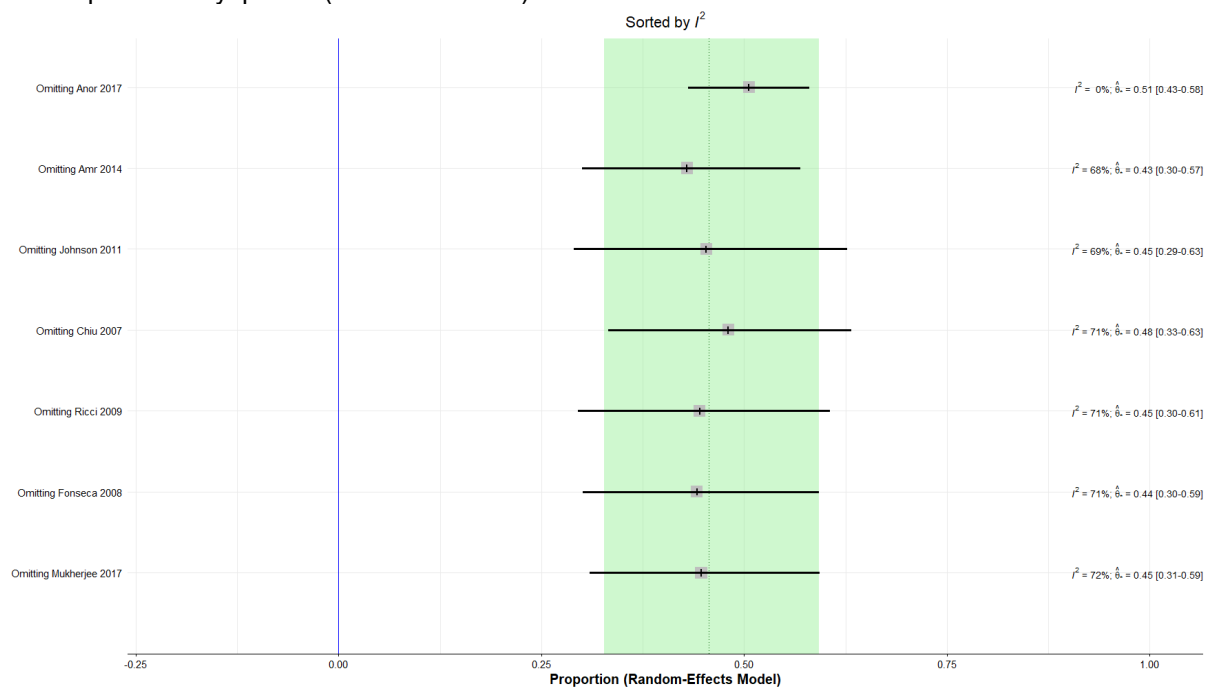
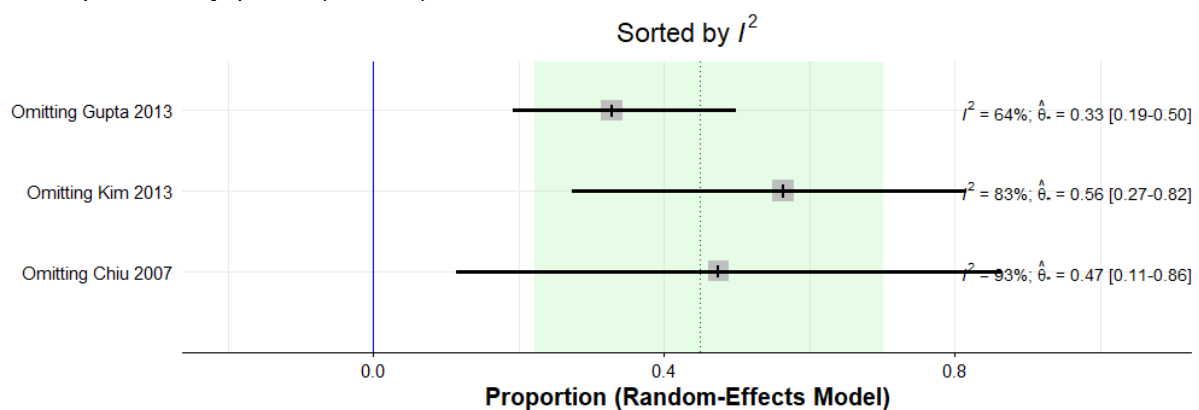
B1. Hallucinations (general)**B2. Hallucinations (subcortical)**

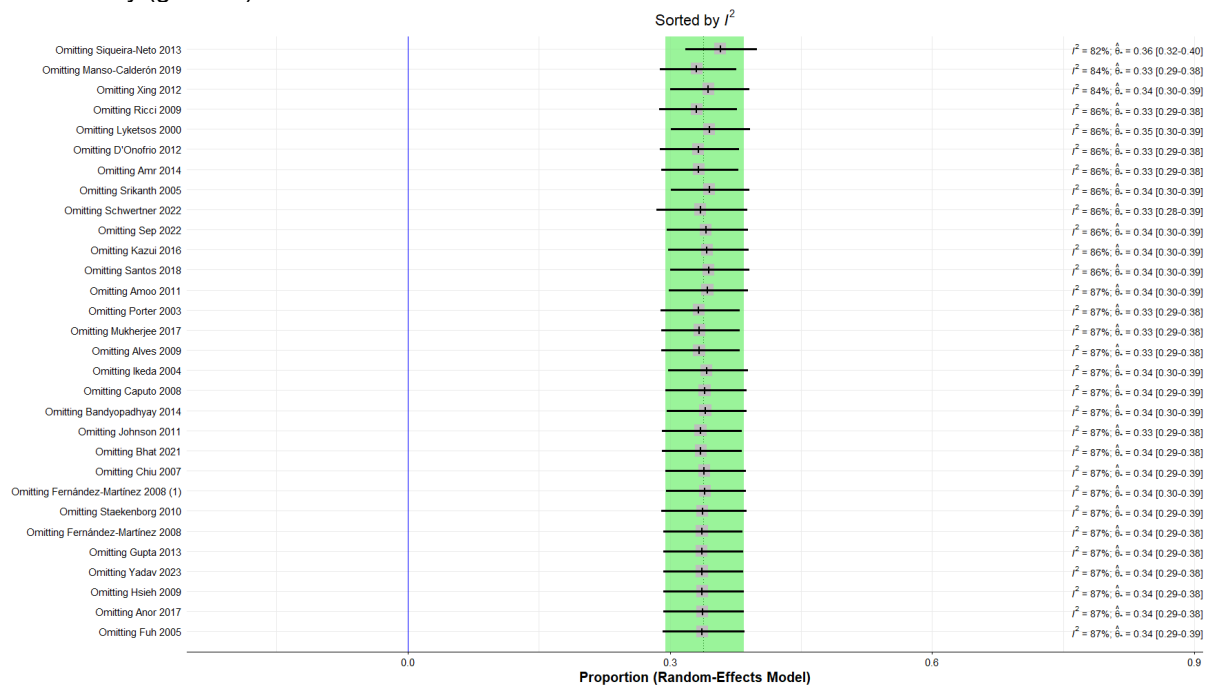
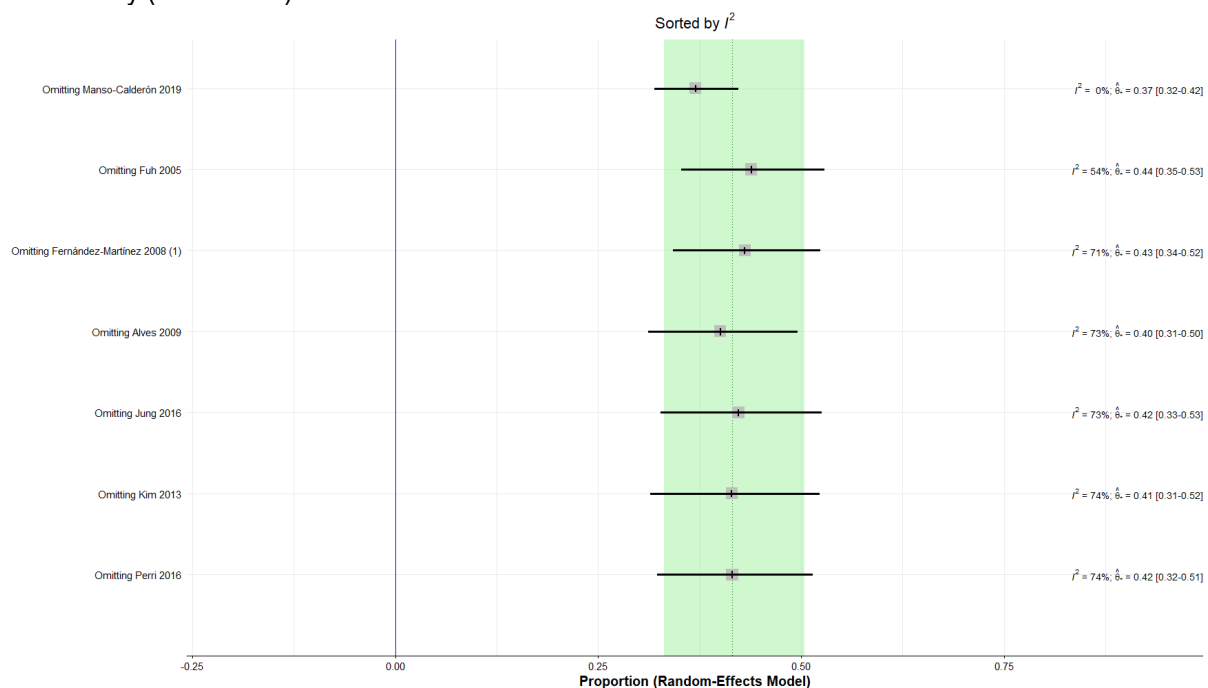
B3. Hallucinations (mixed)**B4. Hallucinations (VCI-ND)**

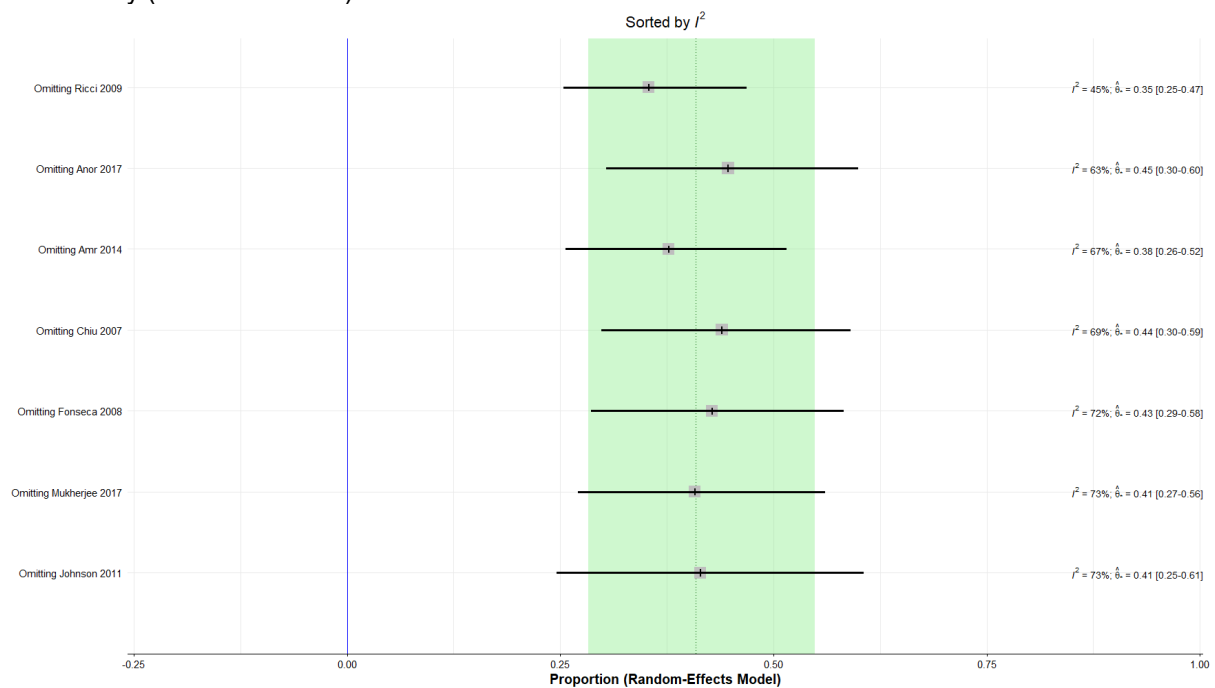
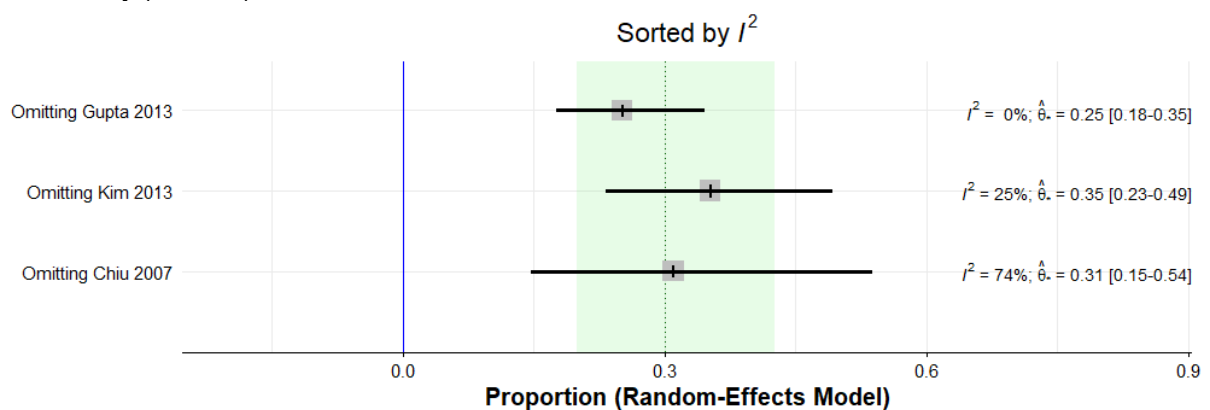
C1. Agitation/Aggression (general)**C2. Agitation/Aggression (subcortical)**

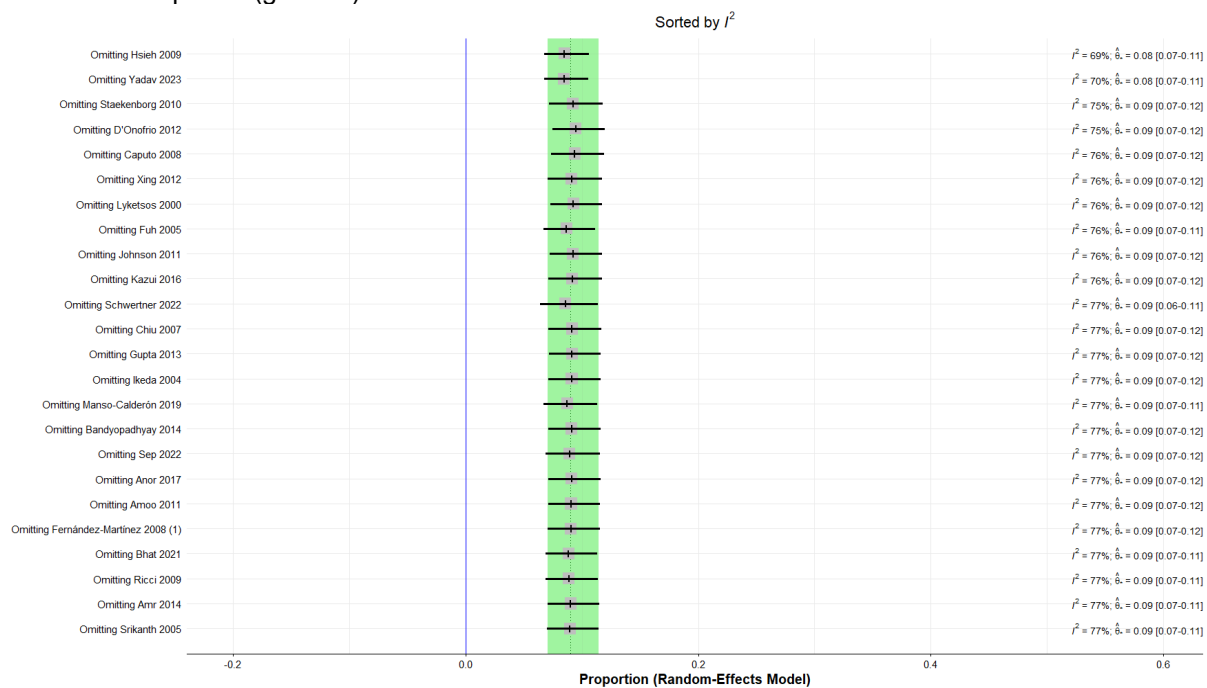
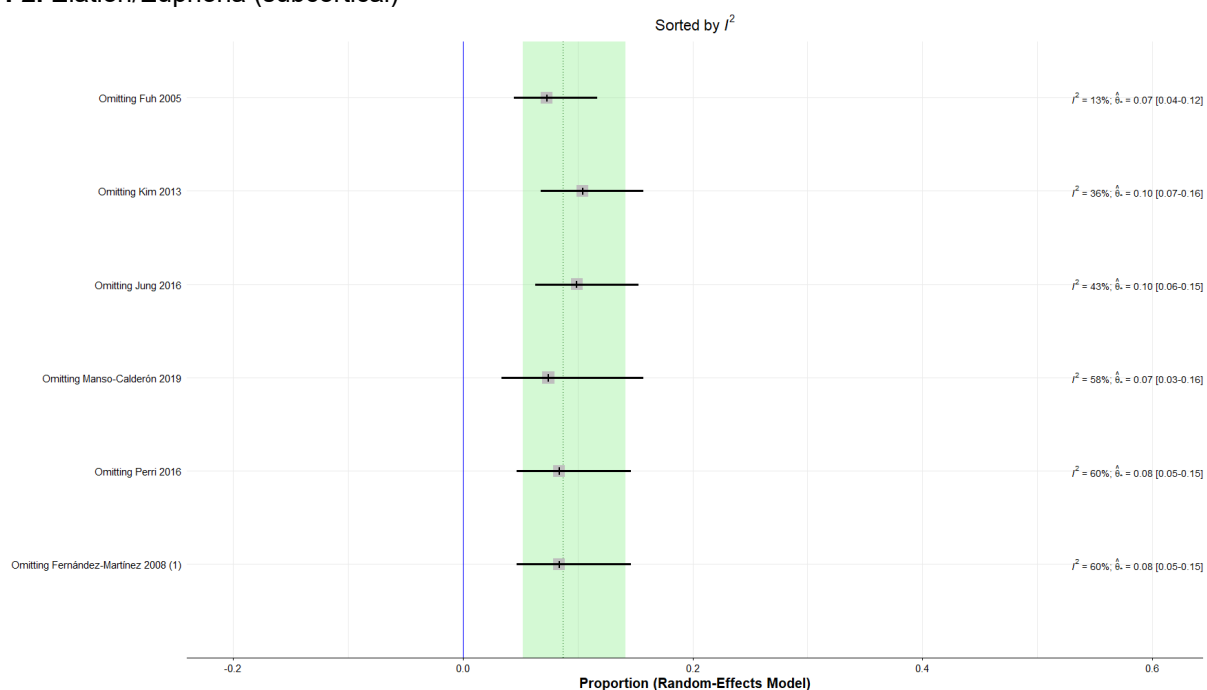
C3. Agitation/Aggression (mixed dementia)**C4. Agitation/Aggression (VCI-ND)**

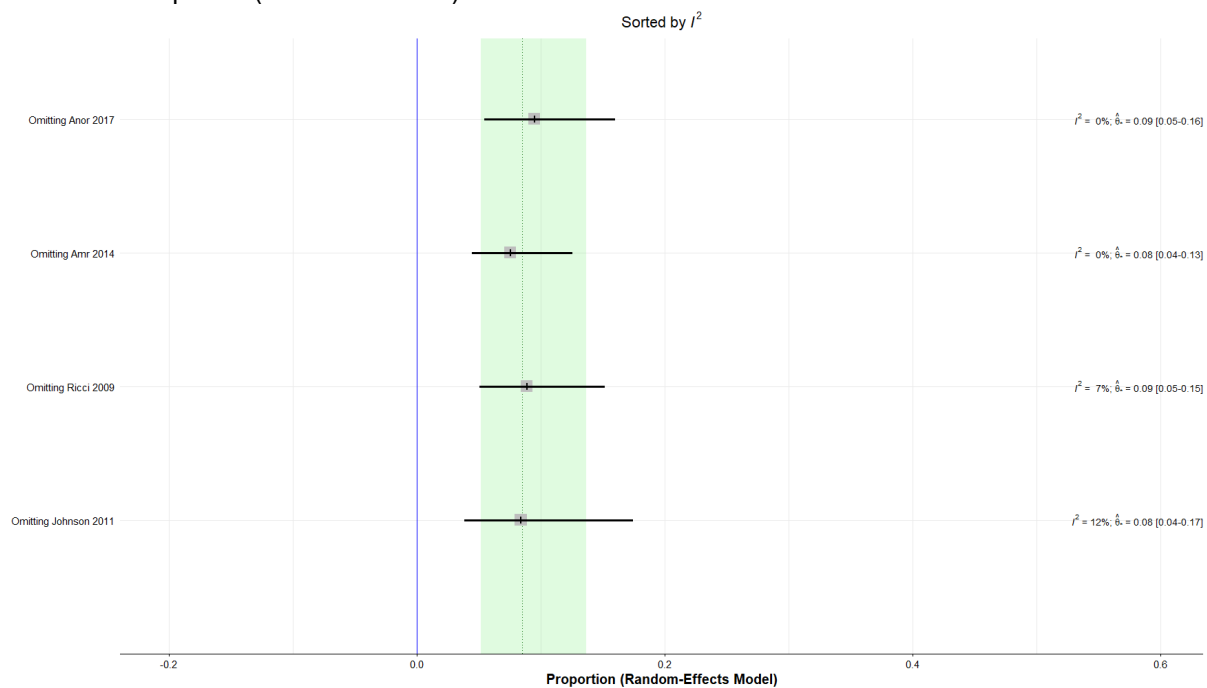
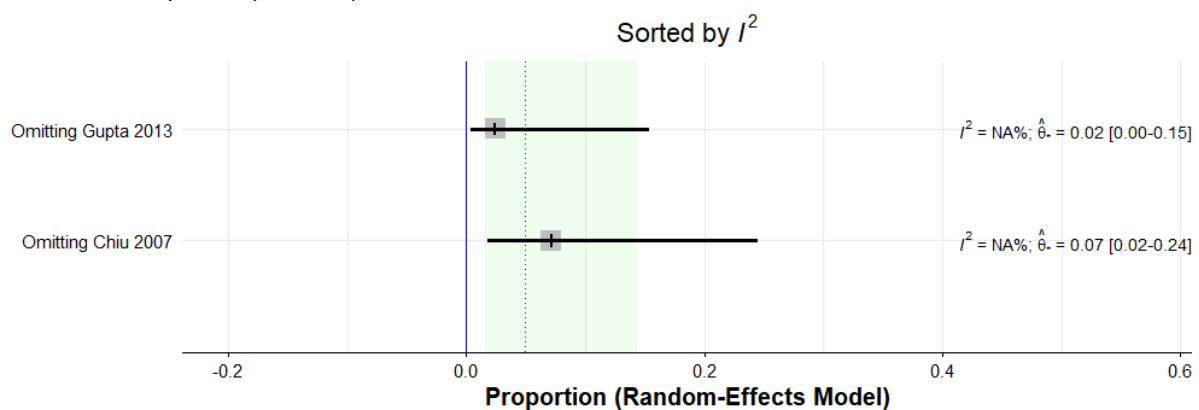
D1. Depression/Dysphoria (general)**D2. Depression/Dysphoria (subcortical)**

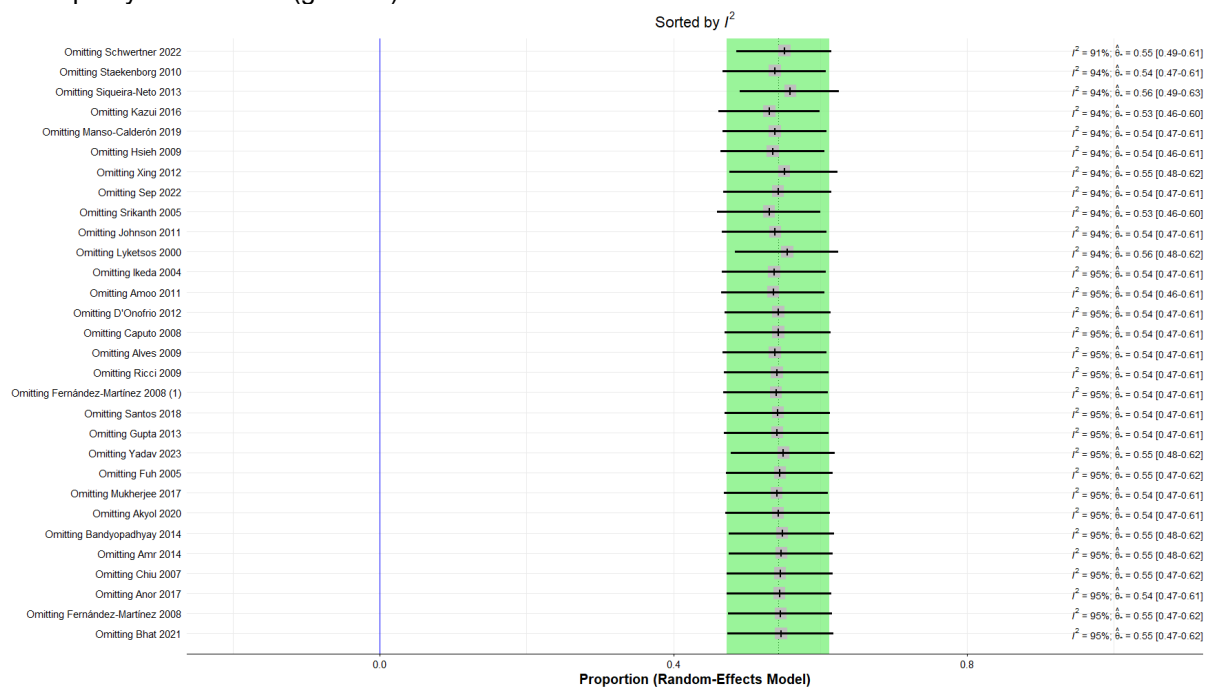
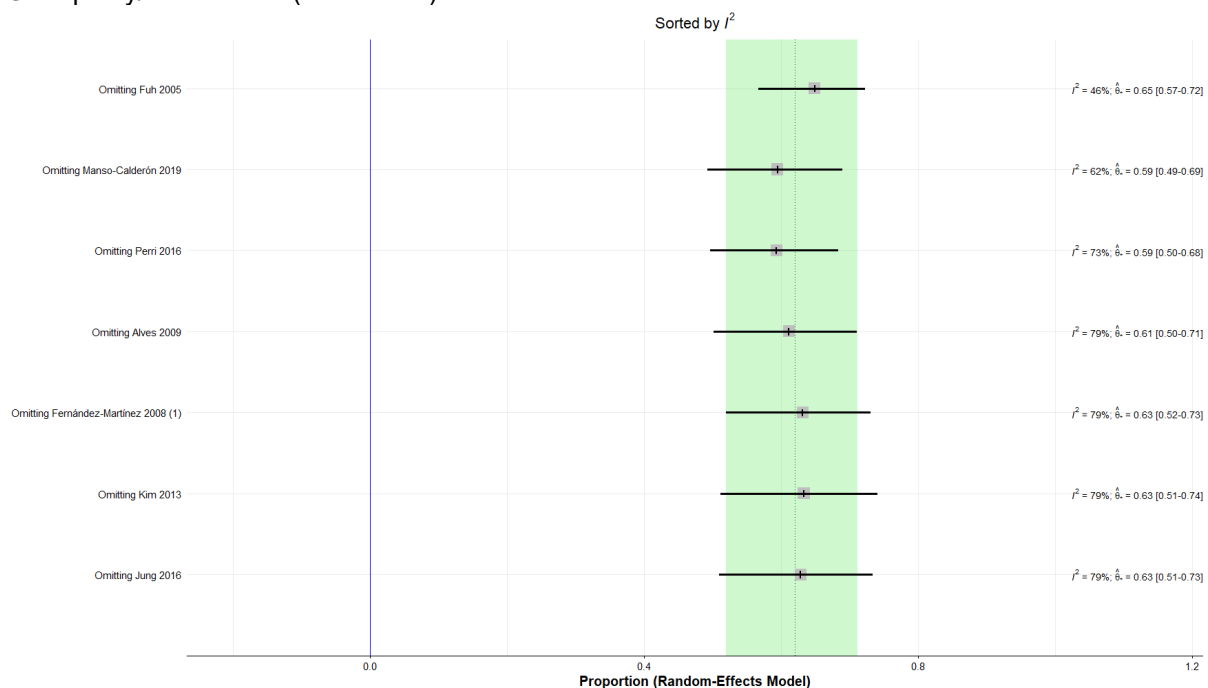
D3. Depression/Dysphoria (mixed dementia)**D4. Depression/Dysphoria (VCI-ND)**

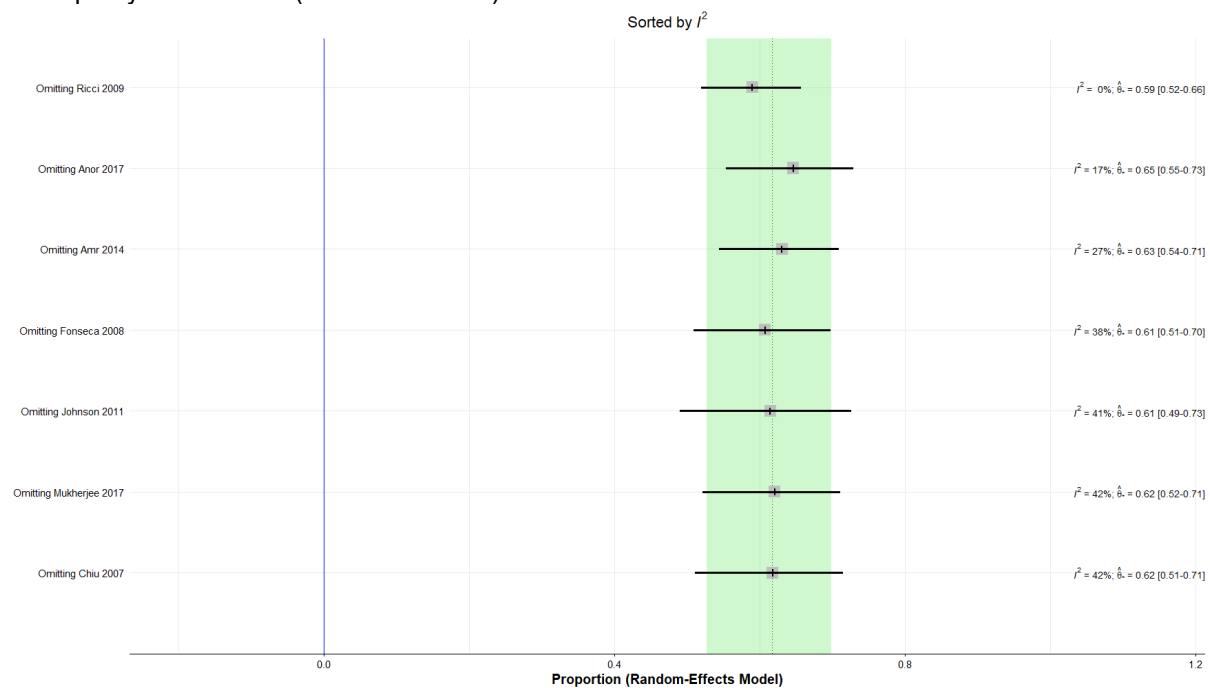
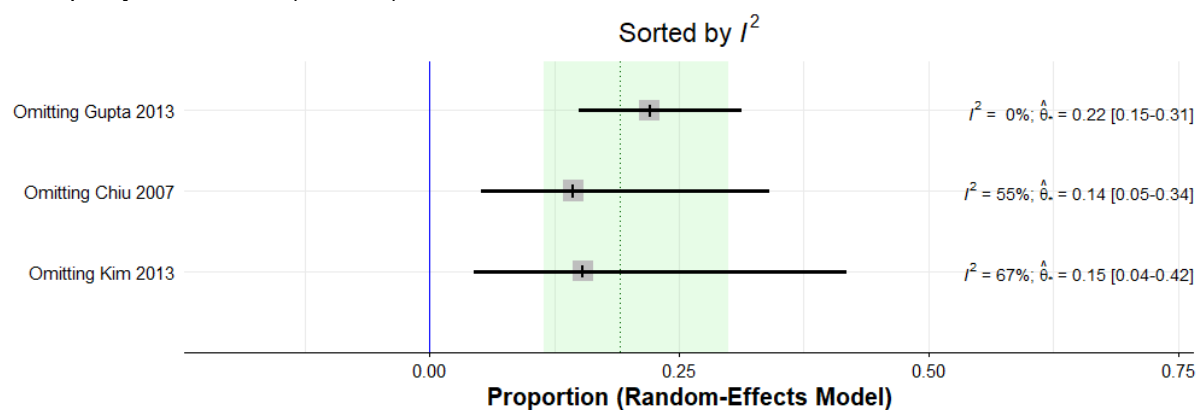
E1. Anxiety (general)**E2. Anxiety (subcortical)**

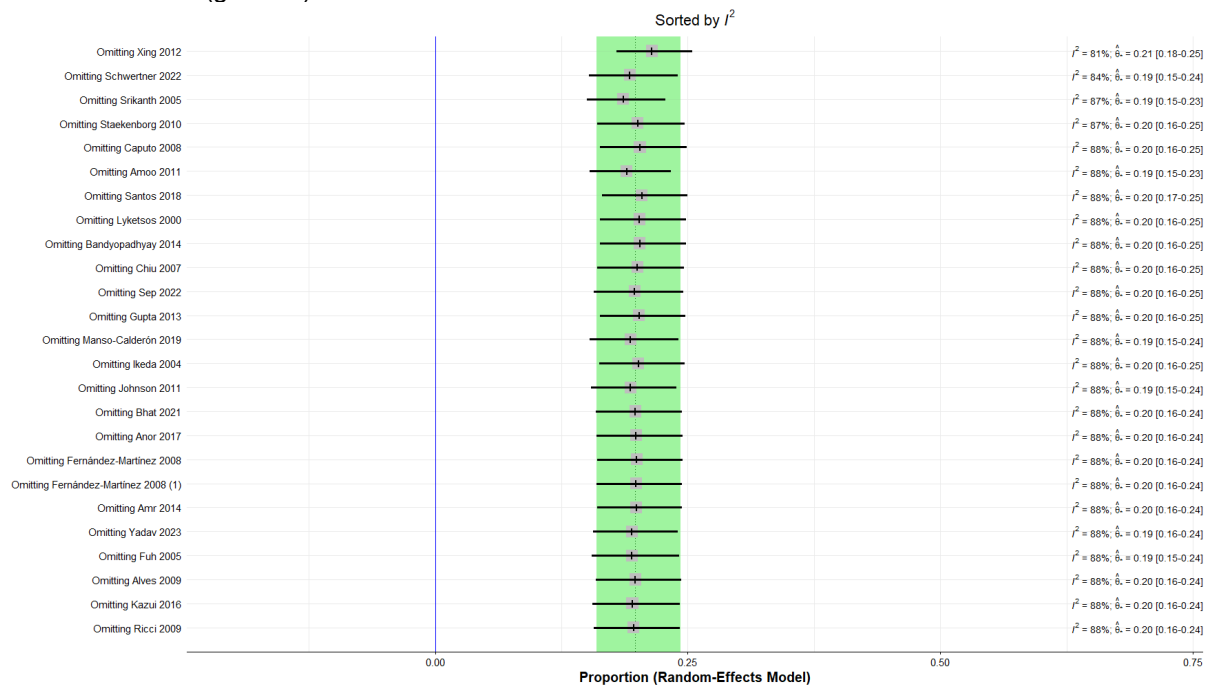
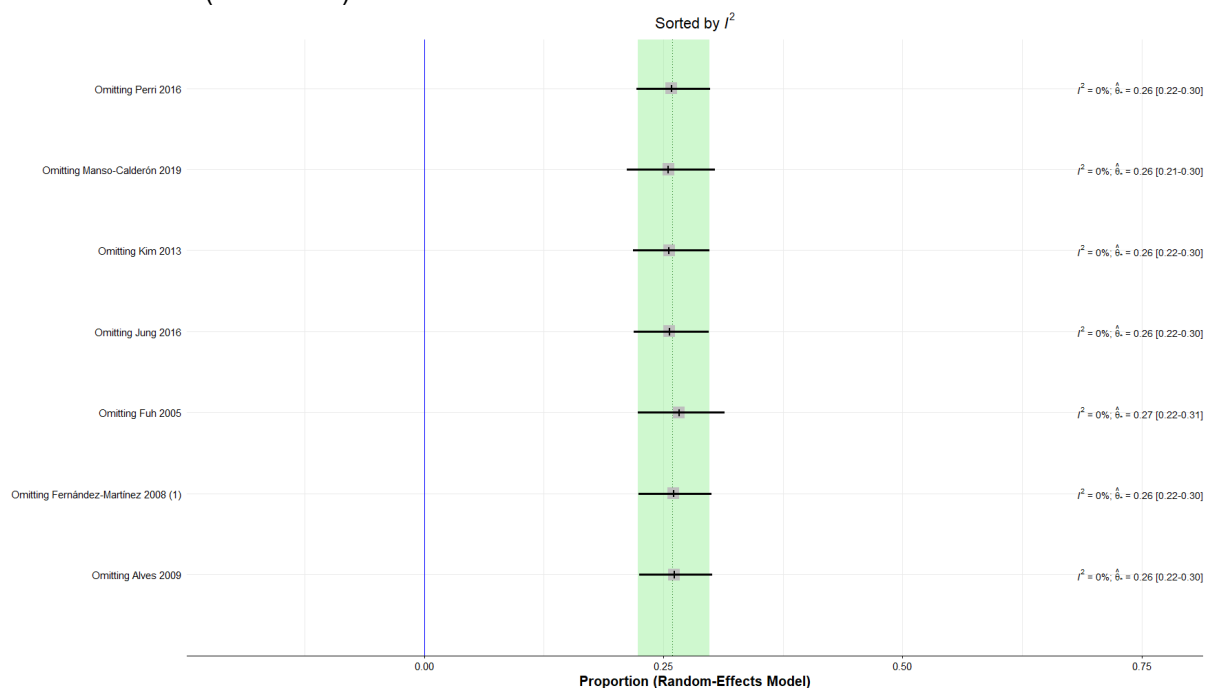
E3. Anxiety (mixed dementia)**E4. Anxiety (VCI-ND)**

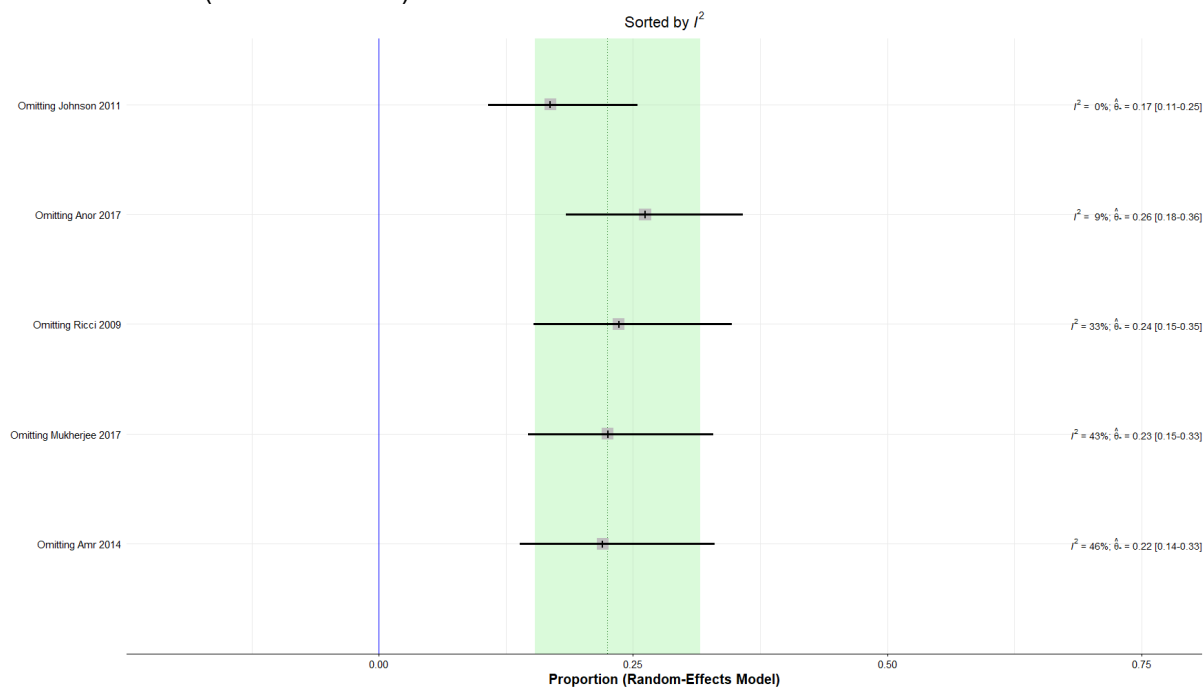
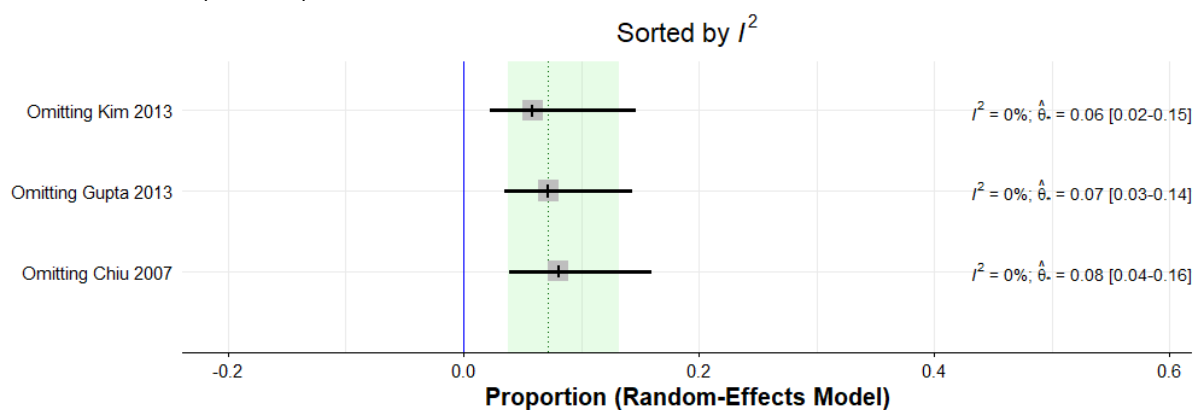
F1. Elation/Euphoria (general)**F2. Elation/Euphoria (subcortical)**

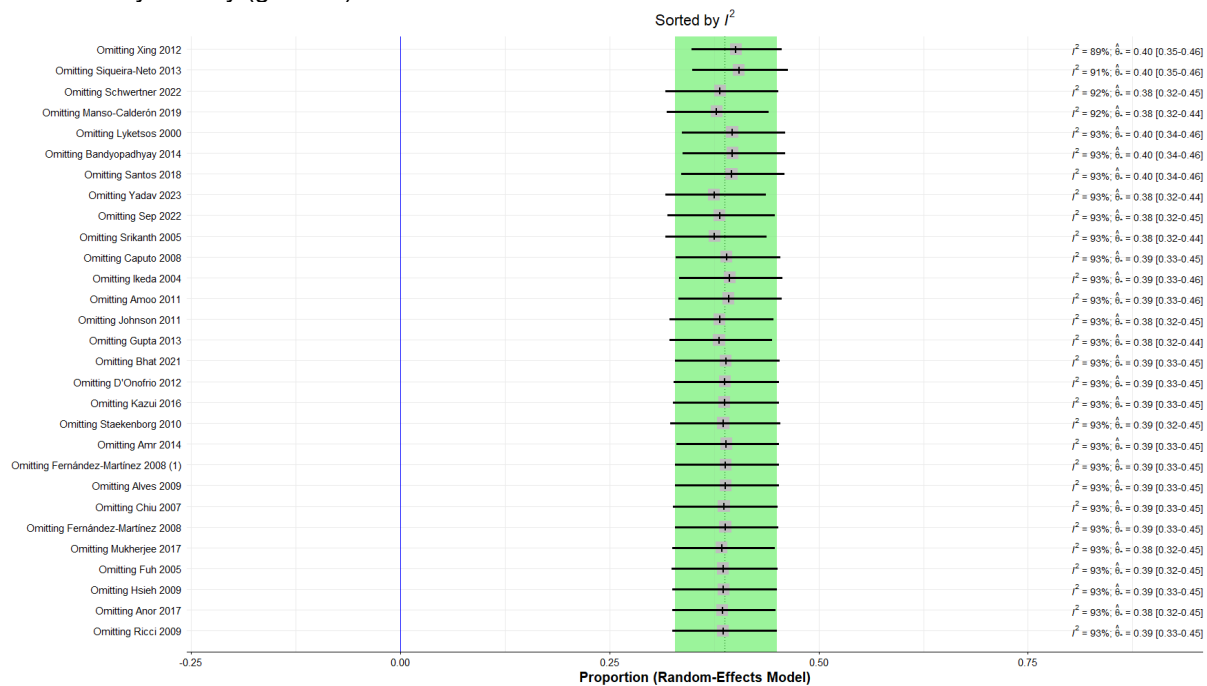
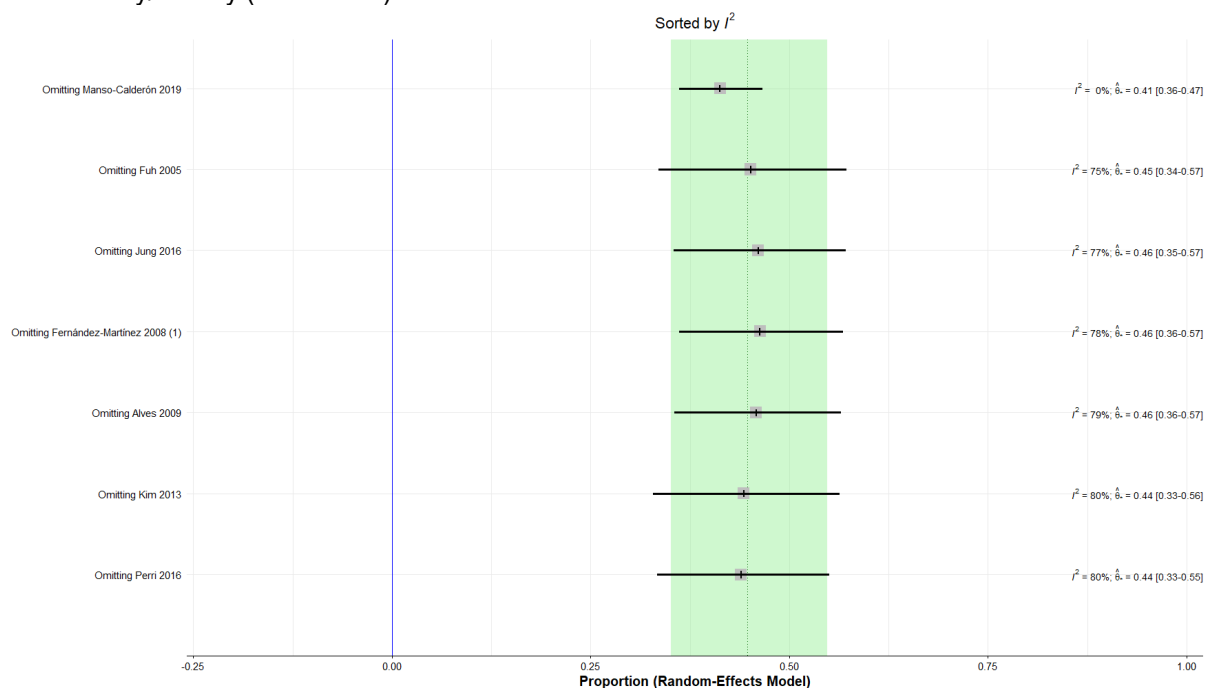
F3. Elation/Euphoria (mixed dementia)**F4. Elation/Euphoria (VCI-ND)**

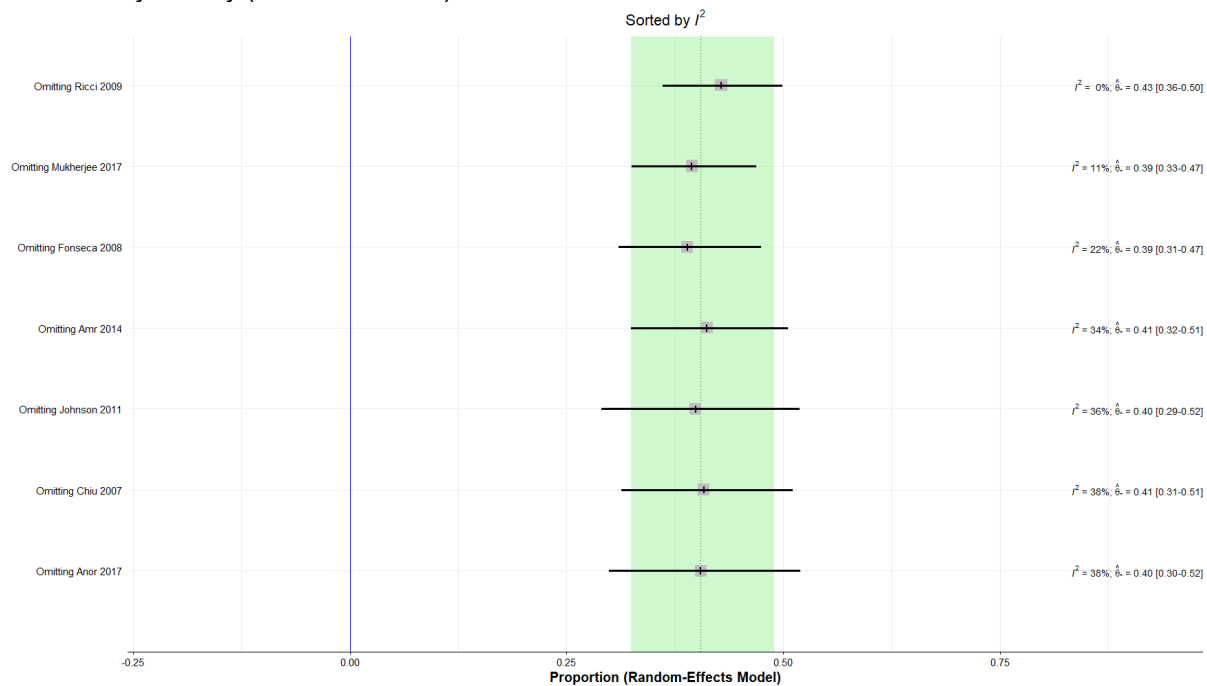
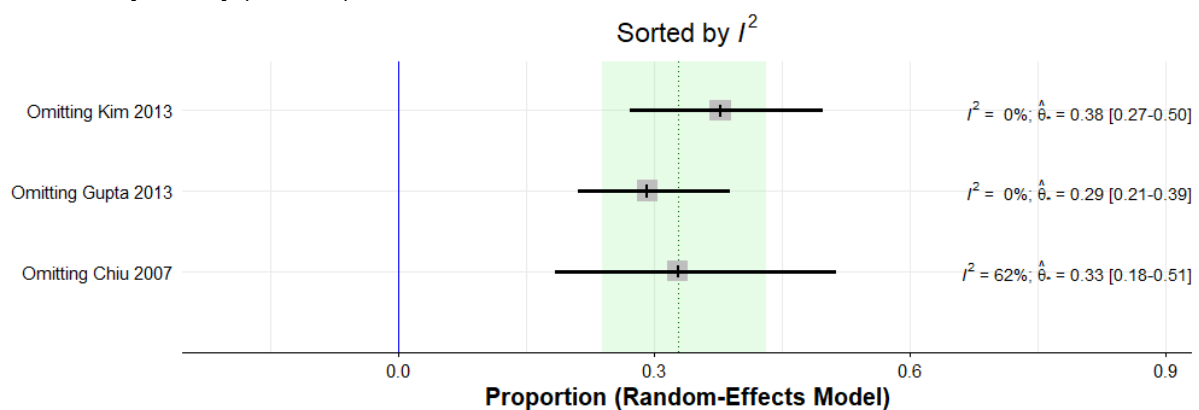
G1. Apathy/Indifference (general)**G2. Apathy/Indifference (subcortical)**

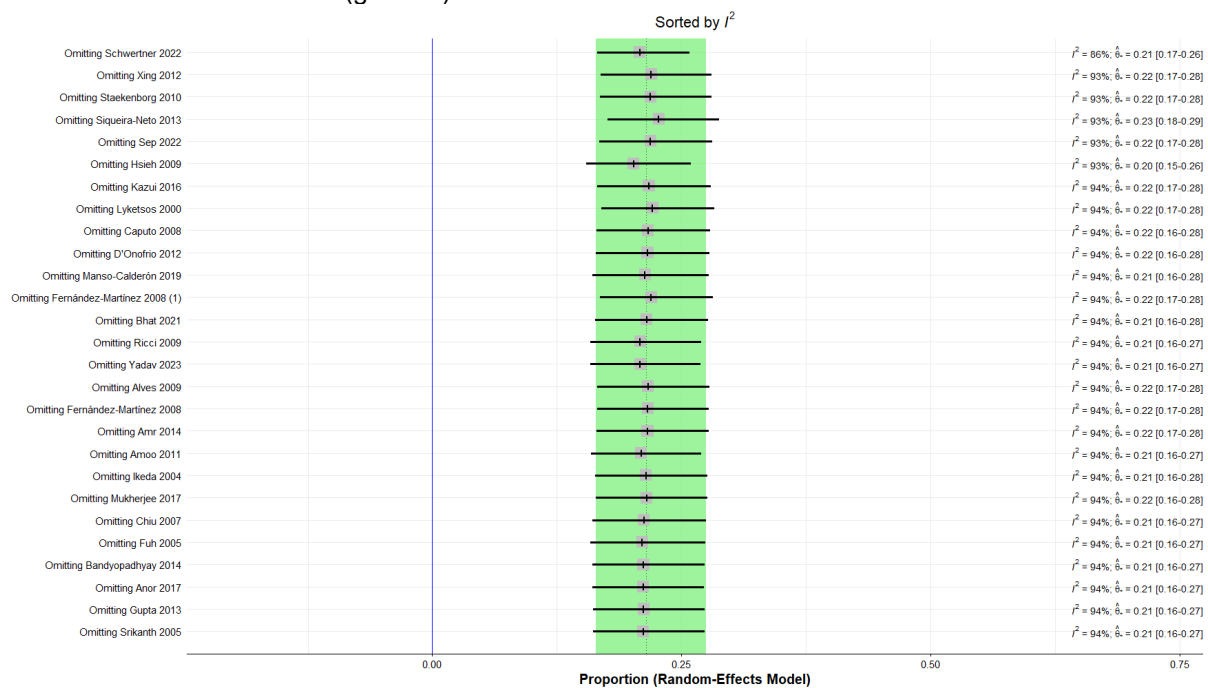
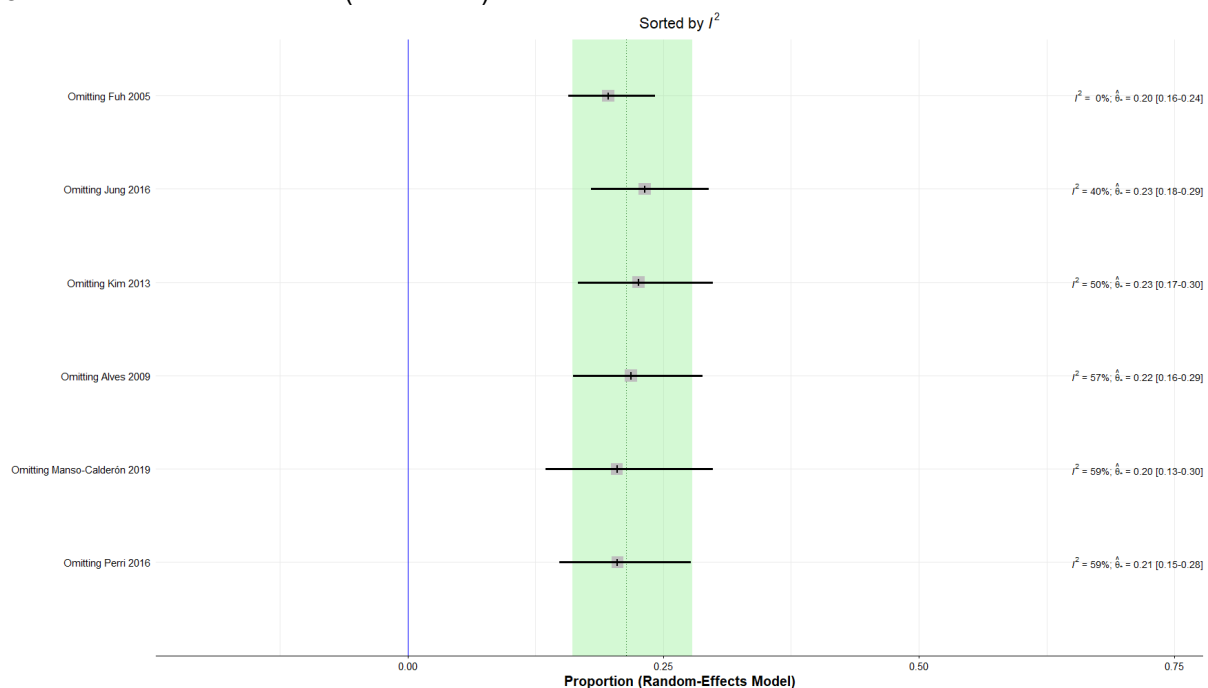
G3. Apathy/Indifference (mixed dementia)**G4. Apathy/Indifference (VCI-ND)**

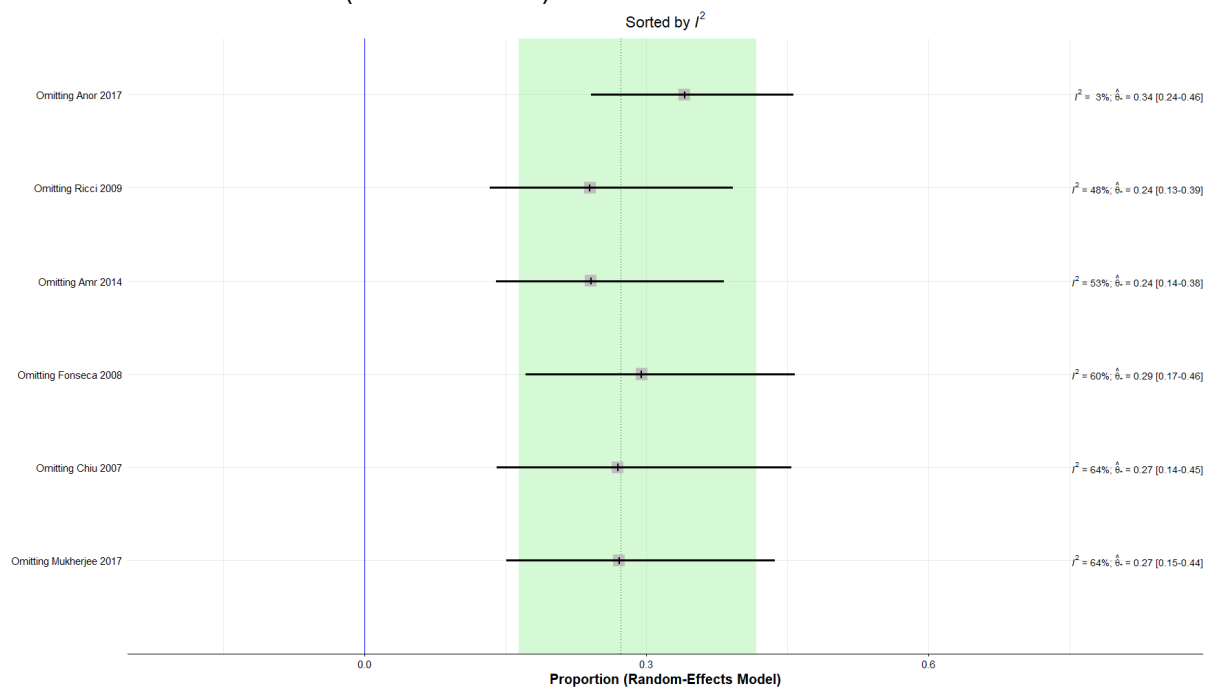
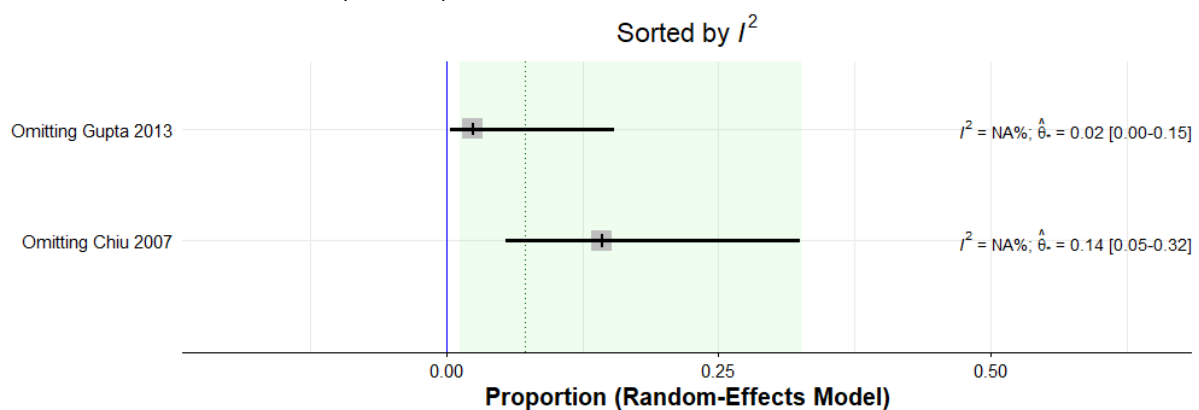
H1. Disinhibition (general)**H2. Disinhibition (subcortical)**

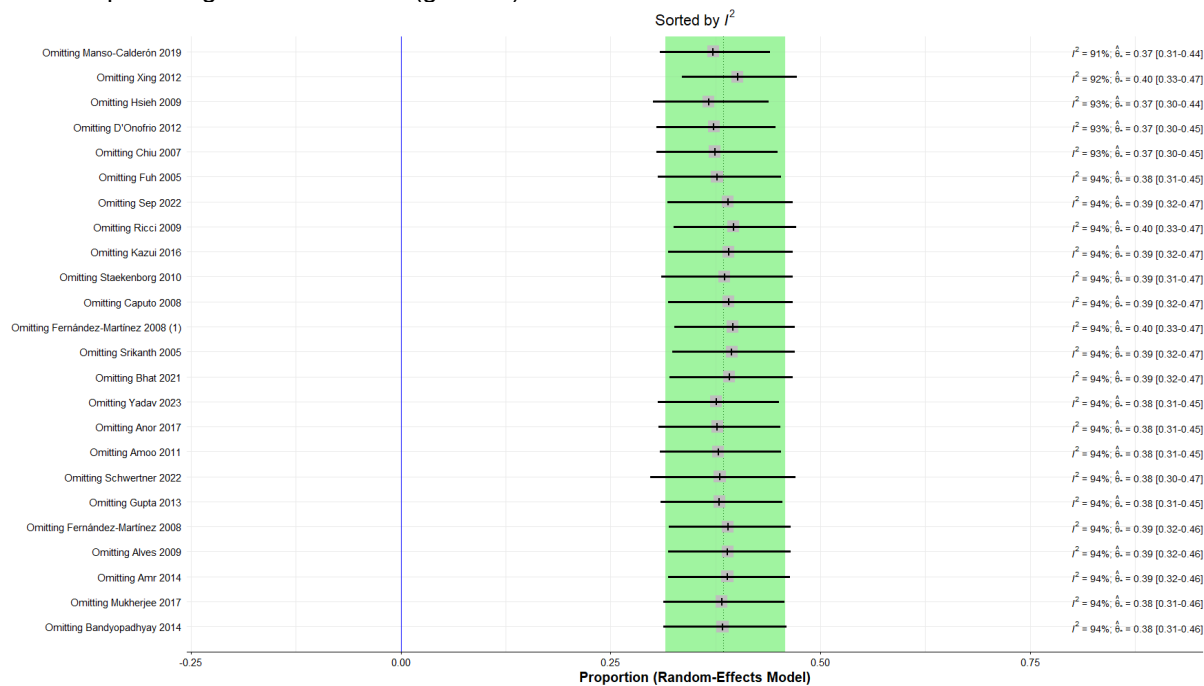
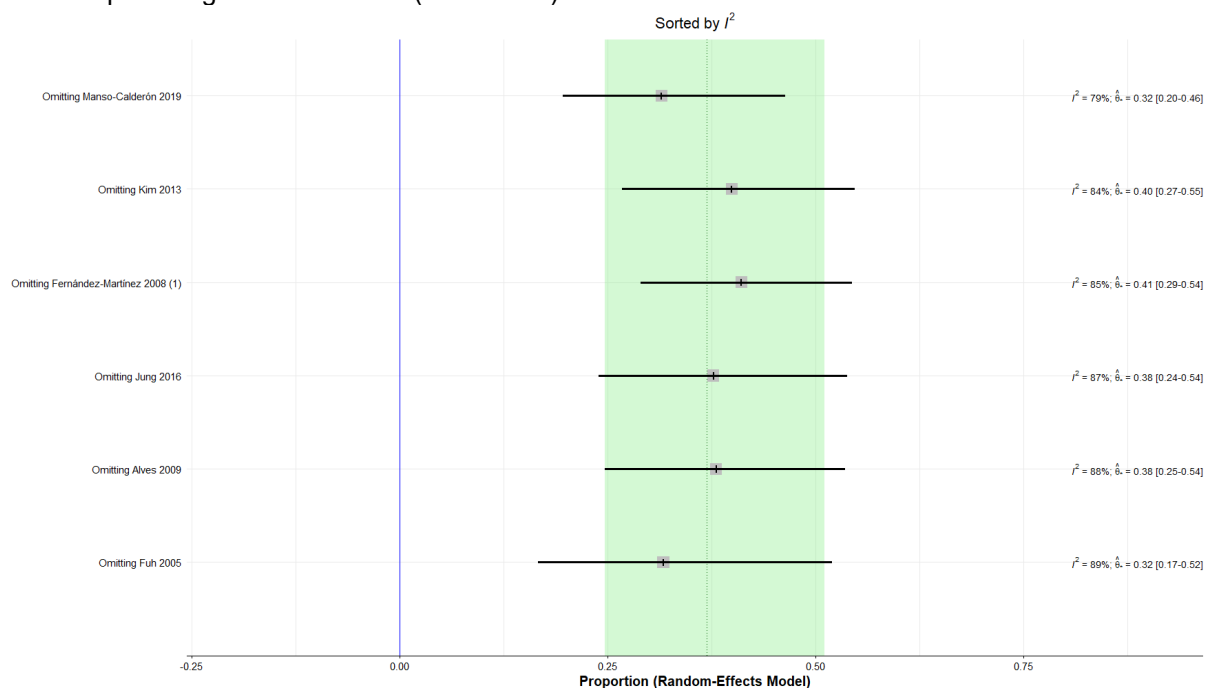
H3. Disinhibition (mixed dementia)**H4. Disinhibition (VCI-ND)**

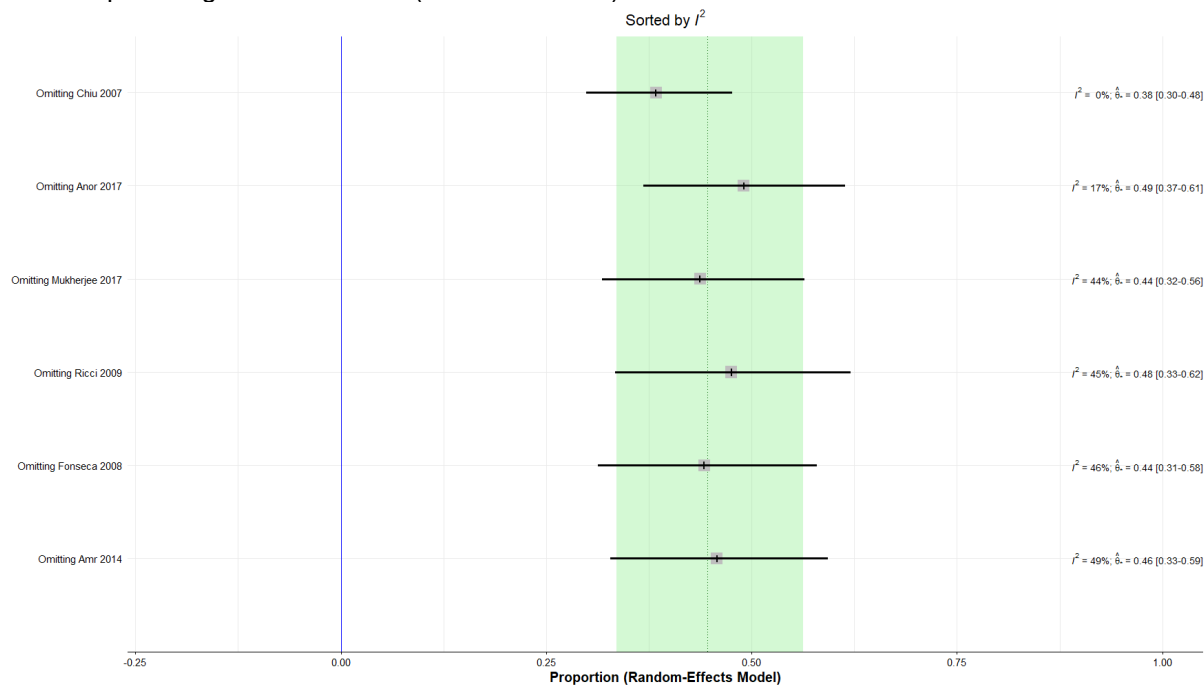
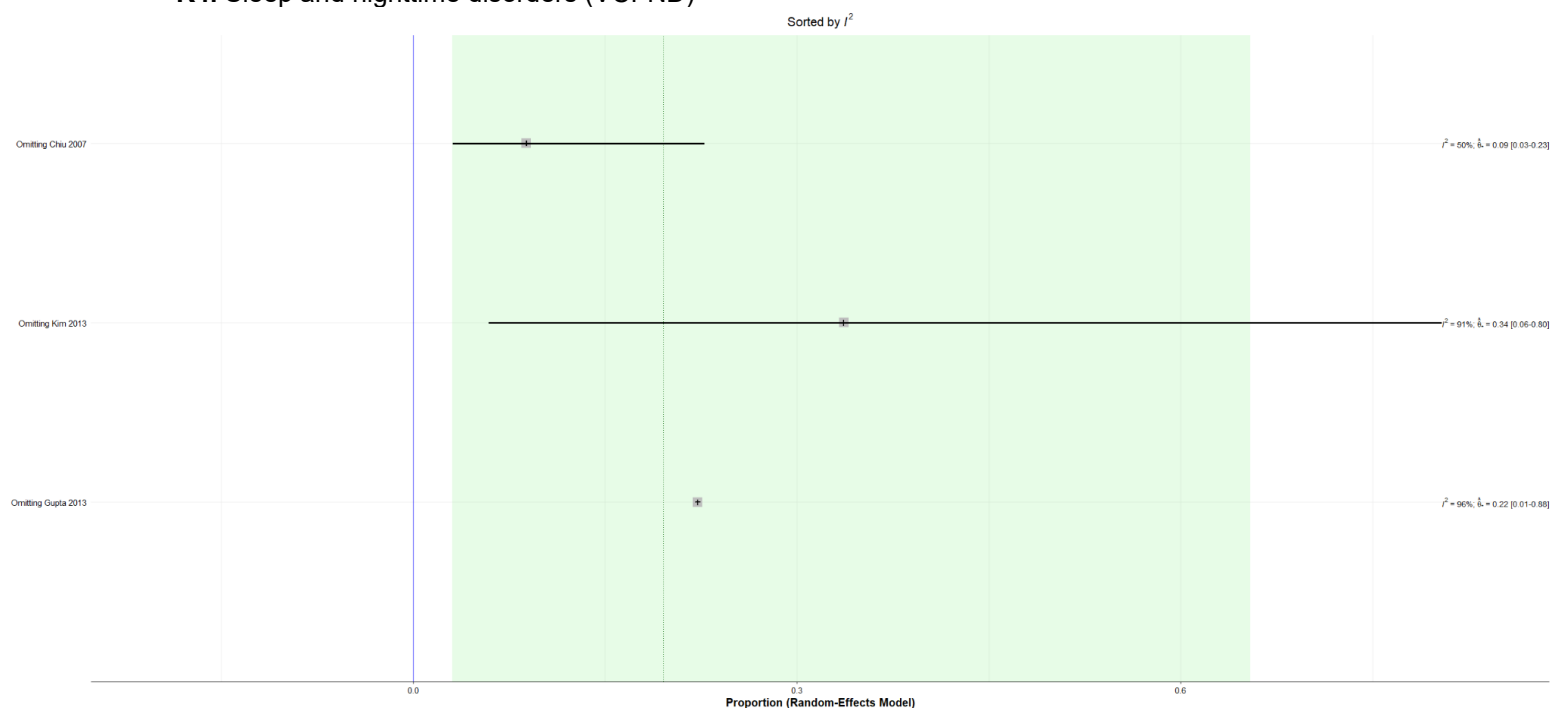
I1. Irritability/Lability (general)**I2. Irritability/Lability (subcortical)**

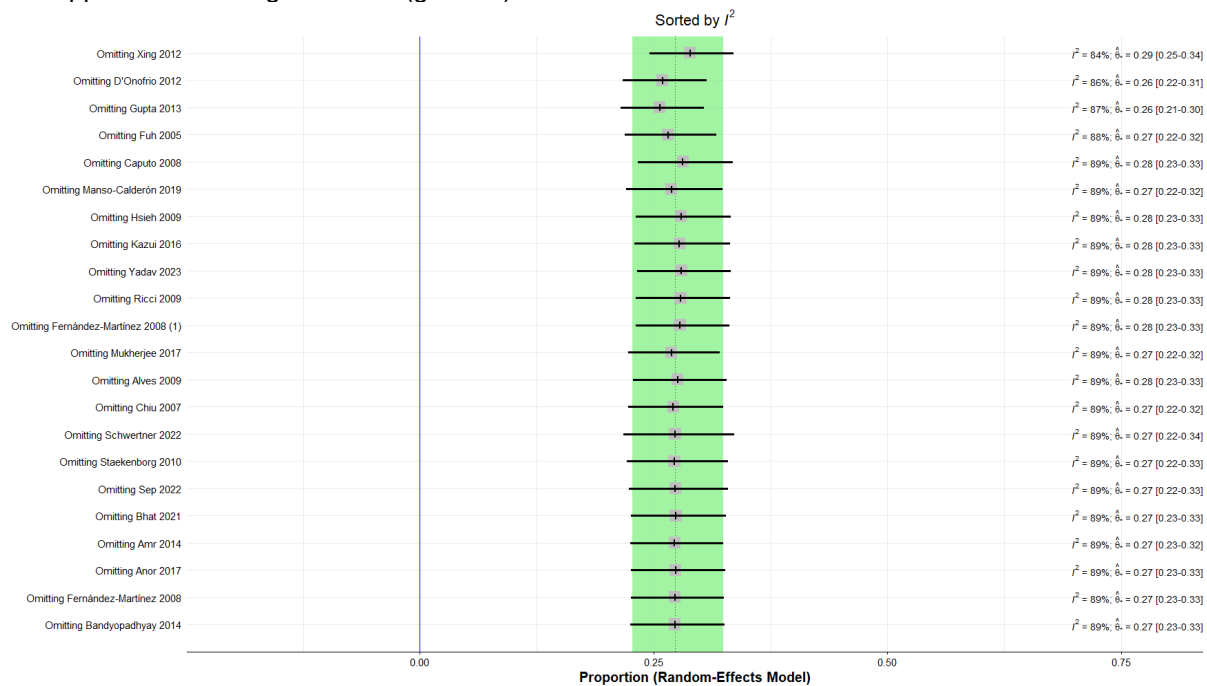
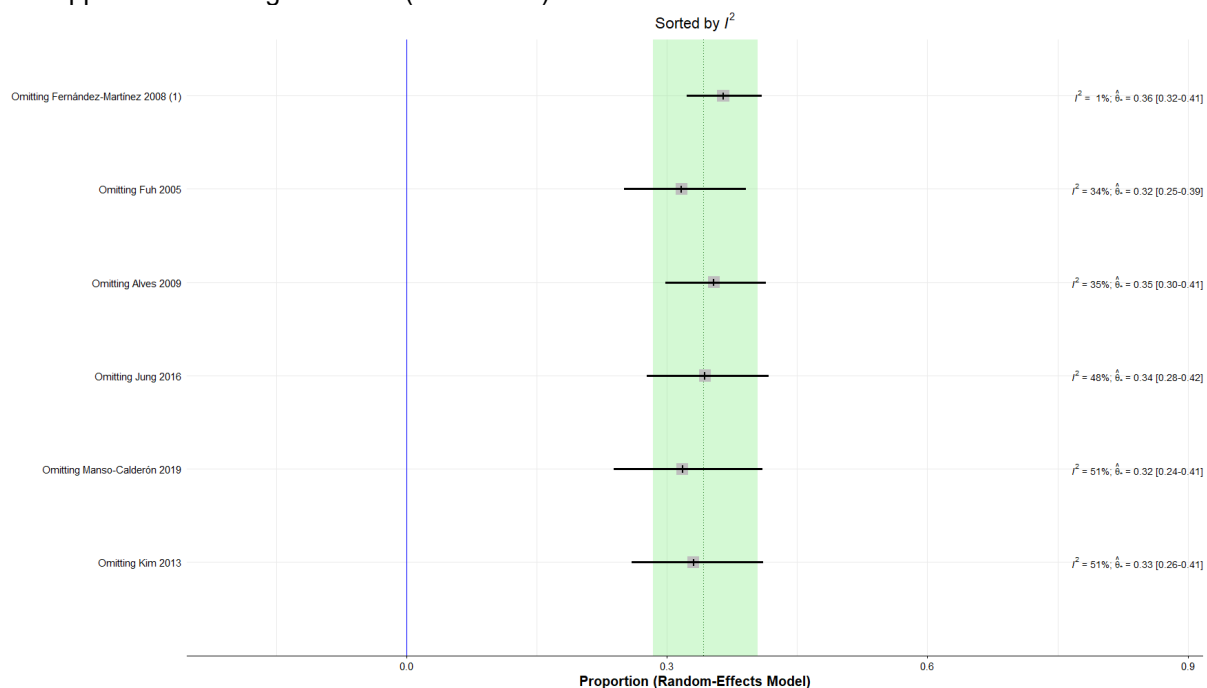
I3. Irritability/Lability (mixed dementia)**I4. Irritability/Lability (VCI-ND)**

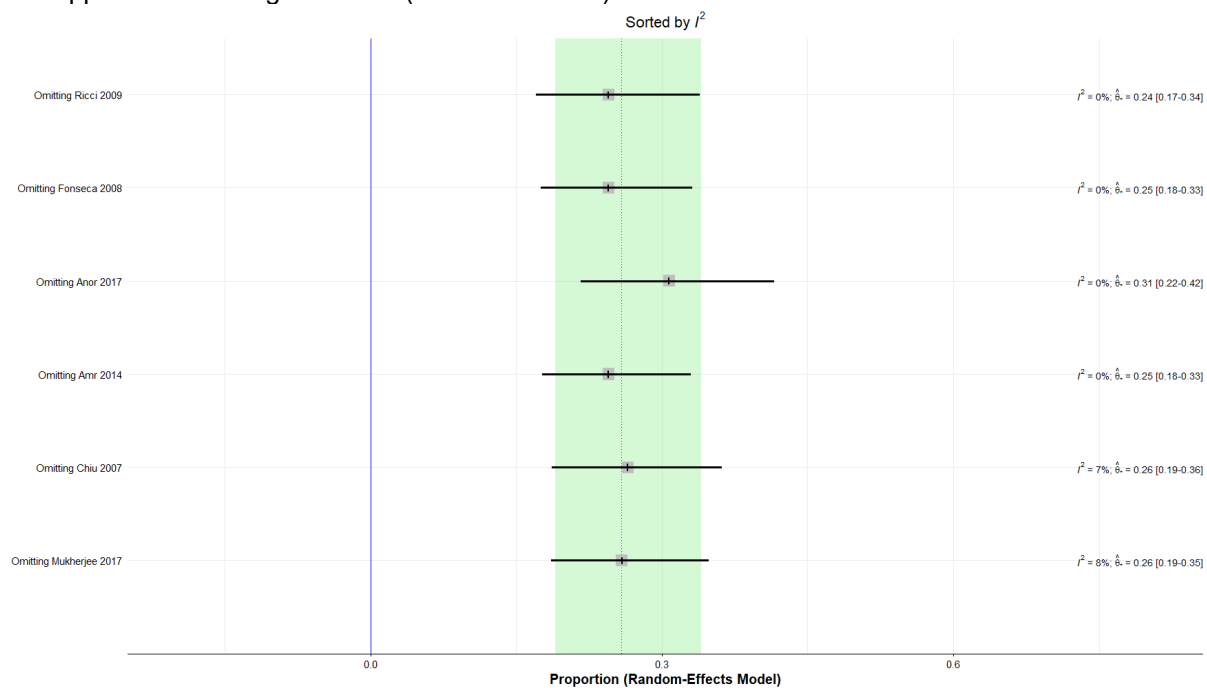
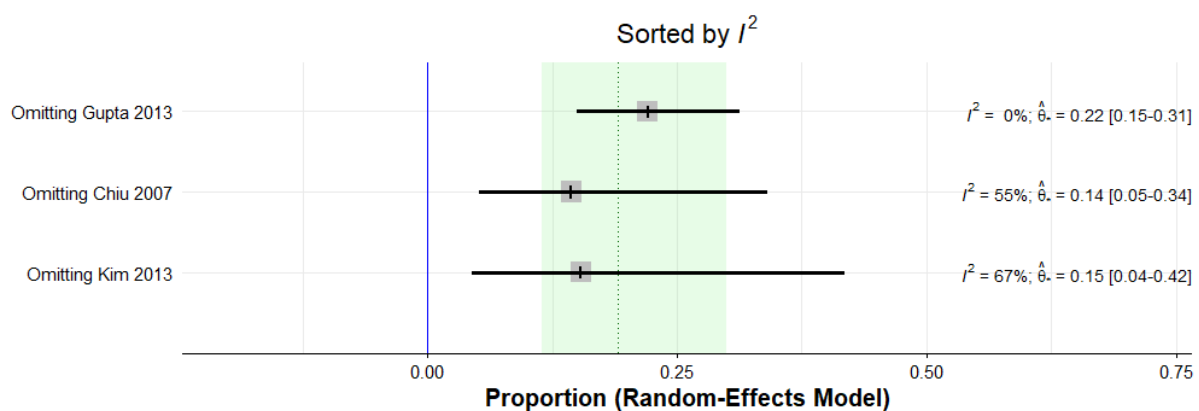
J1. Aberrant motor behavior (general)**J2. Aberrant motor behavior (subcortical)**

J3. Aberrant motor behavior (mixed dementia)**J4. Aberrant motor behavior (VCI-ND)**

K1. Sleep and nighttime disorders (general)**K2. Sleep and nighttime disorders (subcortical)**

K3. Sleep and nighttime disorders (mixed dementia)**K4. Sleep and nighttime disorders (VCI-ND)**

L1. Appetite and eating disorders (general)**L2. Appetite and eating disorders (subcortical)**

L3. Appetite and eating disorders (mixed dementia)**L4. Appetite and eating disorders (VCI-ND)**

Supplementary Table S3 Pooled results of the secondary synthesis for each Neuropsychiatric Inventory domain in each group

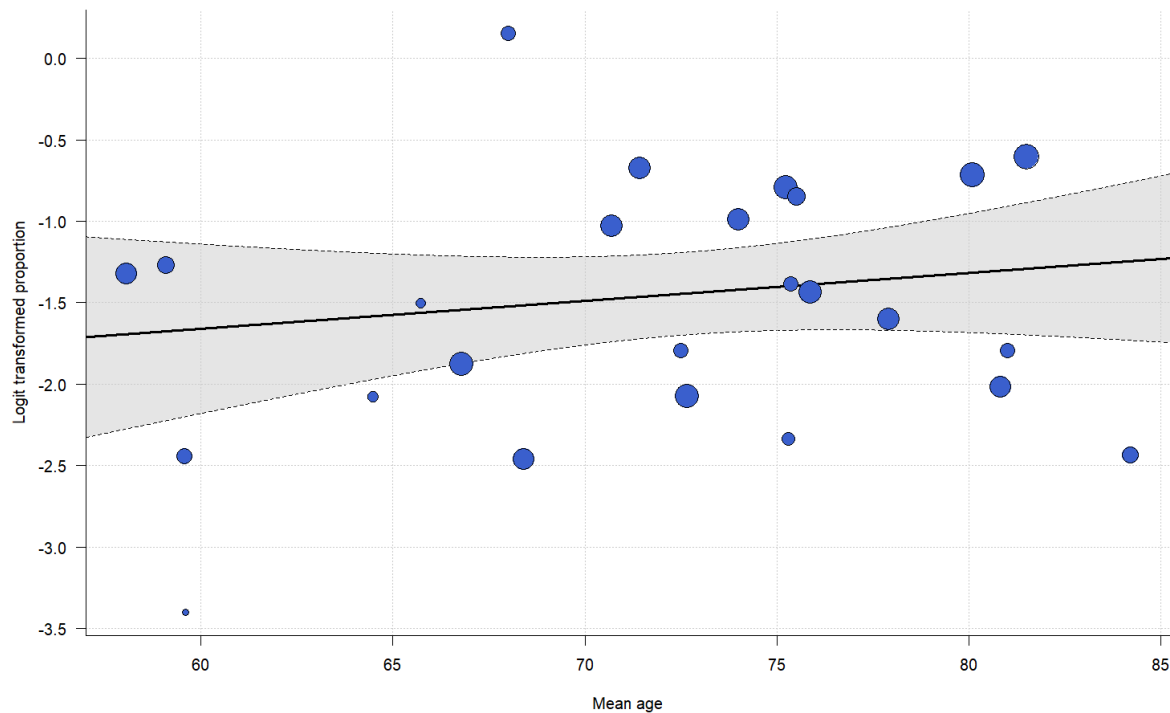
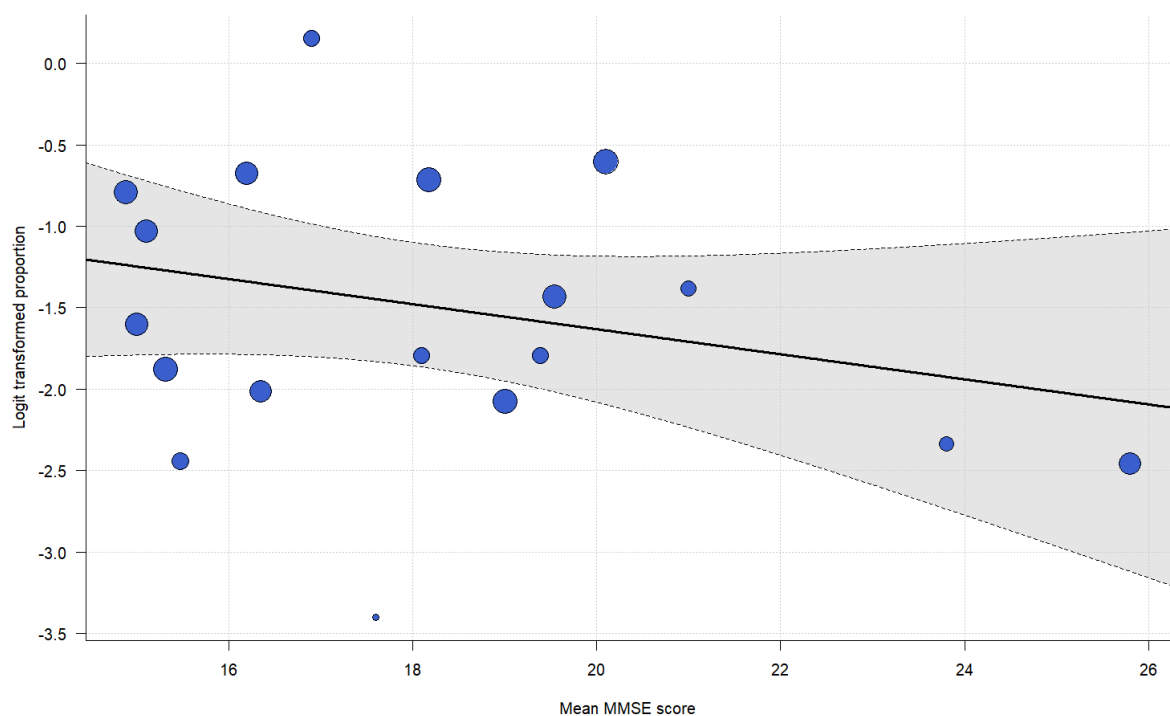
NPI domain	No. patients	Frequency (per 100 observations)	95%CI	P	95%PI
Unspecified					
Delusions	2847	18.73	14.91 to 23.25	84%	6.16 to 44.70
Hallucinations	4043	15.64	12.51 to 19.39	83%	5.60 to 36.71
Agitation/aggression	3258	36.72	32.12 to 41.59	84%	18.23 to 60.17
Depression/dysphoria	4624	45.13	40.44 to 49.90	86%	25.25 to 66.69
Anxiety	4666	35.77	31.76 to 39.98	82%	19.70 to 55.82
Elation/euphoria	4581	8.49	6.77 to 10.60	69%	3.68 to 18.41
Apathy/indifference	3316	55.12	48.60 to 61.48	91%	24.20 to 82.54
Disinhibition	4065	21.46	17.94 to 25.45	81%	9.81 to 40.70
Irritability/lability	4522	40.10	34.83 to 45.50	89%	18.26 to 66.72
Aberrant motor behavior	3173	20.80	16.56 to 25.78	86%	6.50 to 49.78
Sleep and nighttime behavior disorders	4030	37.20	30.85 to 44.03	91%	14.04 to 68.24
Appetite and eating disorders	3986	28.88	24.61 to 33.57	84%	14.43 to 49.46
Subcortical					
Delusions	477	26.05	19.86 to 33.37	51%	12.09 to 47.43
Hallucinations	477	18.33	12.11 to 26.76	64%	5.37 to 47.03
Agitation/aggression	526	43.18	38.98 to 47.48	0%	37.70 to 48.83
Depression/dysphoria	342	47.60	41.15 to 54.13	21%	34.23 to 61.32
Anxiety	342	36.97	31.96 to 42.28	0%	29.92 to 44.63
Elation/euphoria	345	7.30	4.47 to 11.69	13%	2.48 to 19.64
Apathy/indifference	365	64.89	56.67 to 72.30	46%	42.49 to 82.21
Disinhibition	526	25.91	22.34 to 29.83	0%	21.30 to 31.12
Irritability/lability	342	41.31	36.18 to 46.63	0%	34.13 to 48.87
Aberrant motor behavior	343	19.61	15.70 to 24.22	0%	13.60 to 27.44
Sleep and nighttime behavior disorders	320	31.52	19.68 to 46.36	79%	5.10 to 79.75
Appetite and eating disorders	482	36.48	32.25 to 40.92	1%	29.61 to 43.96
Mixed					
Delusions	214	24.66	18.69 to 31.80	12%	14.48 to 38.76
Hallucinations	214	22.17	13.41 to 34.38	60%	4.53 to 63.11
Agitation/aggression	221	36.26	30.14 to 42.86	0%	27.77 to 45.70
Depression/dysphoria	174	50.60	43.12 to 58.06	0%	40.07 to 61.08
Anxiety	198	35.35	25.36 to 46.82	45%	15.55 to 65.61
Elation/euphoria	186	8.49	5.17 to 13.63	0%	2.81 to 22.95
Apathy/indifference	198	58.97	51.91 to 65.68	0%	48.93 to 68.32
Disinhibition	101	16.87	10.75 to 25.47	0%	6.06 to 38.93
Irritability/lability	198	42.84	36.06 to 49.91	0%	33.37 to 52.87
Aberrant motor behavior	82	34.07	24.14 to 45.63	3%	18.09 to 54.74

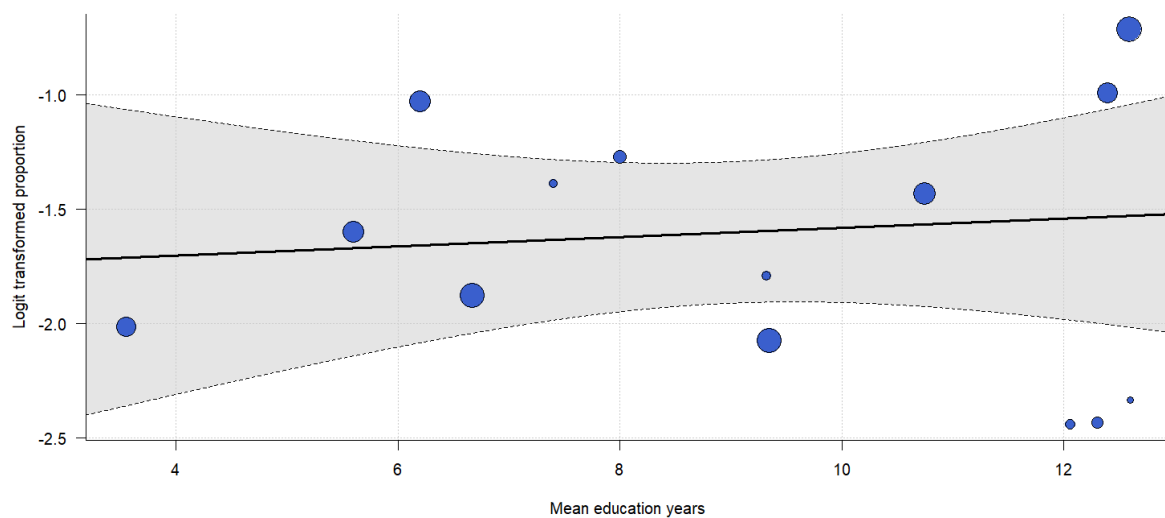
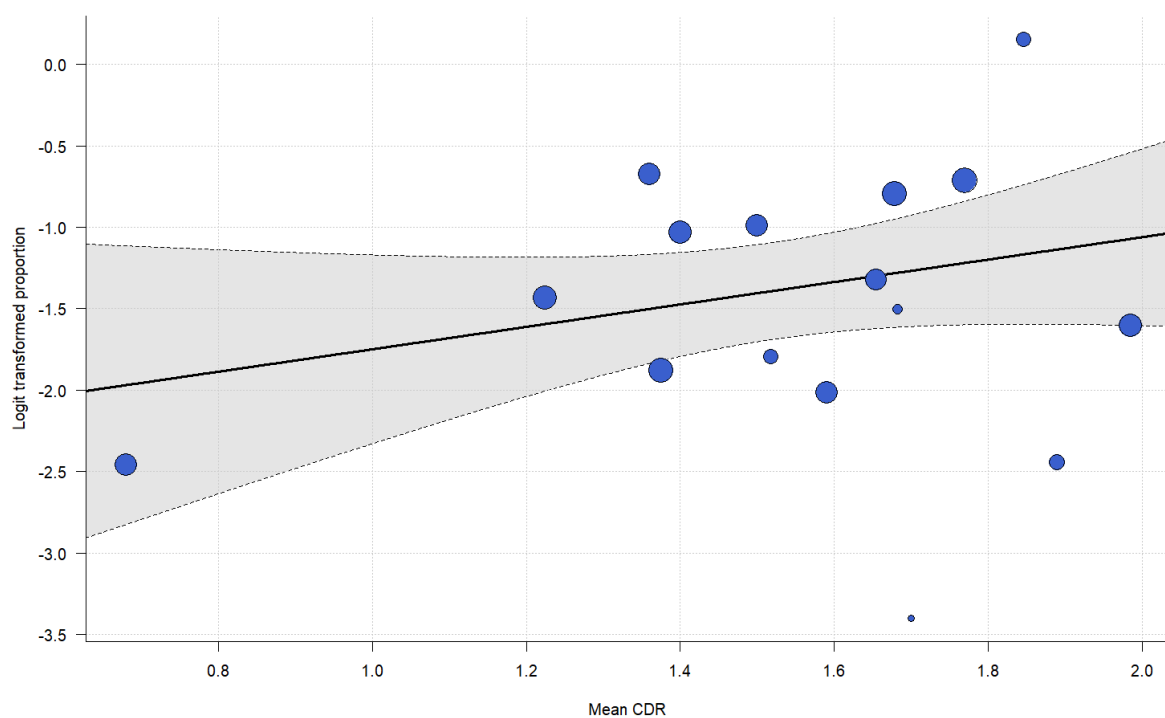
Sleep and nighttime behavior disorders	115	38.36	29.85 to 47.65	0%	25.13 to 53.57
Appetite and eating disorders	136	25.82	19.00 to 34.07	0%	16.00 to 37.85

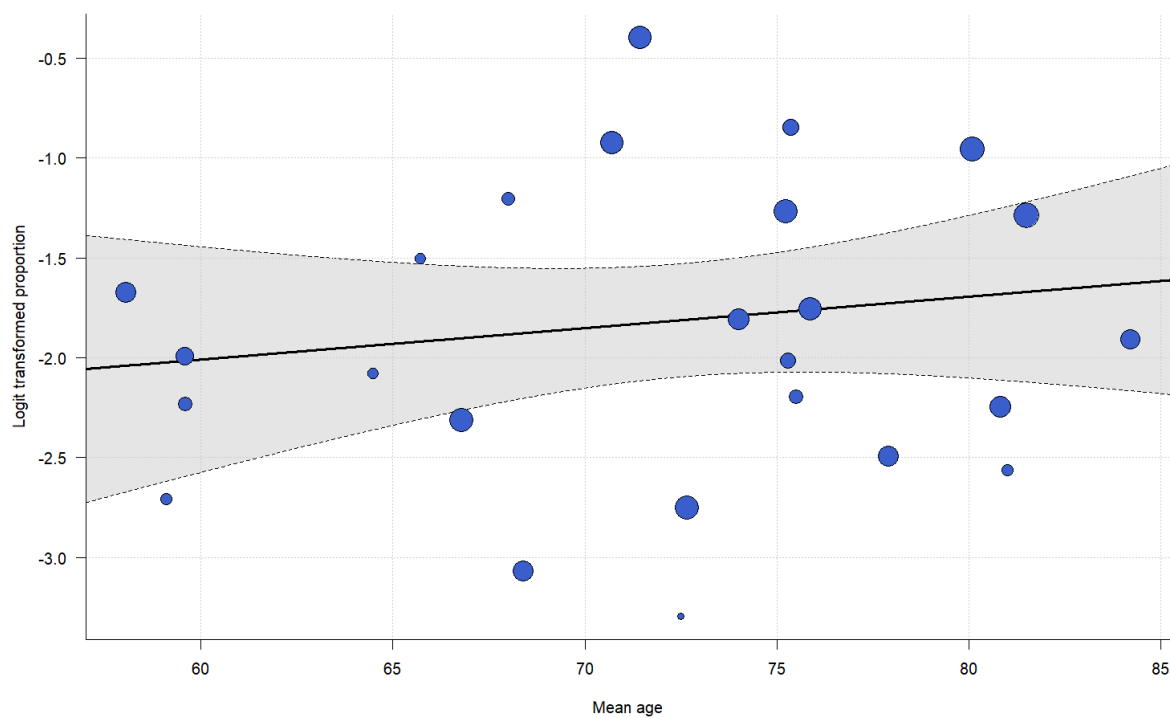
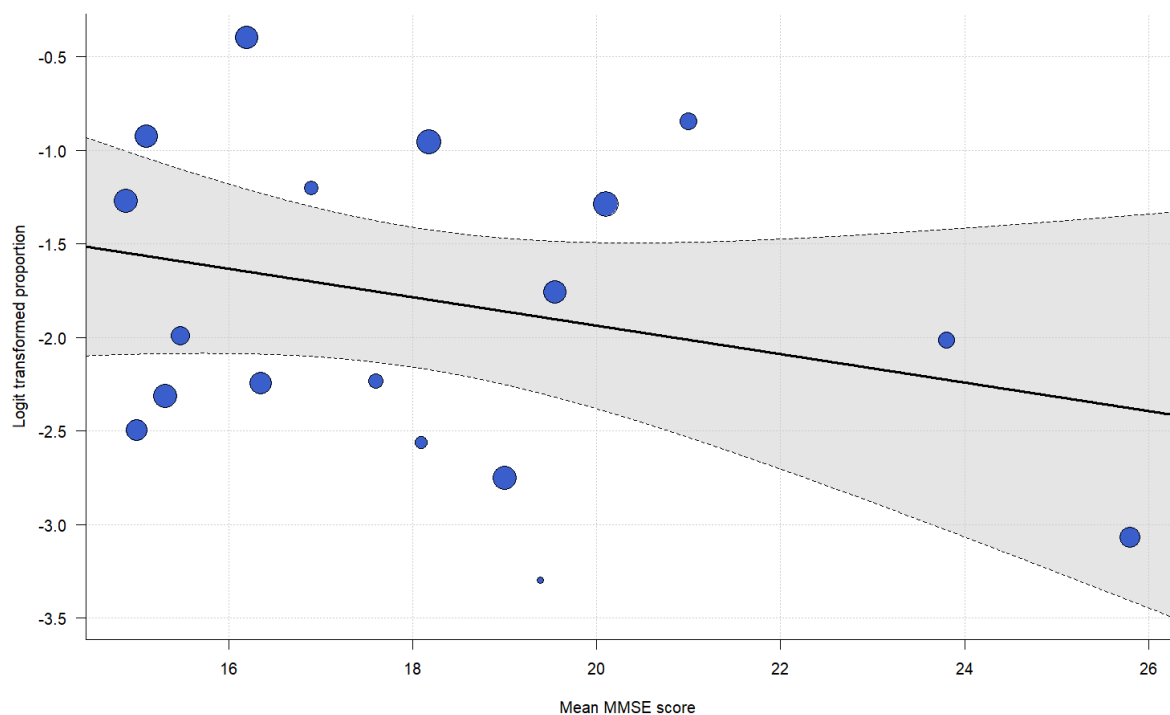
VCI-ND

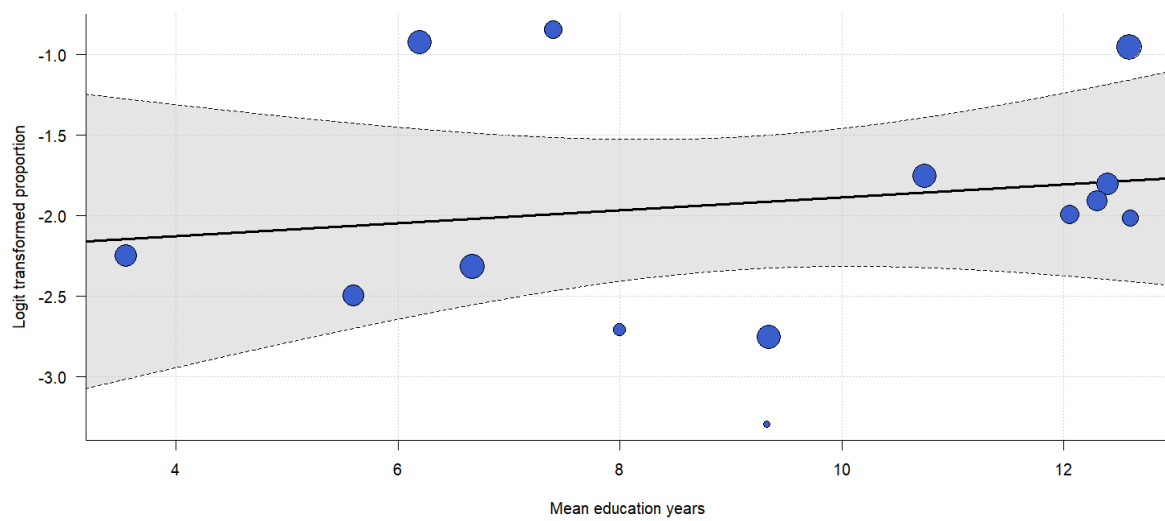
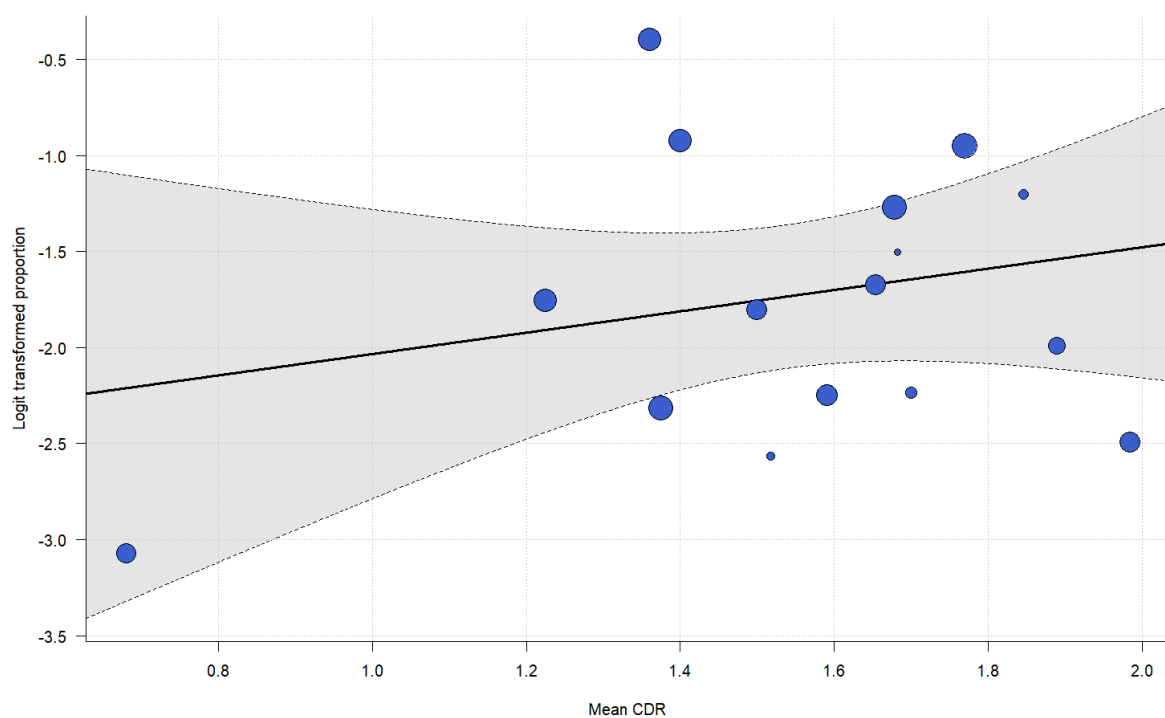
Delusions	69	17.39	10.15 to 28.18	0%	-
Hallucinations	69	2.95	0.74 to 11.04	0%	-
Agitation/aggression	100	12.00	6.94 to 19.95	0%	-
Depression/dysphoria	100	32.78	19.24 to 49.96	64%	-
Anxiety	100	25.16	17.59 to 34.62	0%	-
Elation/euphoria	69	4.96	1.60 to 14.34	0%	-
Apathy/indifference	100	22.06	14.99 to 31.25	0%	-
Disinhibition	128	7.20	3.79 to 13.28	0%	0.10 to 86.36
Irritability/lability	100	29.18	21.07 to 38.87	0%	-
Aberrant motor behavior	69	7.26	1.25 to 32.59	63%	-
Sleep and nighttime behavior disorders	87	8.84	3.09 to 22.76	50%	-
Appetite and eating disorders	100	18.49	10.07 to 31.50	47%	-

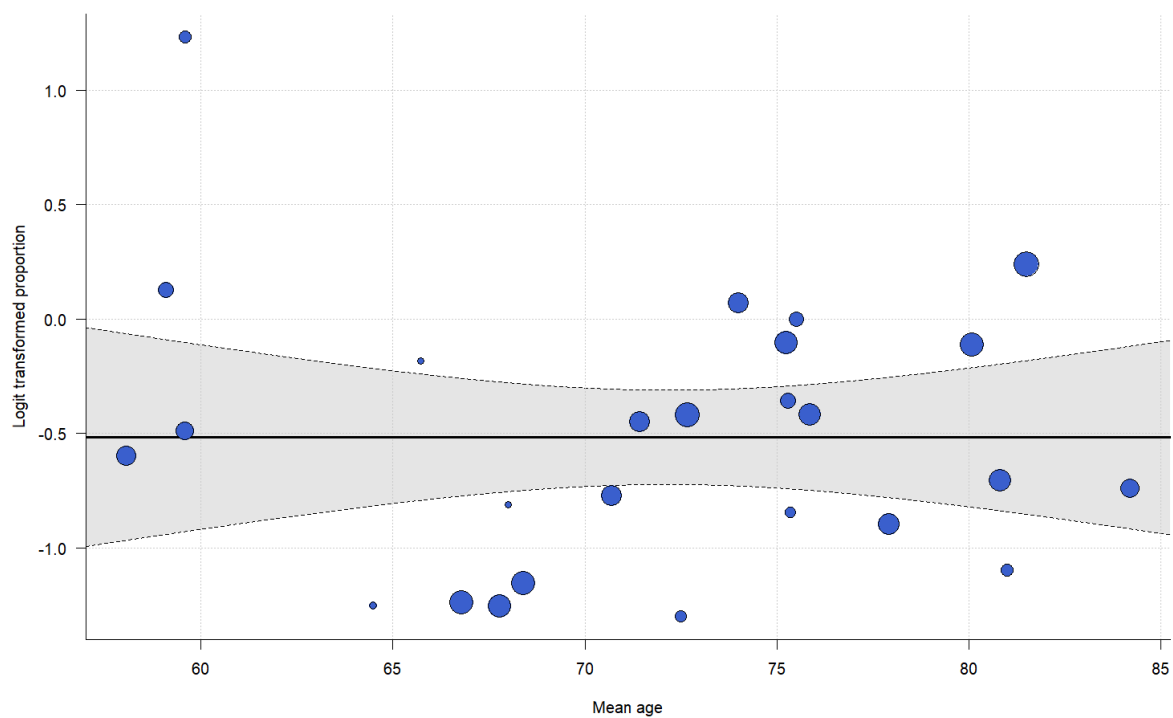
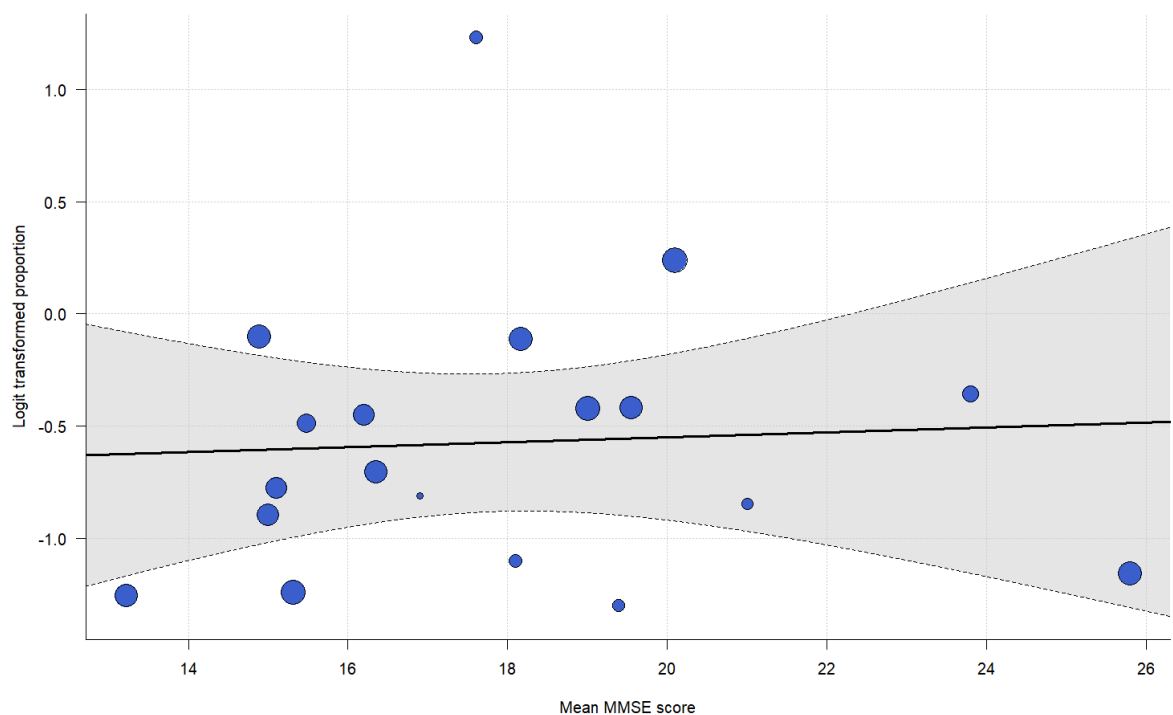
95%PI = 95% prediction interval; NPI = Neuropsychiatric Inventory.

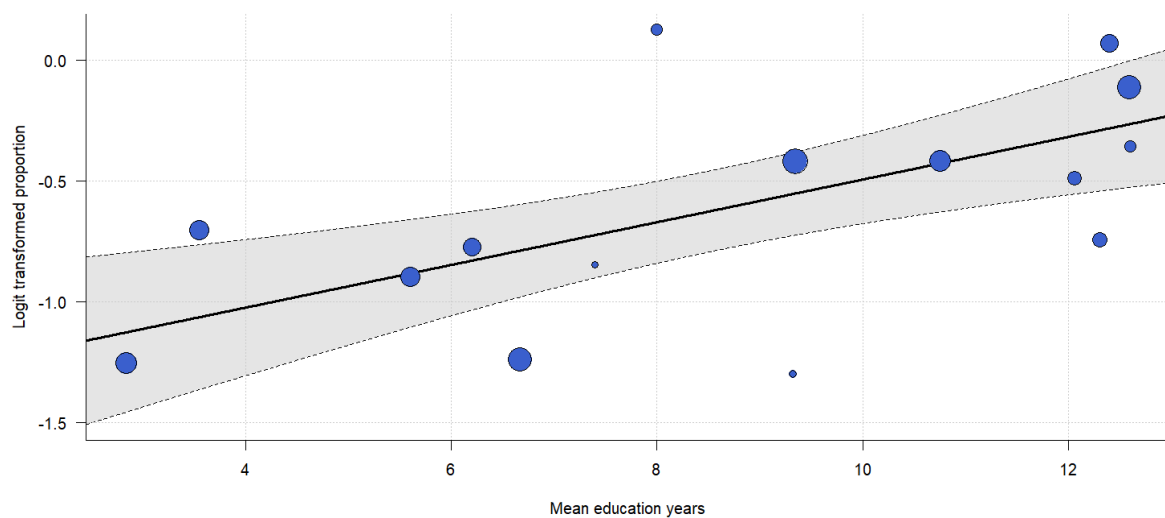
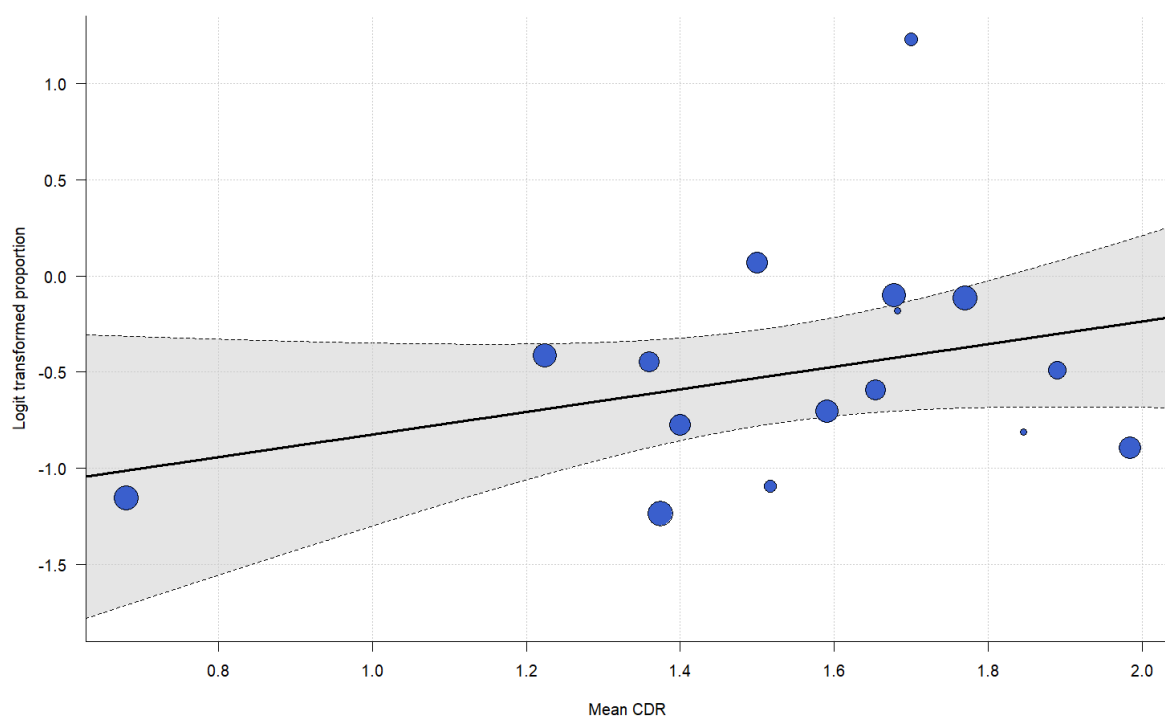
Supplementary Figure S3 Meta-regression scatter plots for each NPI domain in the unspecified VCI group**A1. Delusions (age)****A2. Delusions (MMSE)**

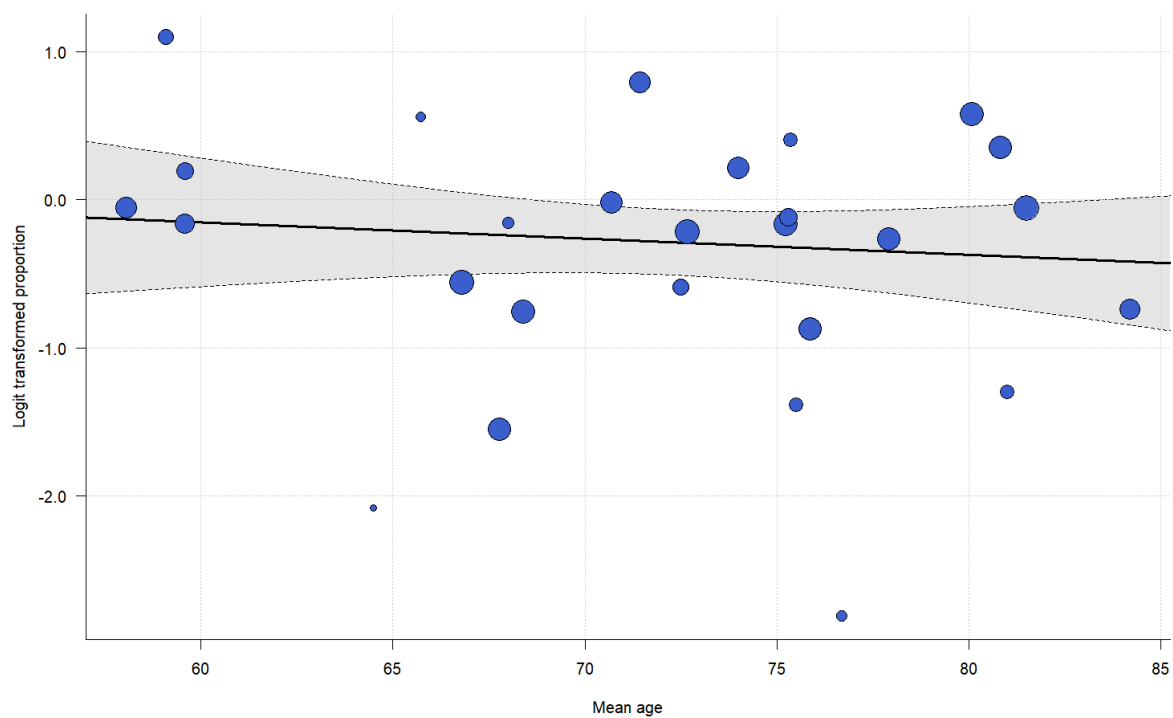
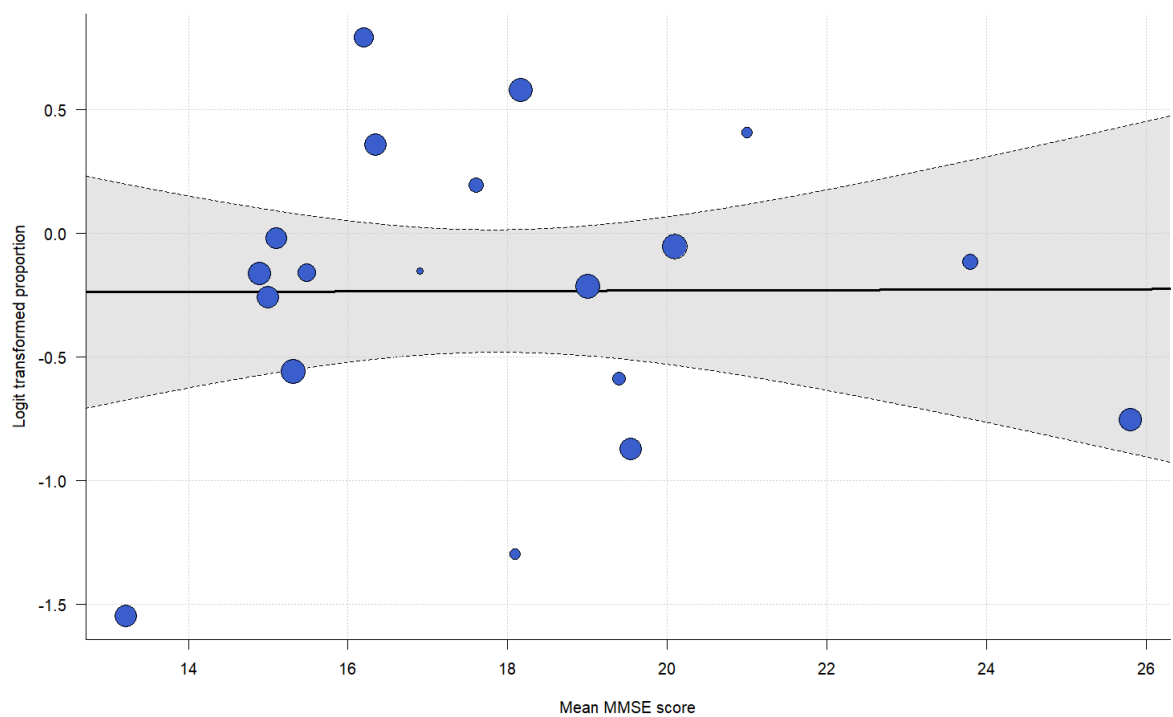
A3. Delusions (years of education)**A4. Delusions (CDR)**

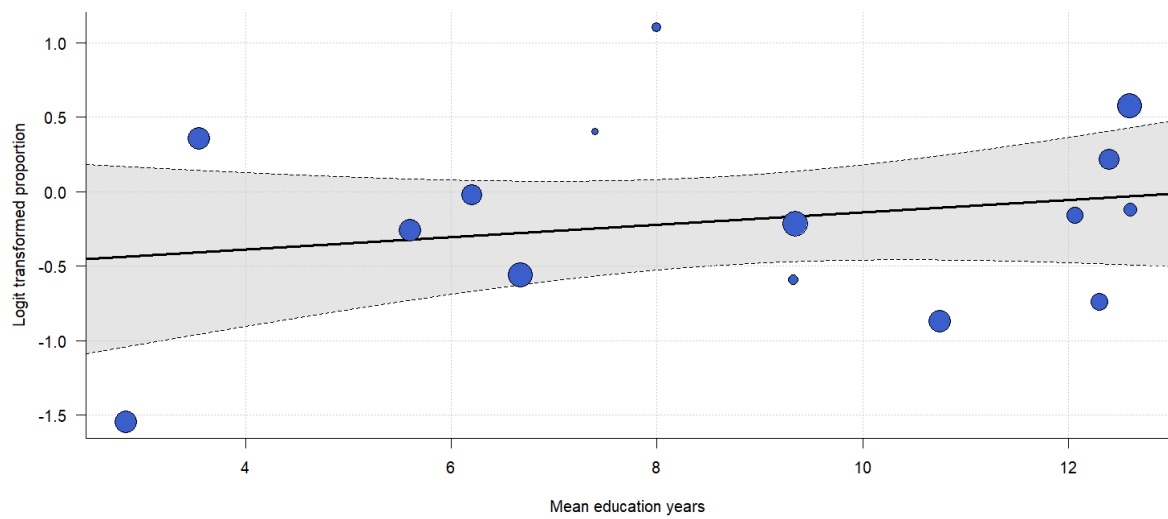
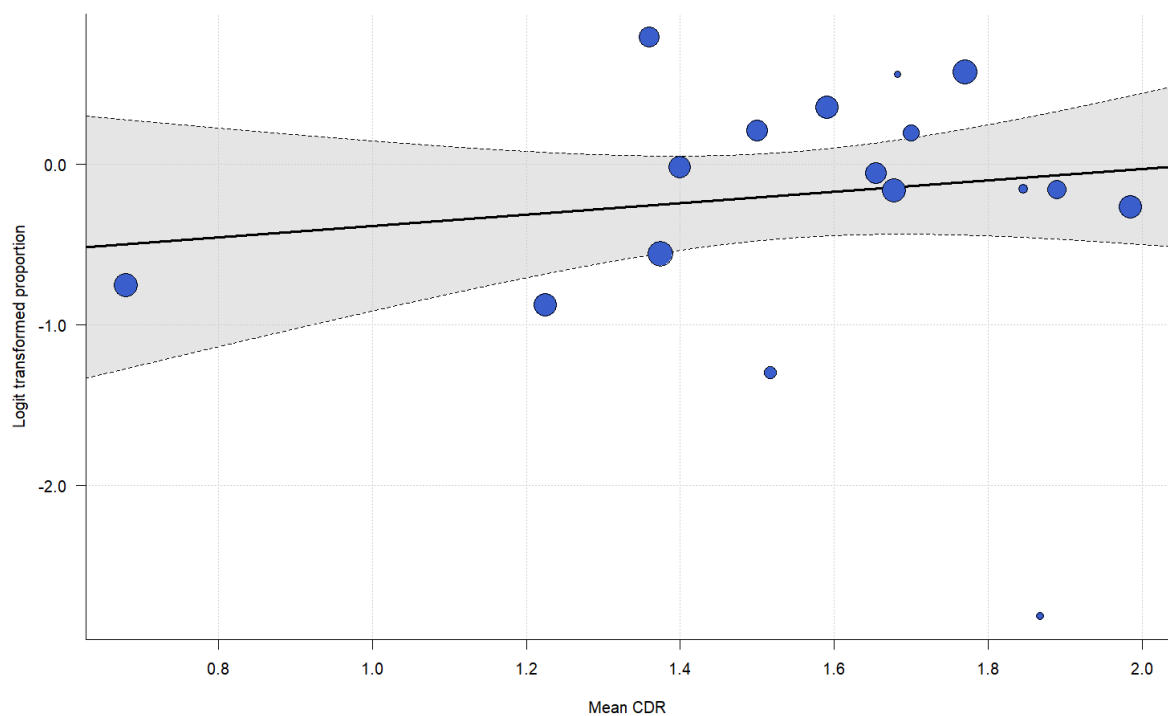
B1. Hallucinations (age)**B2. Hallucinations (MMSE)**

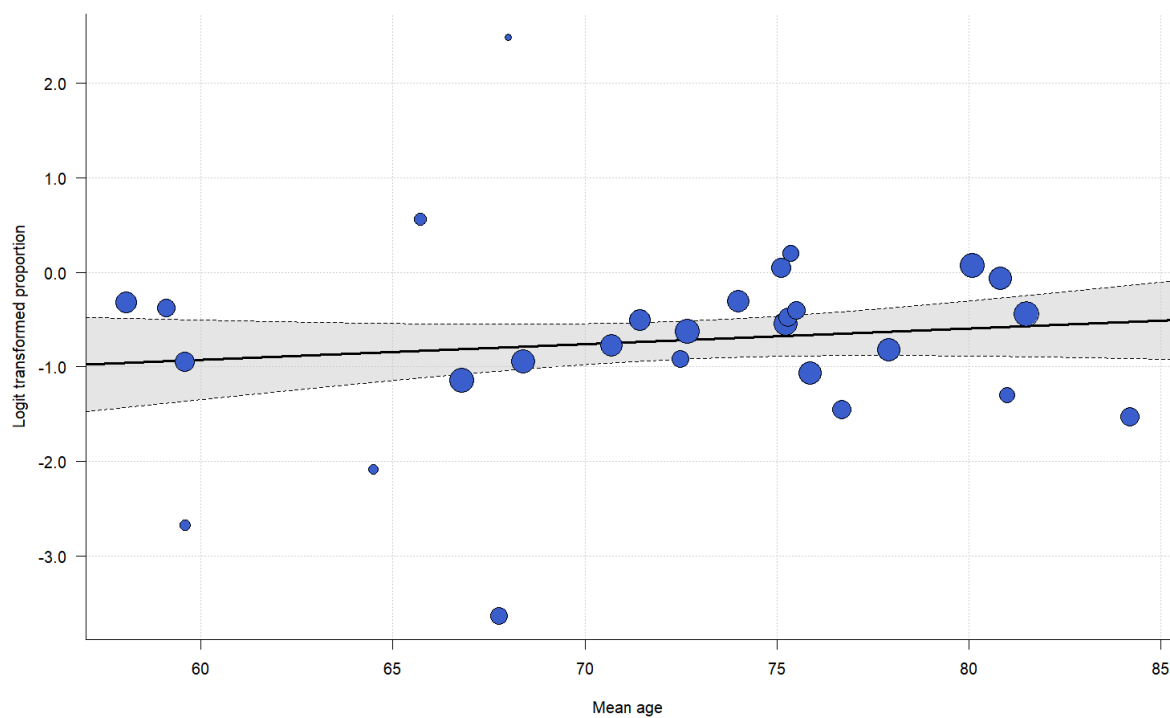
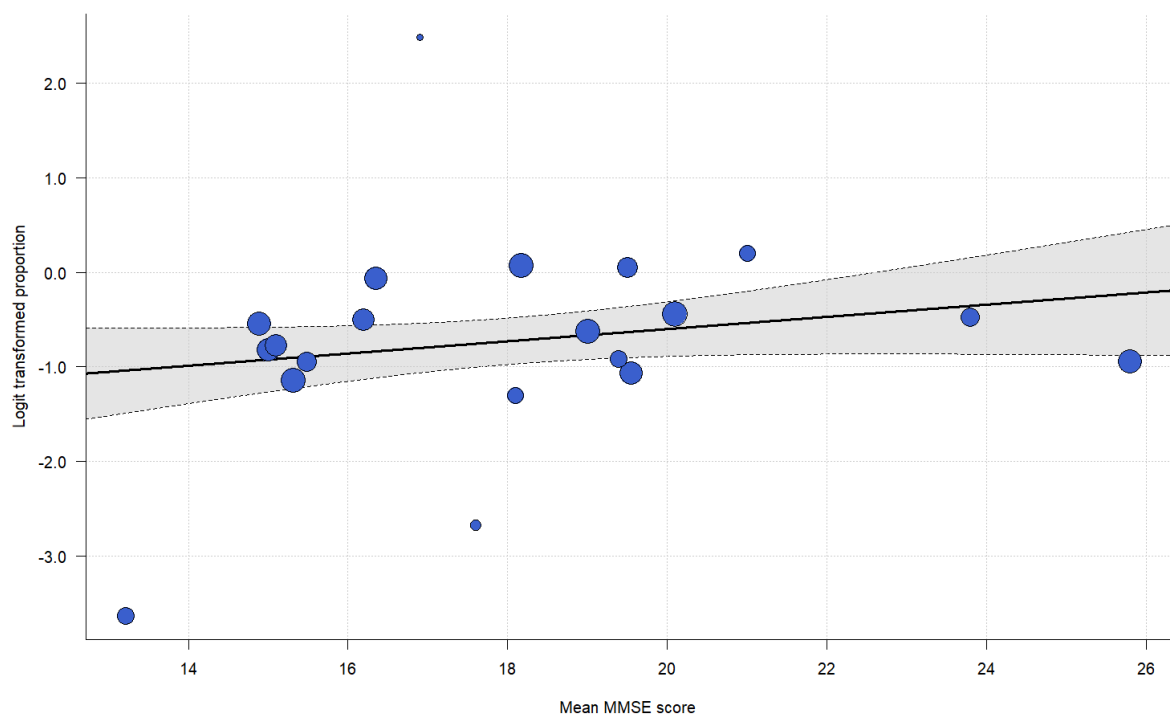
B3. Hallucinations (years of education)**B4. Hallucinations (CDR)**

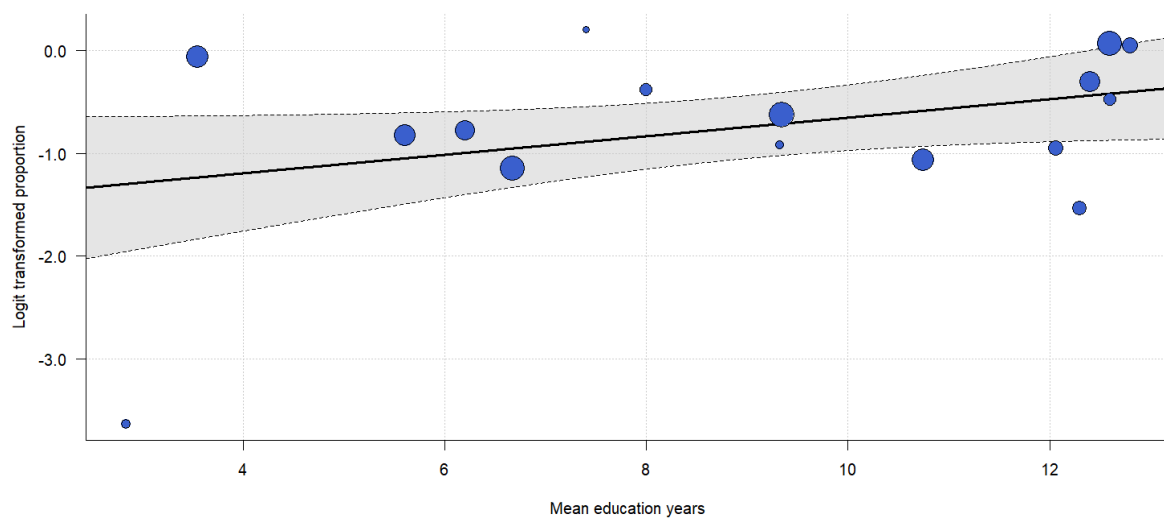
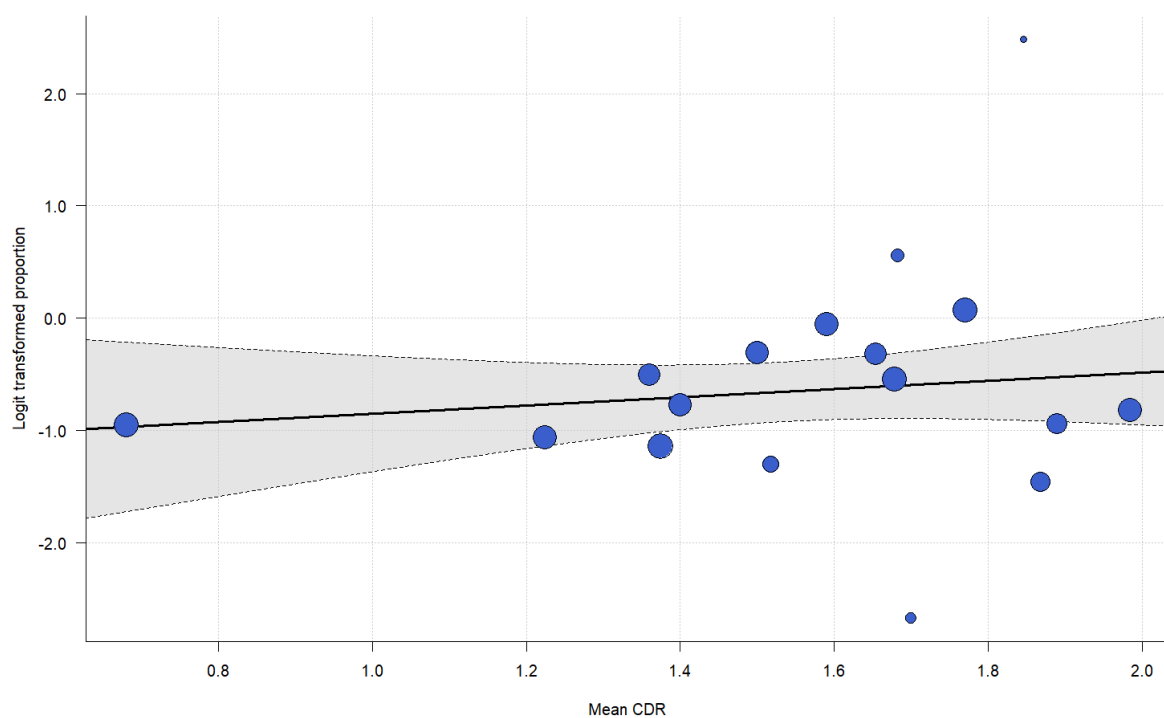
C1. Agitation/Aggression (age)**C2. Agitation/Aggression (MMSE)**

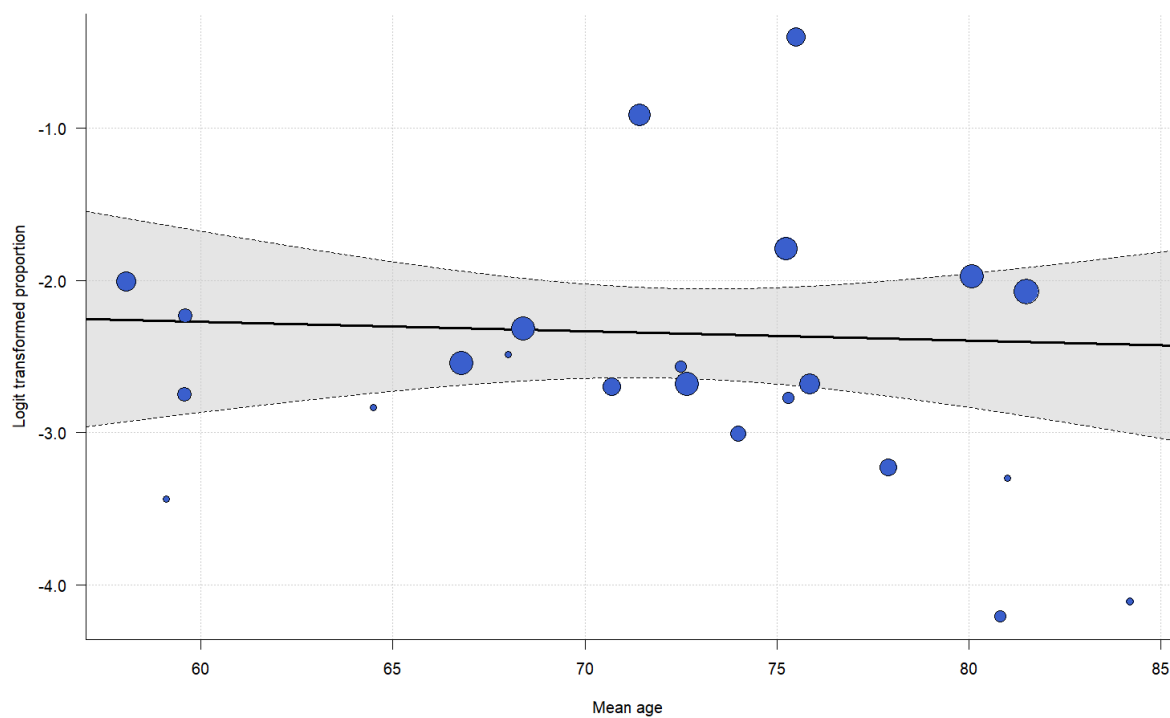
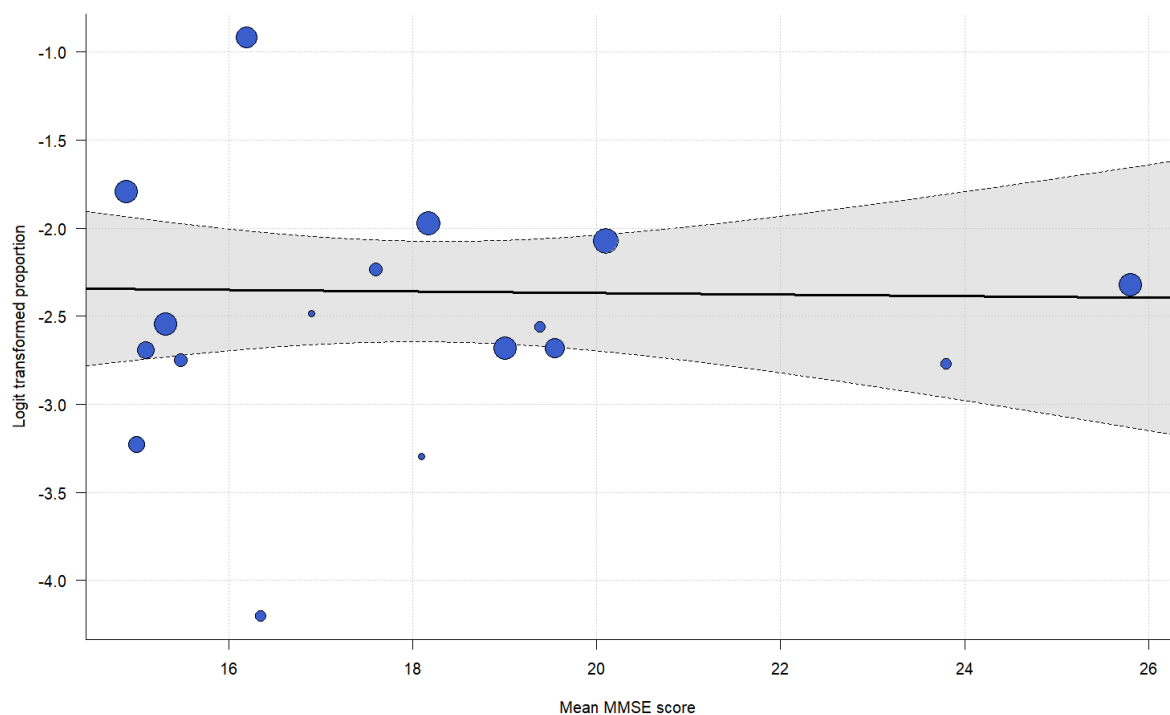
C3. Agitation/Aggression (years of education)**C4. Agitation/Aggression (CDR)**

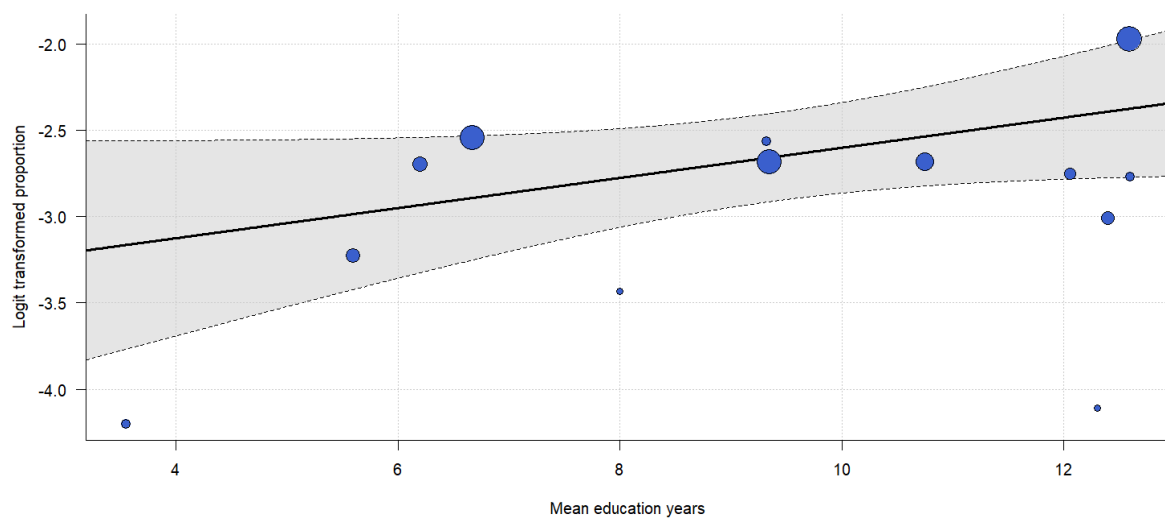
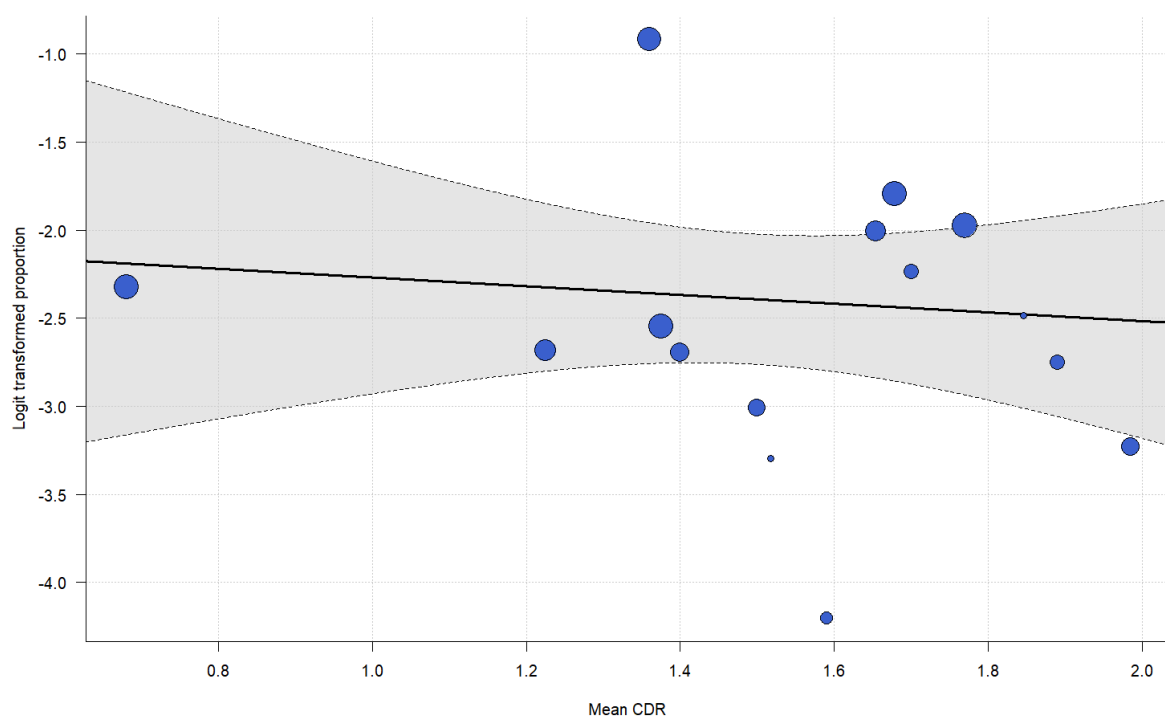
D1. Depression/Dysphoria (age)**D2. Depression/Dysphoria (MMSE)**

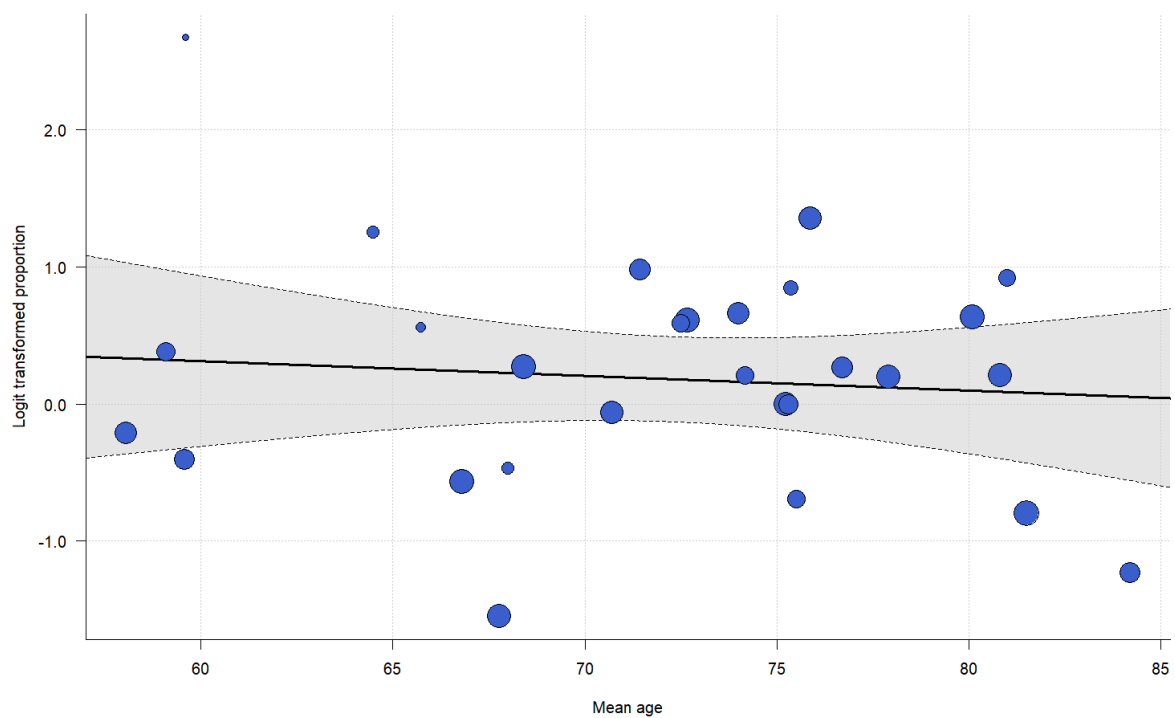
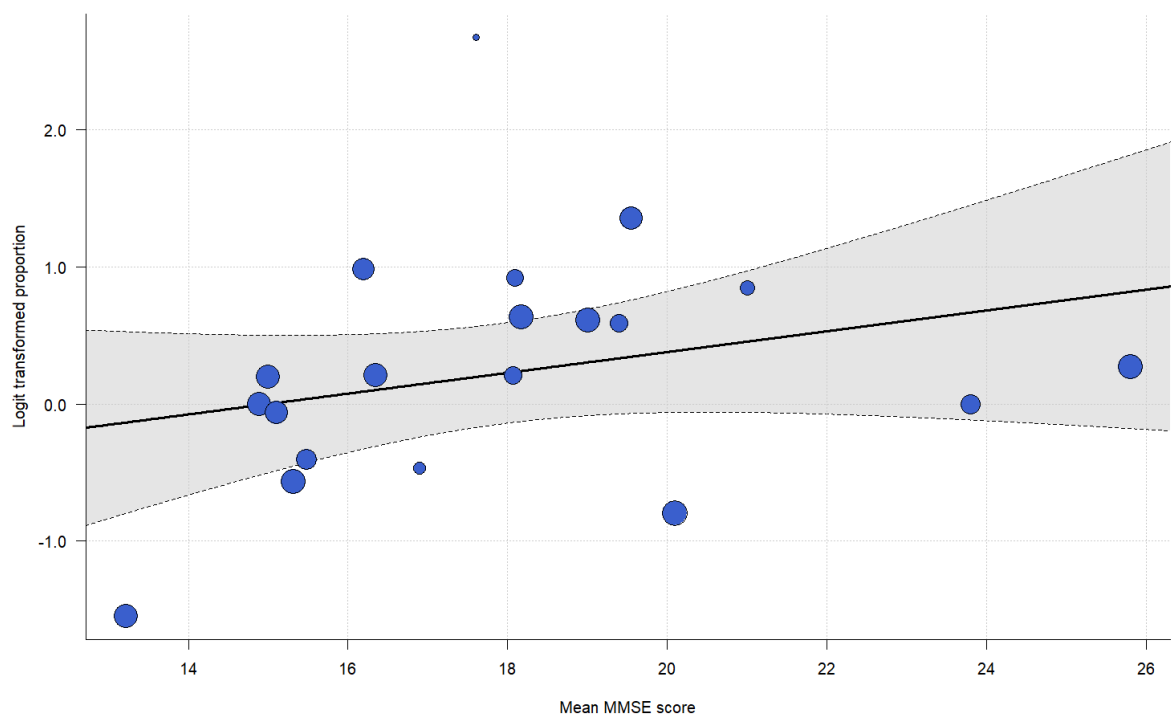
D3. Depression/Dysphoria (years of education)**D4. Depression/Dysphoria (CDR)**

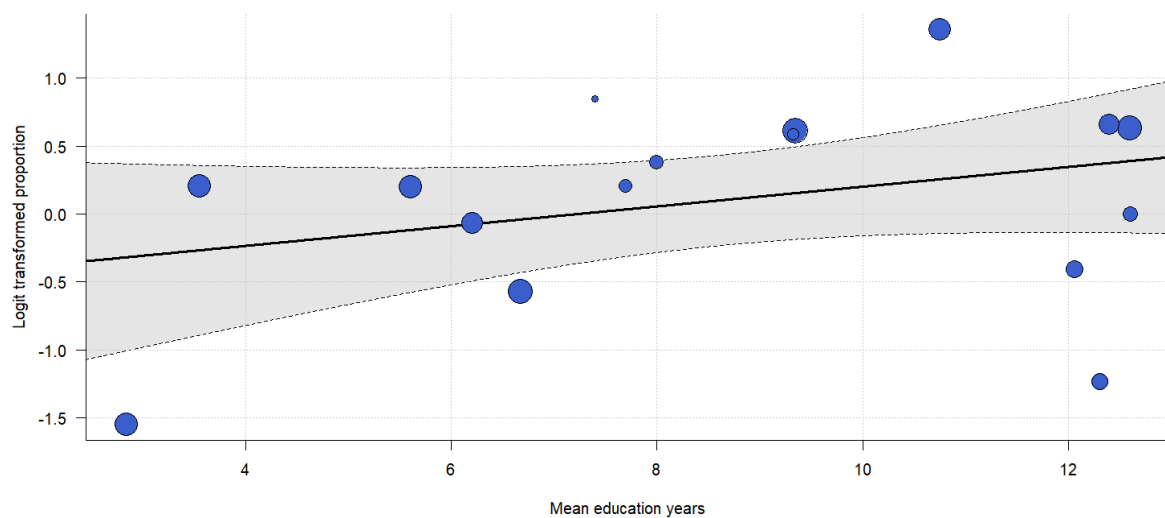
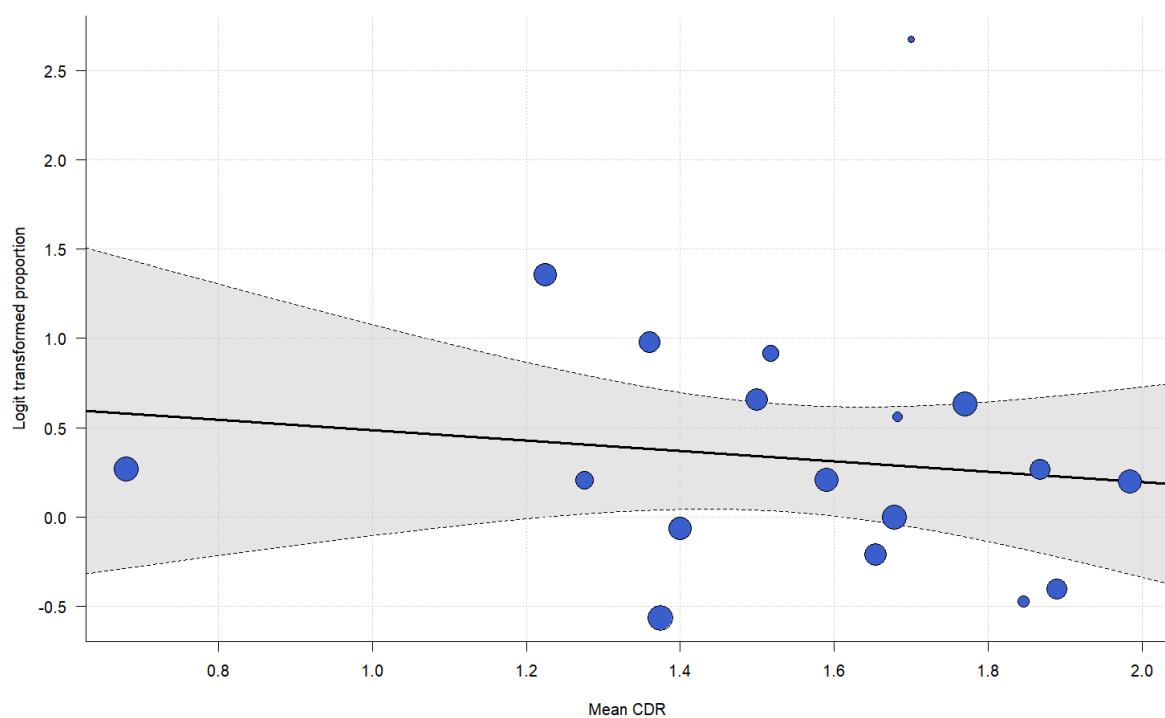
E1. Anxiety (age)**E2. Anxiety (MMSE)**

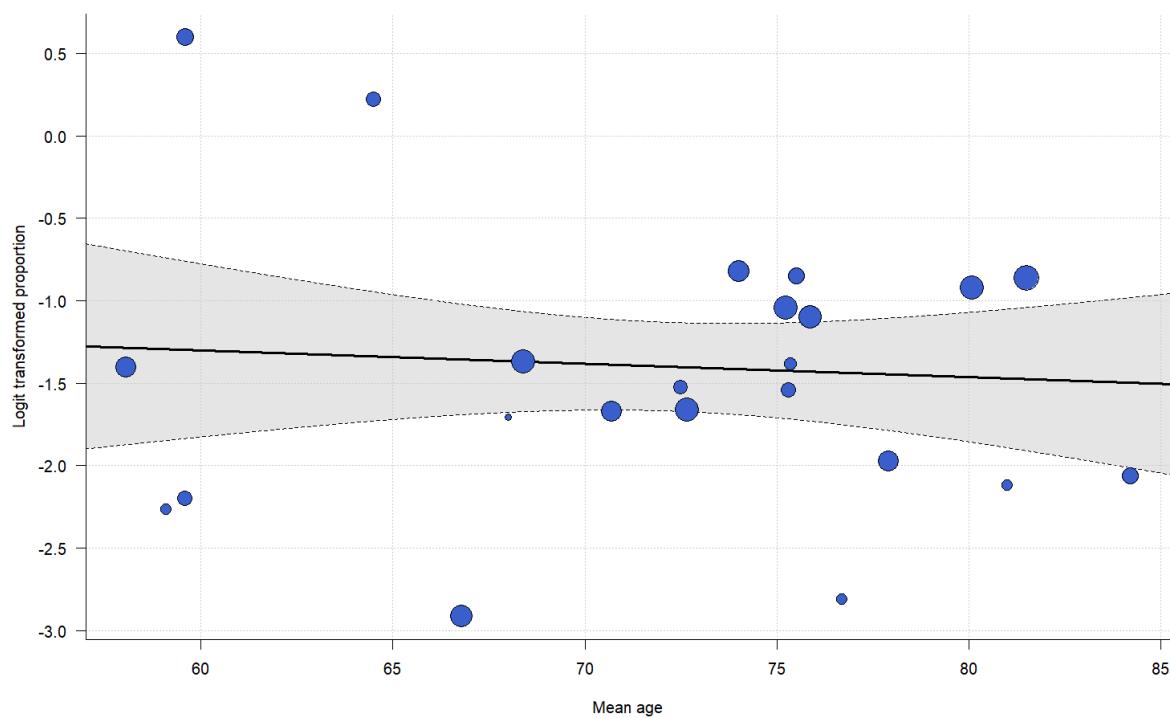
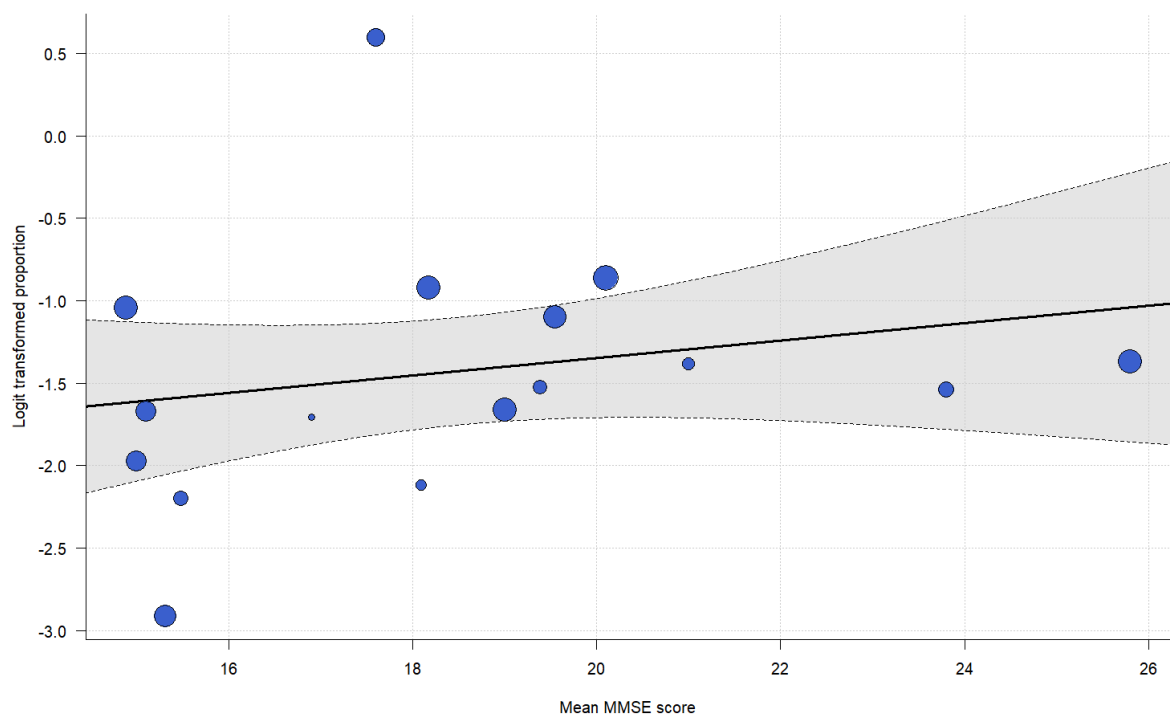
E3. Anxiety (years of education)**E4. Anxiety (CDR)**

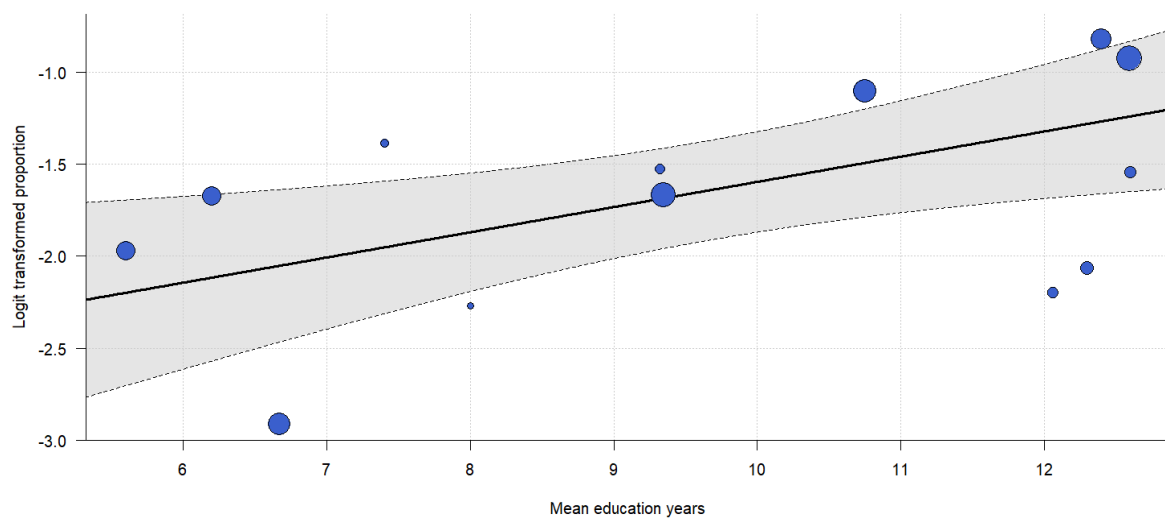
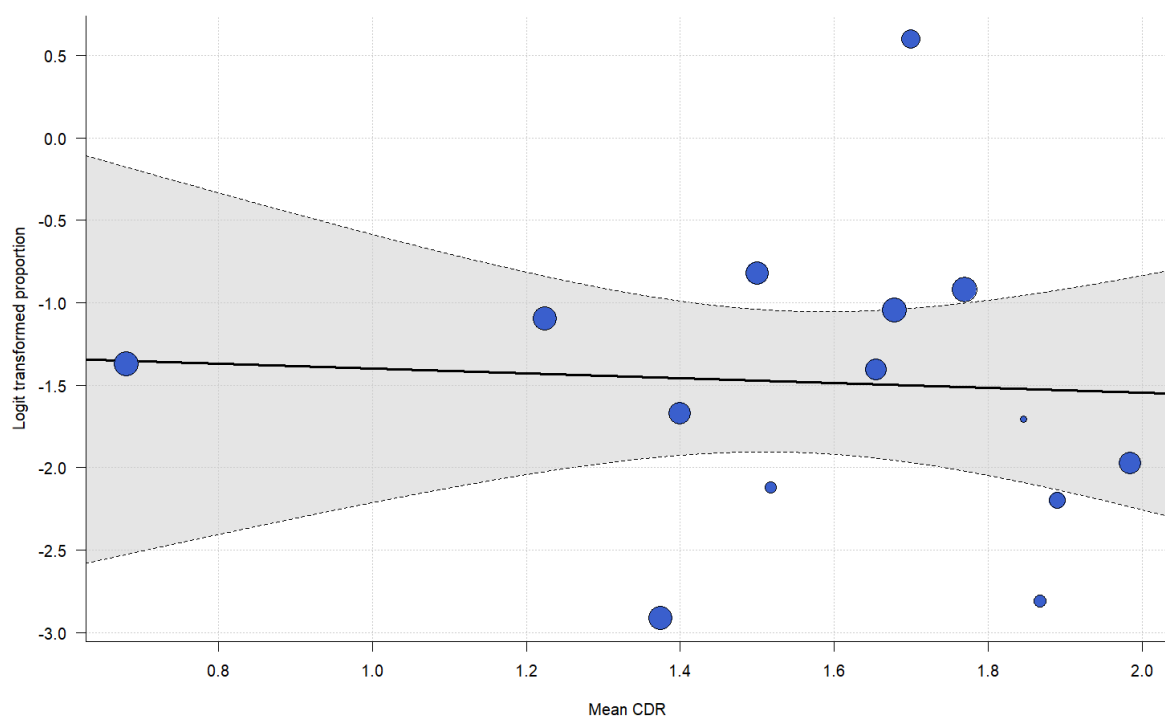
F1. Elation/Euphoria (age)**F2. Elation/Euphoria (MMSE)**

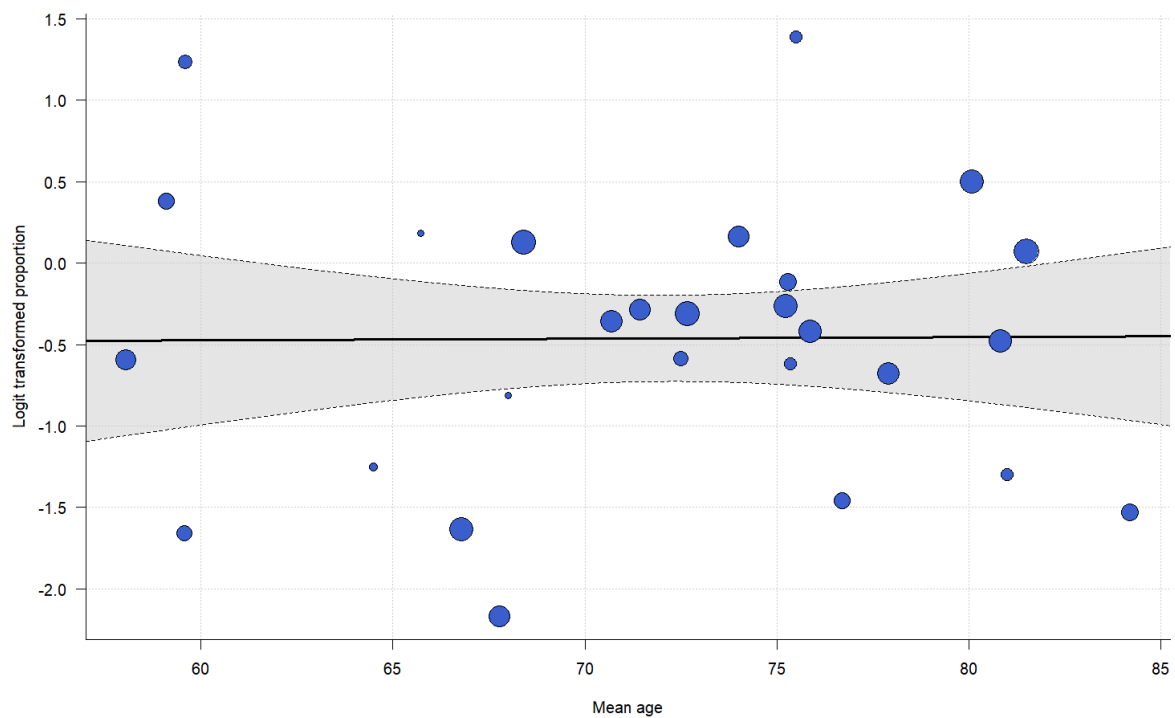
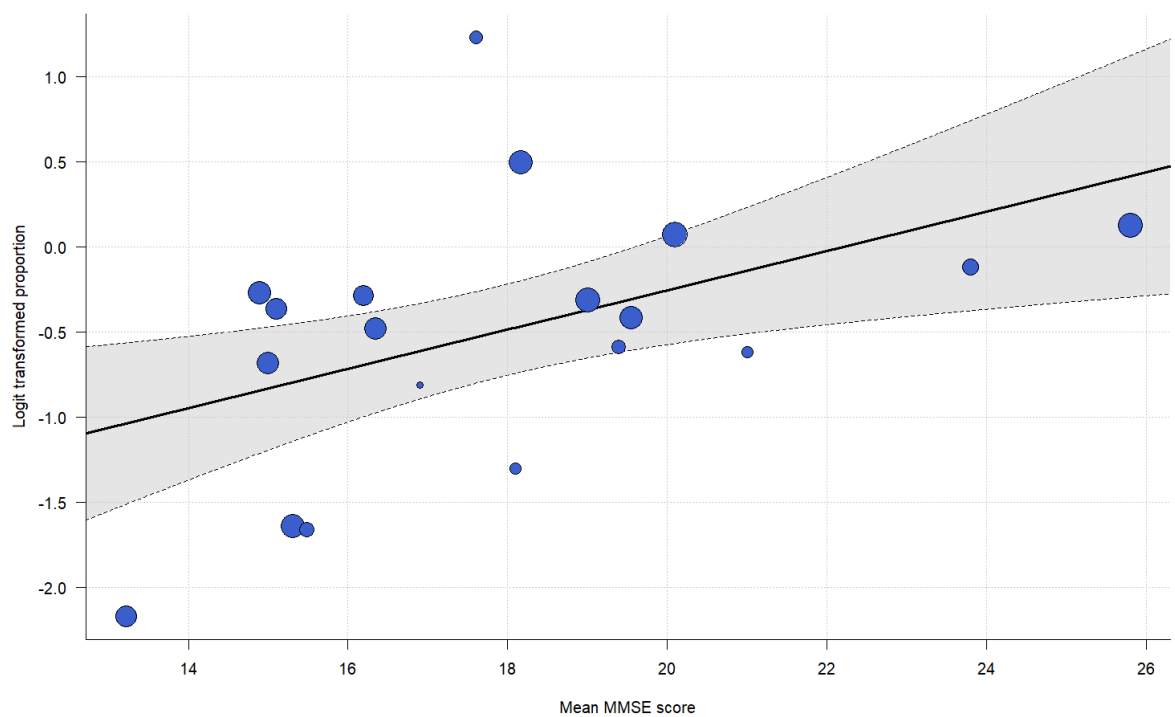
F3. Elation/Euphoria (years of education)**F4. Elation/Euphoria (CDR)**

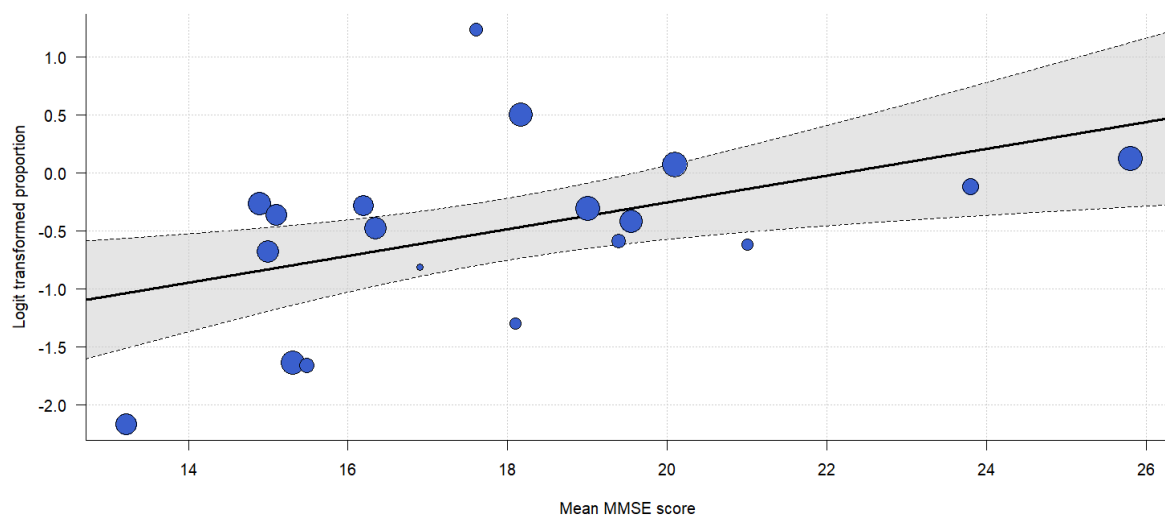
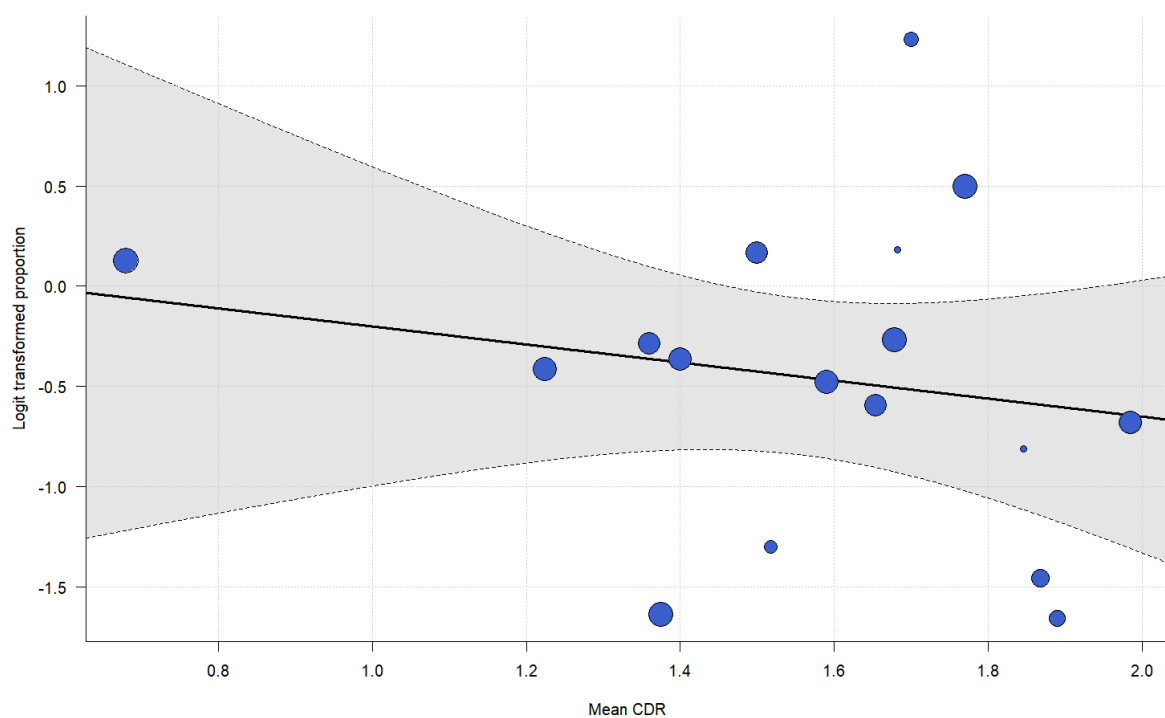
G1. Apathy/Indifference (age)**G2. Apathy/Indifference (MMSE)**

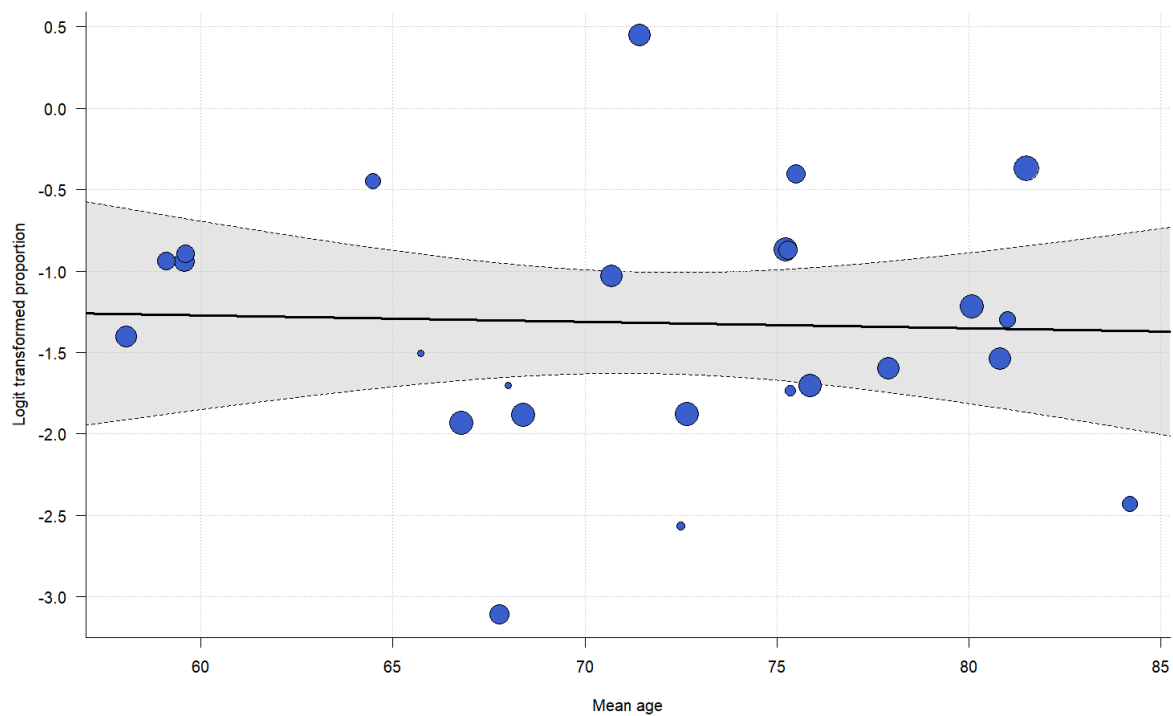
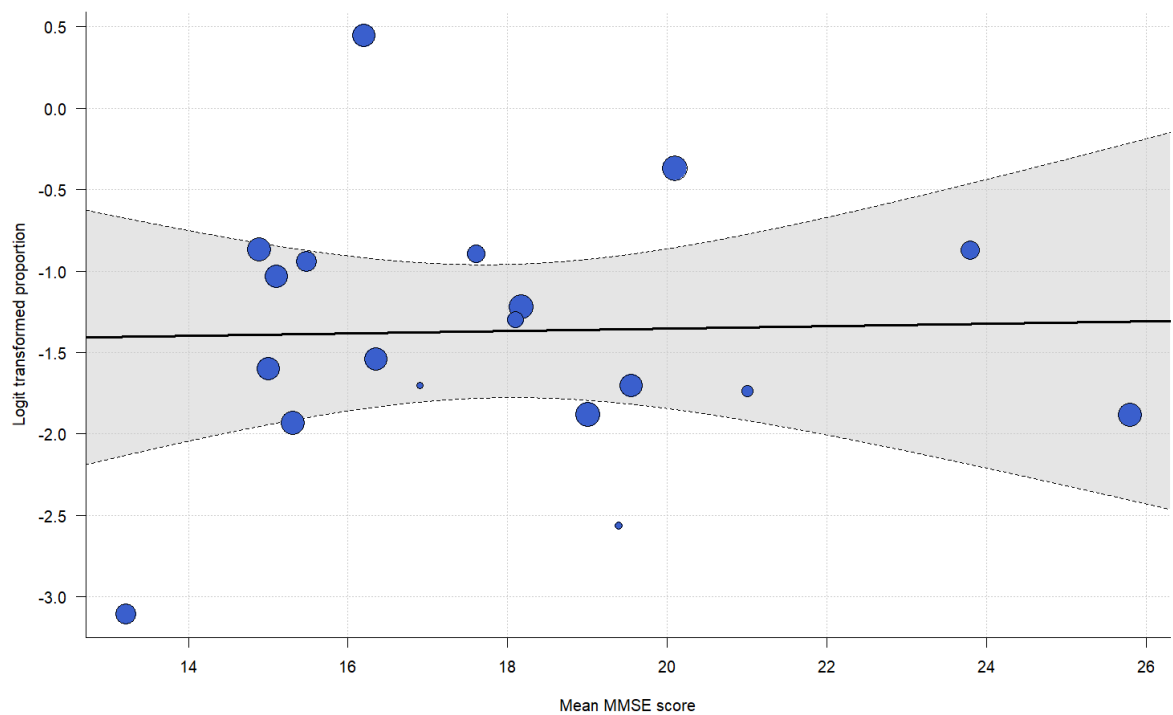
G3. Apathy/Indifference (years of education)**G4. Apathy/Indifference (CDR)**

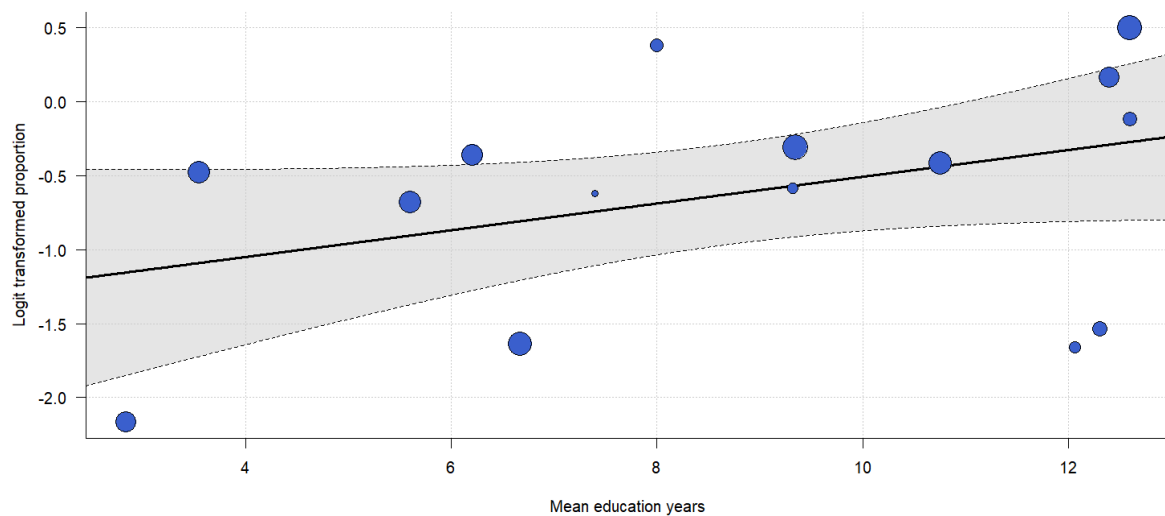
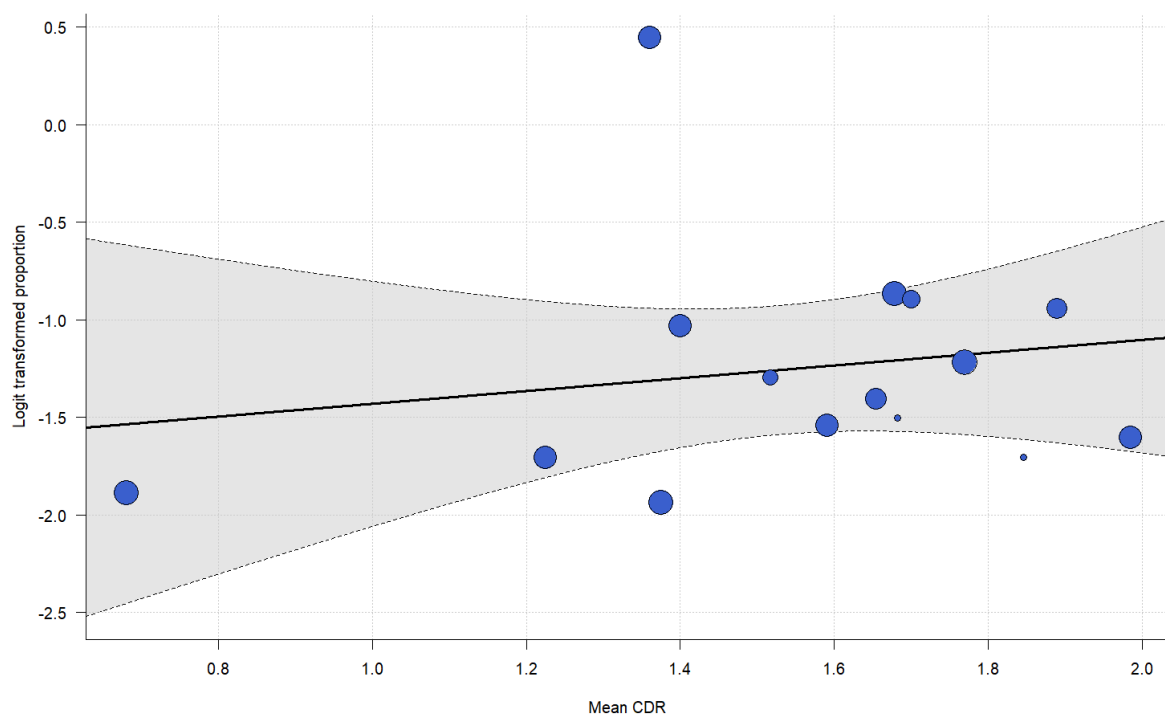
H1. Disinhibition (age)**H2. Disinhibition (MMSE)**

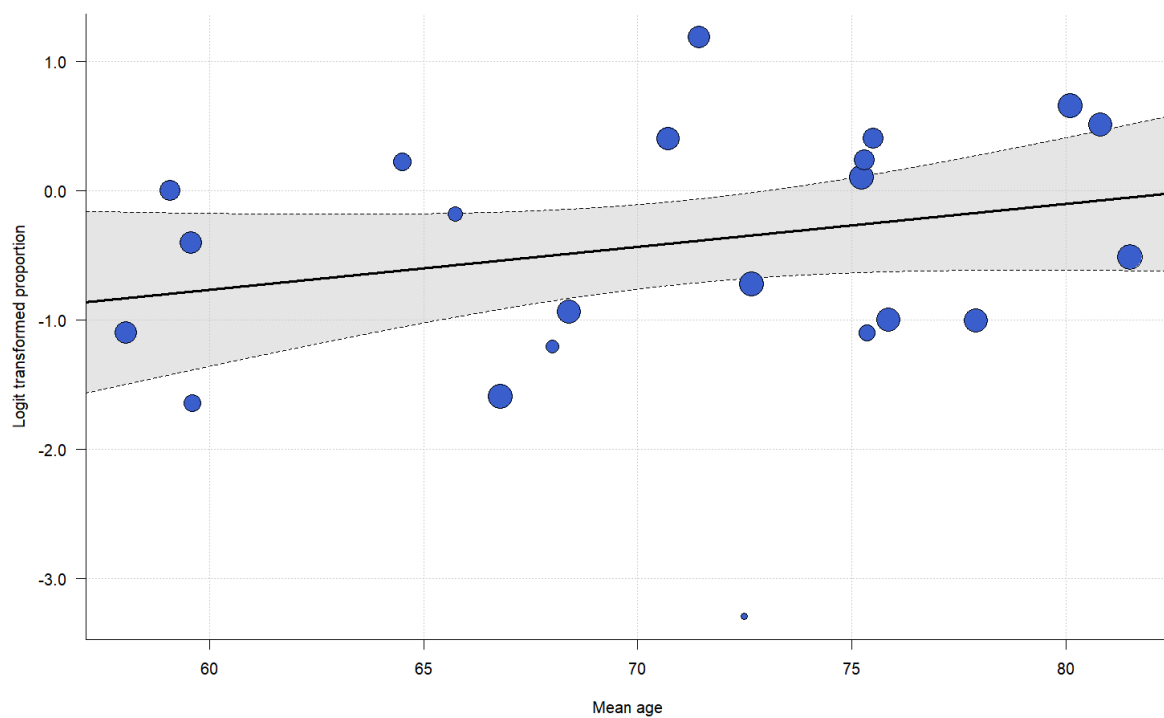
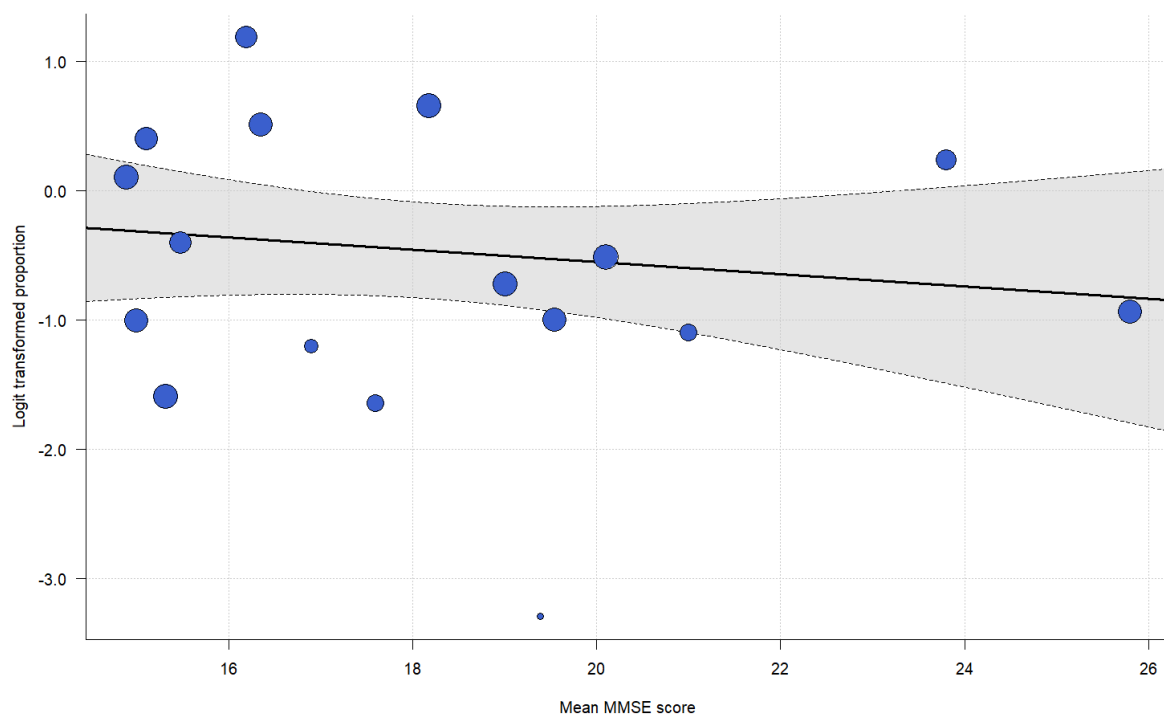
H3. Disinhibition (years of education)**H4. Disinhibition (CDR)**

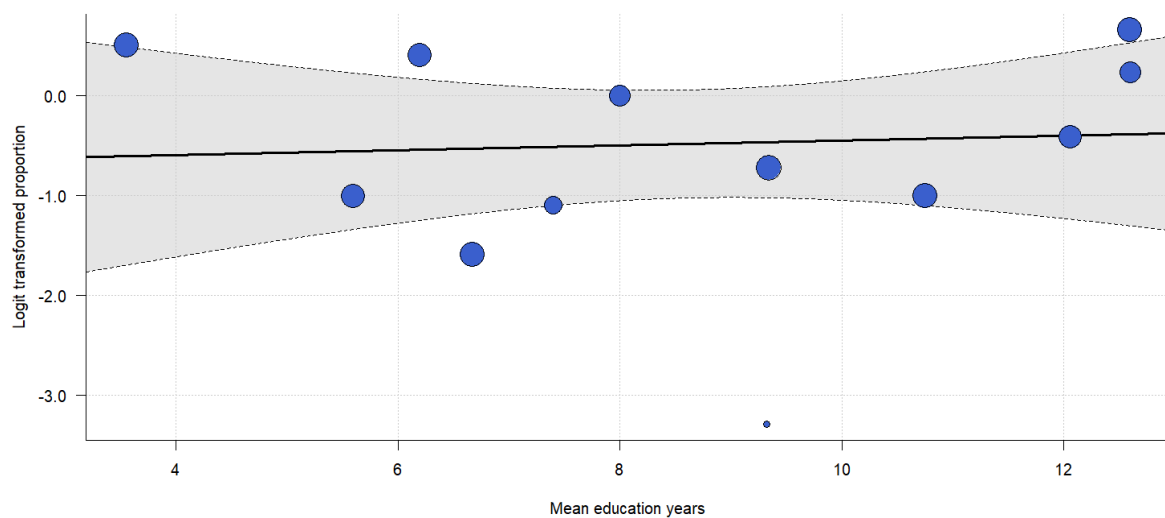
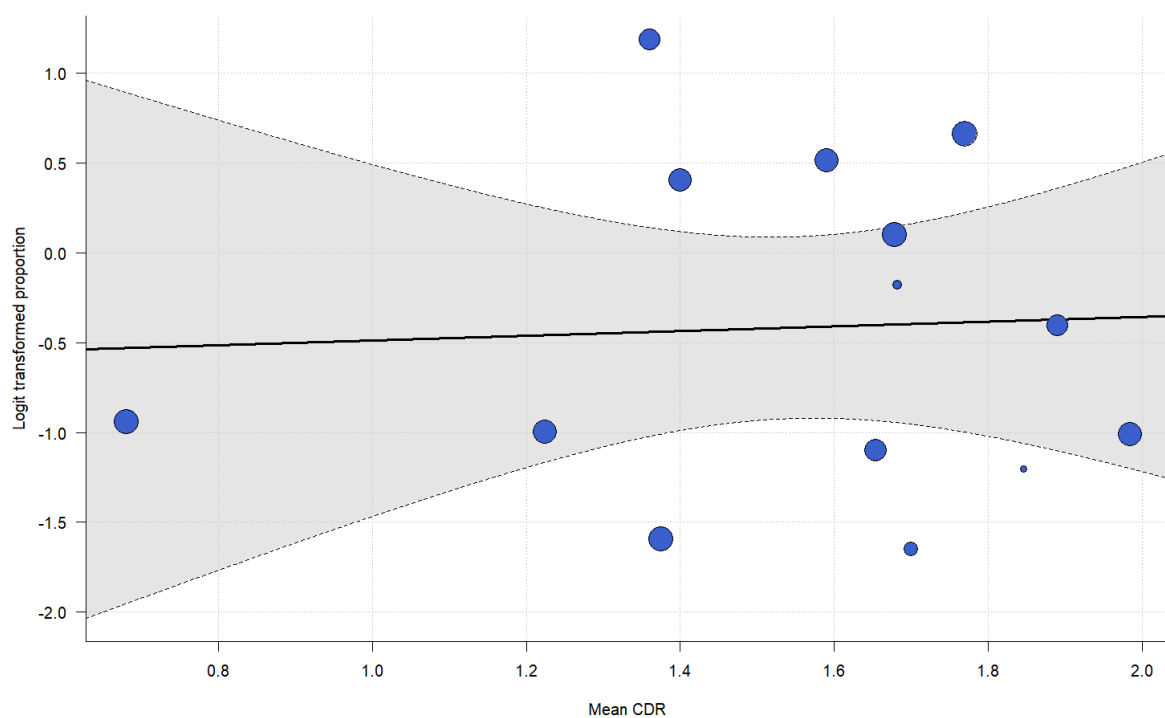
I1. Irritability/Lability (age)**I2. Irritability/Lability (MMSE)**

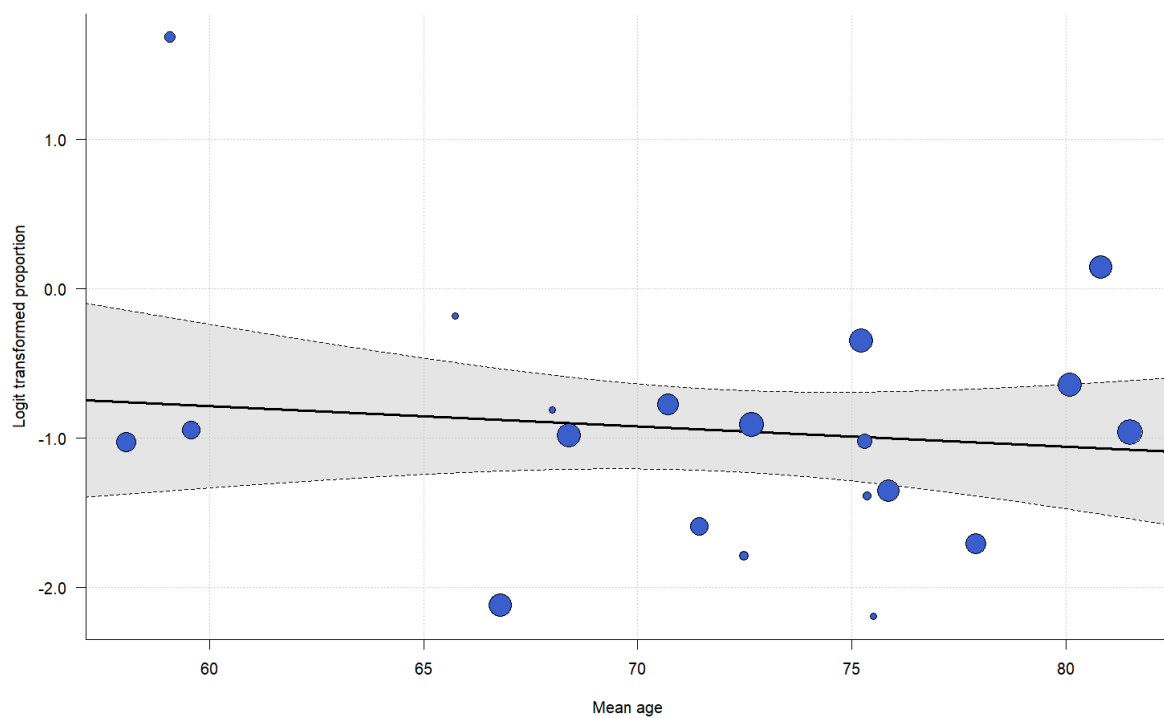
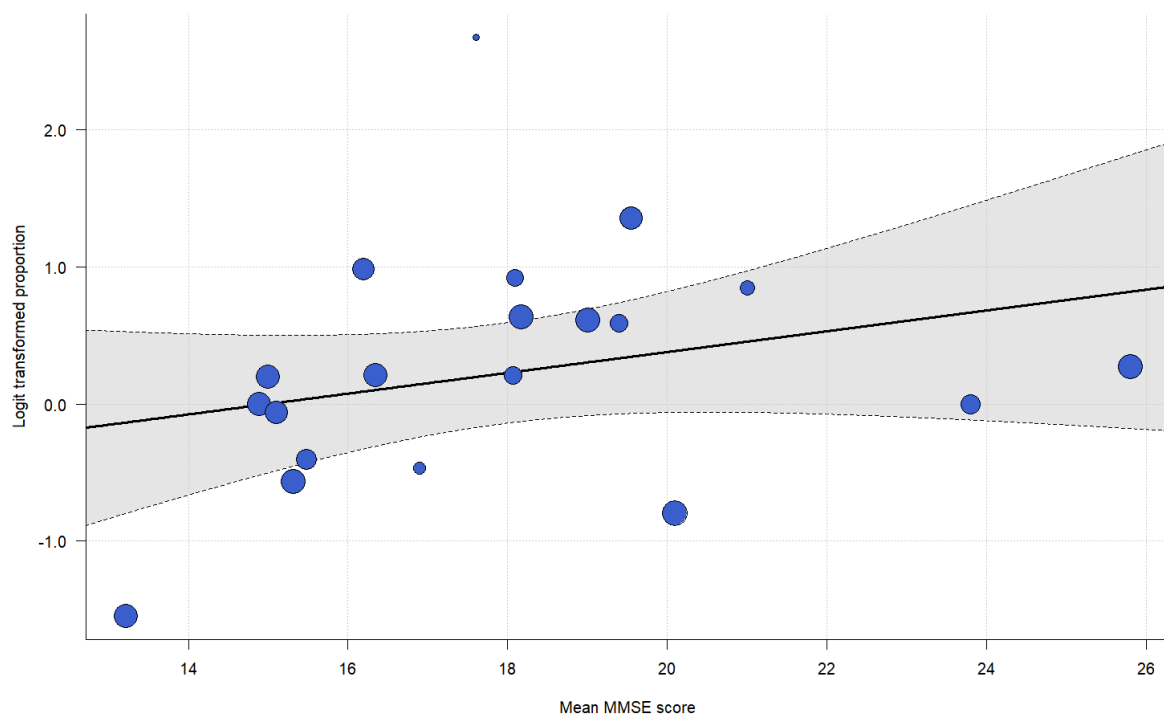
I3. Irritability/Lability (years of education)**I4. Irritability/Lability (CDR)**

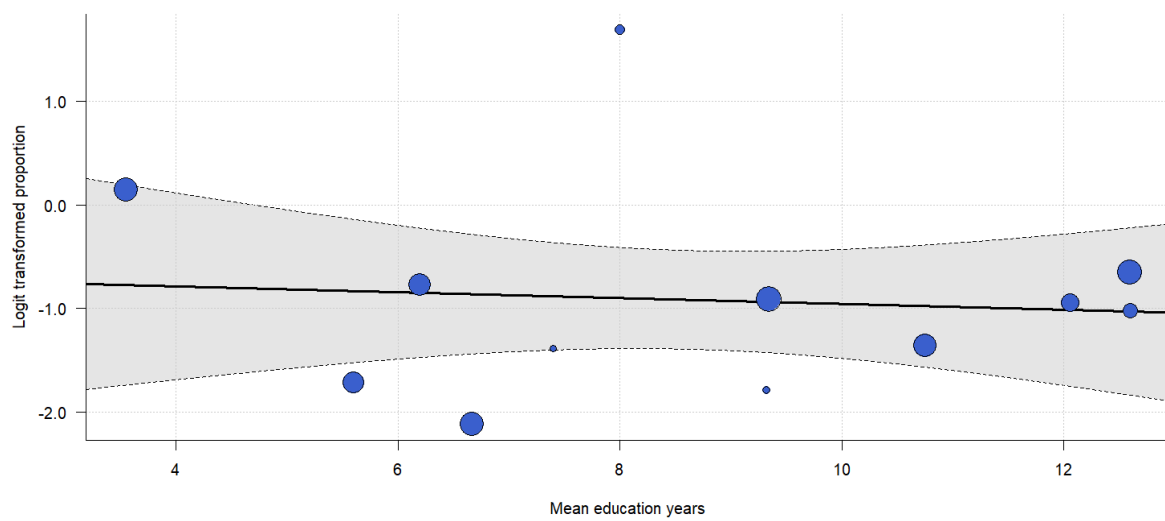
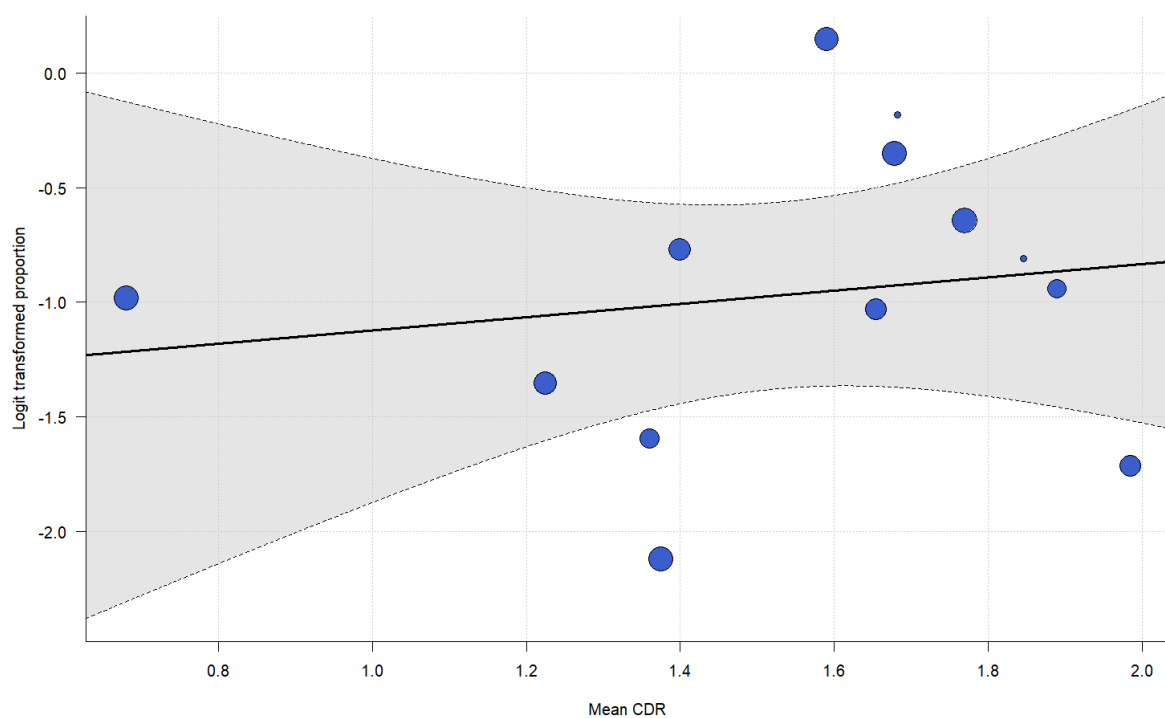
J1. Aberrant motor behavior (age)**J2. Aberrant motor behavior (MMSE)**

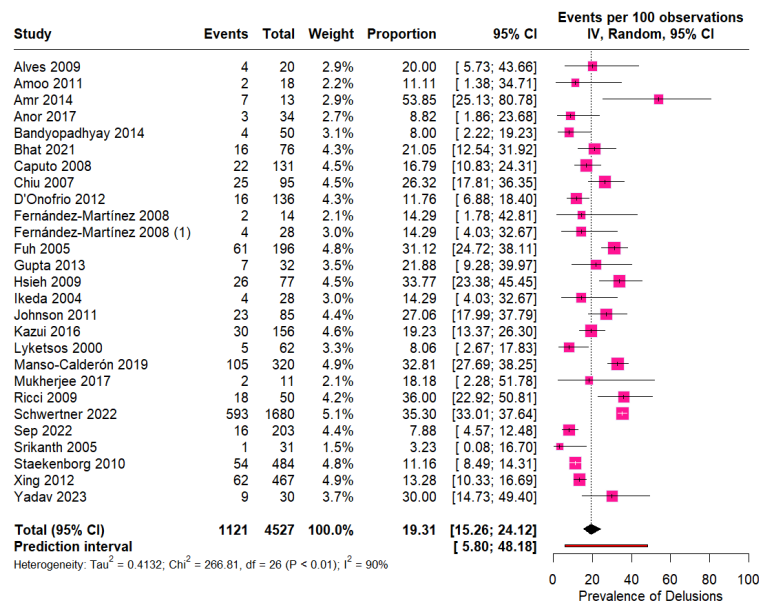
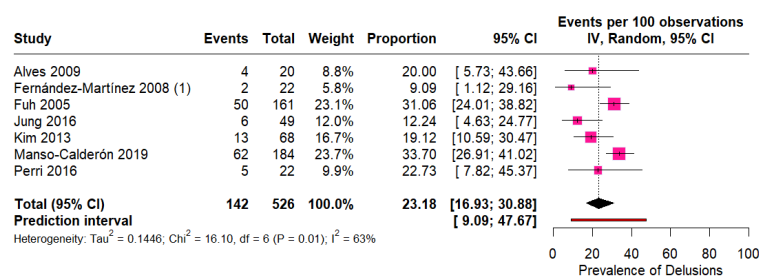
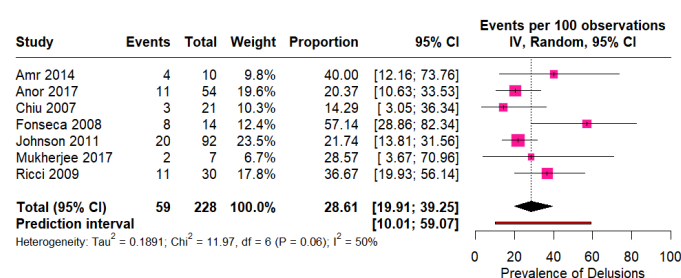
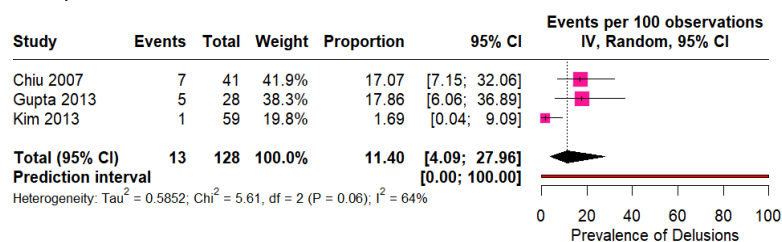
J3. Aberrant motor behavior (years of education)**J4. Aberrant motor behavior (CDR)**

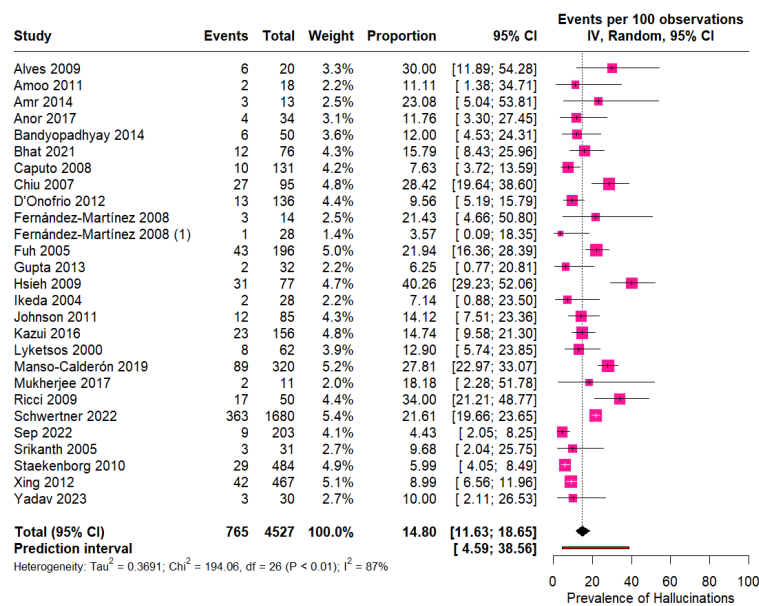
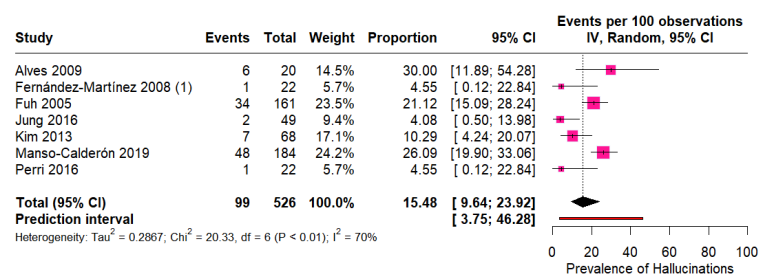
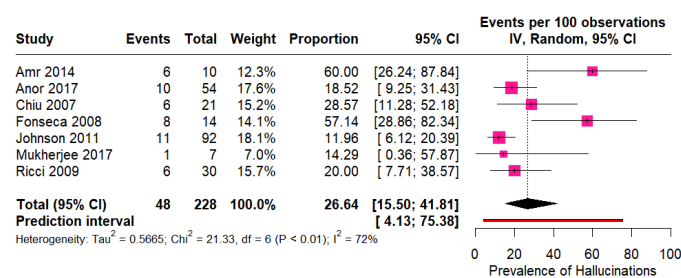
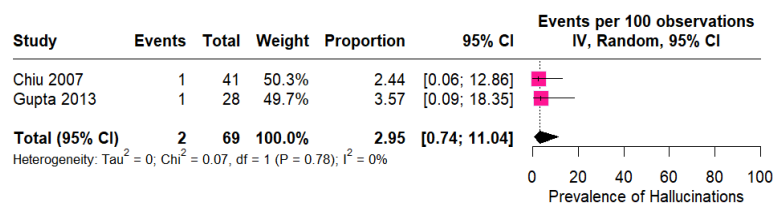
K1. Sleep and nighttime disorders (age)**K2. Sleep and nighttime disorders (MMSE)**

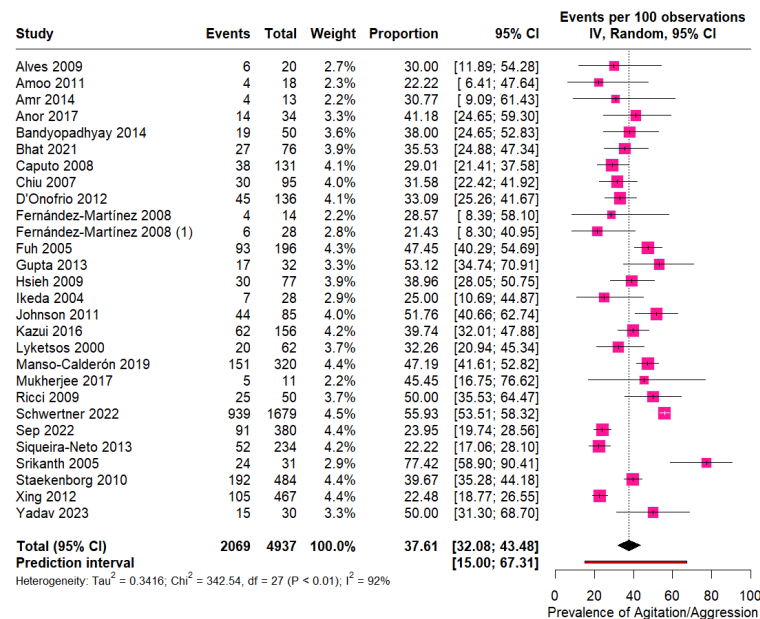
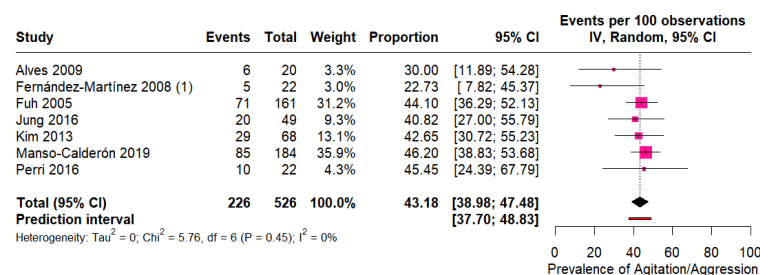
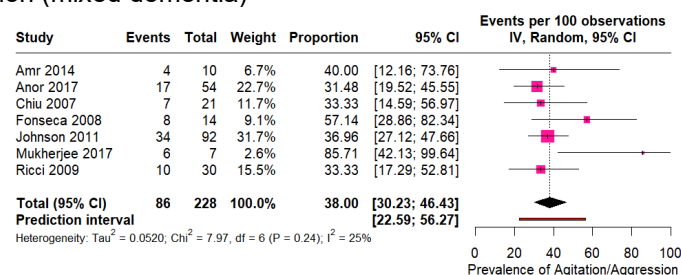
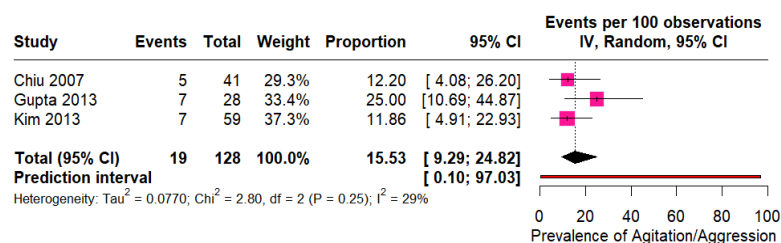
K3. Sleep and nighttime disorders (years of education)**K4. Sleep and nighttime disorders (CDR)**

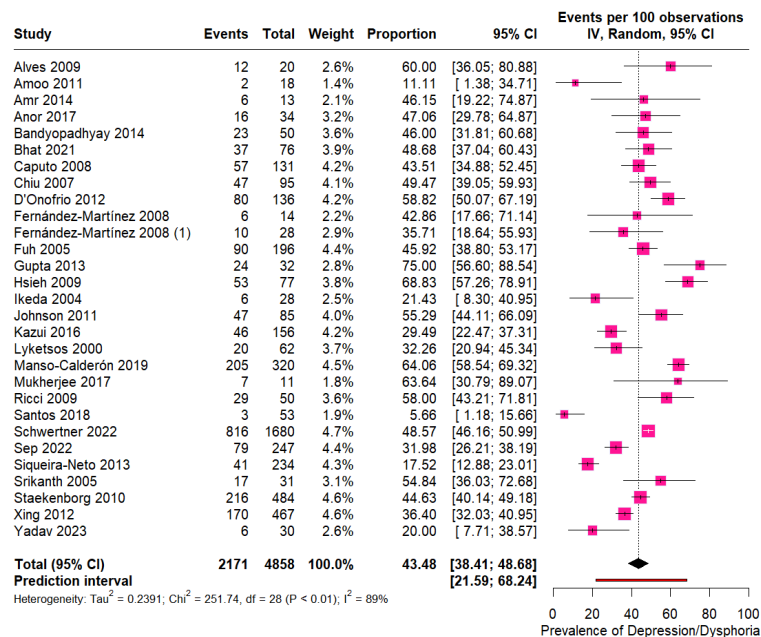
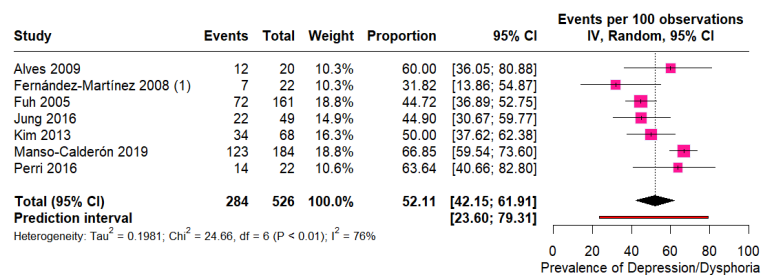
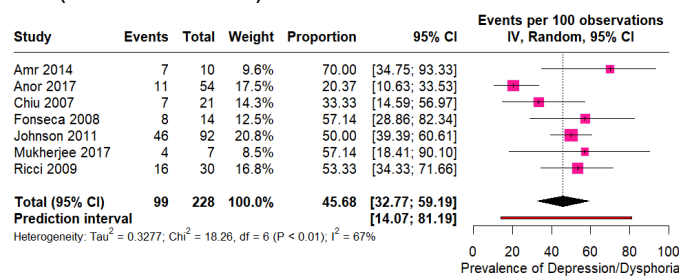
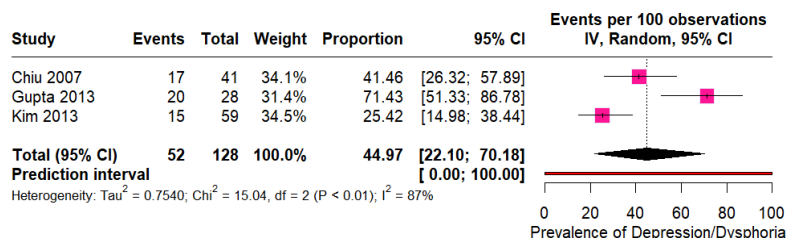
L1. Appetite and eating disorders (age)**L2. Appetite and eating disorders (MMSE)**

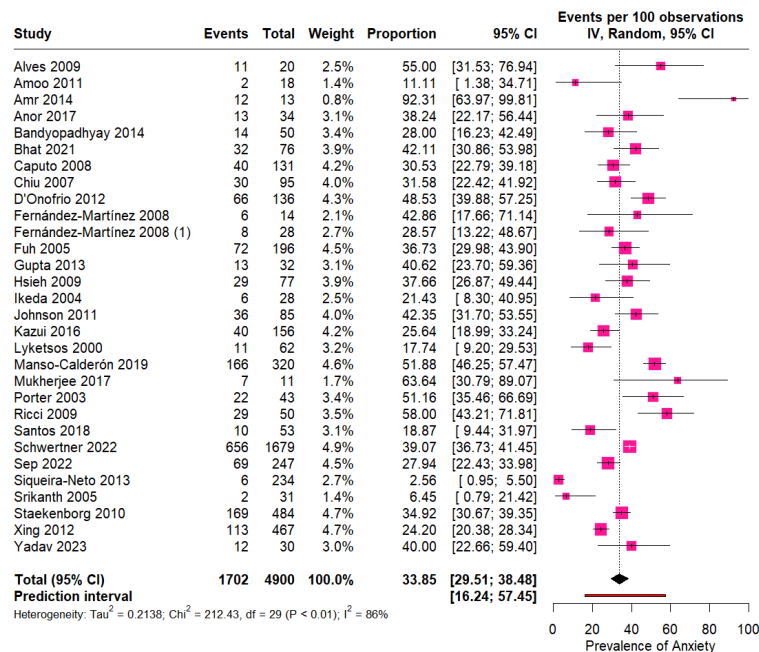
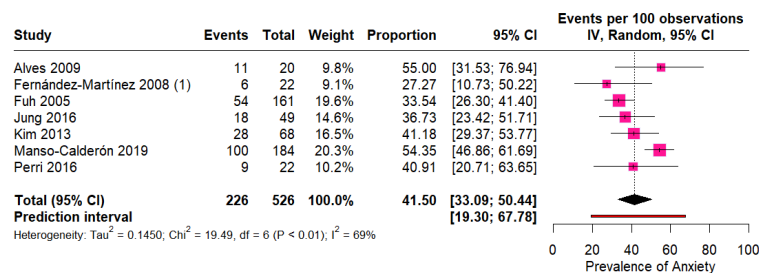
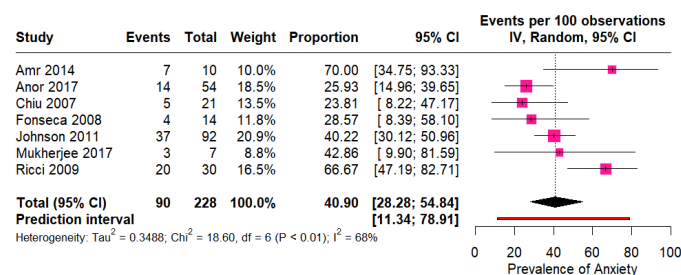
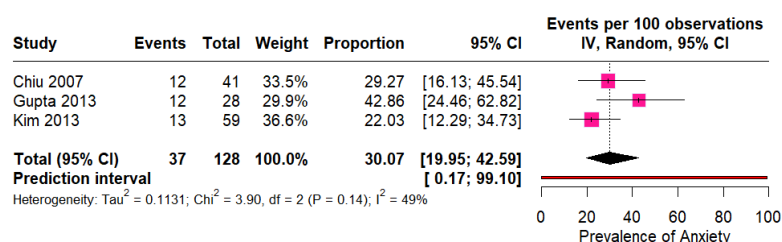
L3. Appetite and eating disorders (years of education)**L4. Appetite and eating disorders (CDR)**

Supplementary Figure S4 Forest plots for prevalence of each NPI domain per VCI group**A1. Delusions (general)****A2. Delusions (subcortical)****A3. Delusions (mixed dementia)****A4. Delusions (VCI-ND)**

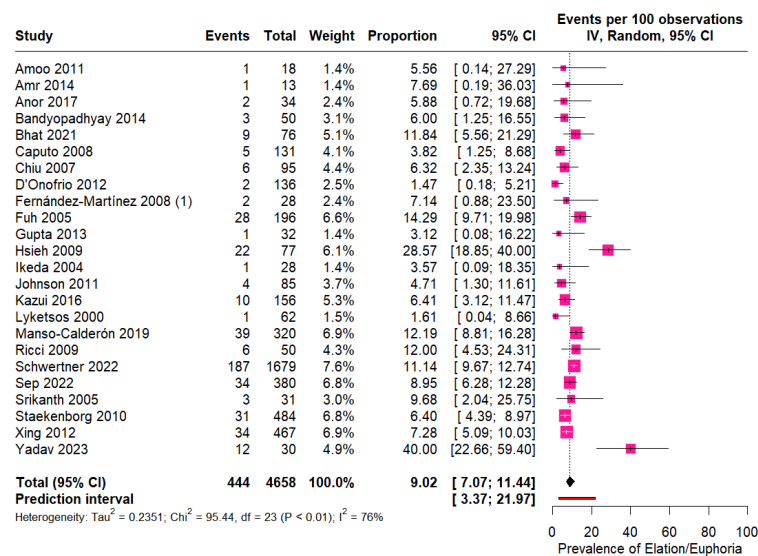
B1. Hallucinations (general)**B2. Hallucinations (subcortical)****B3. Hallucinations (mixed)****B4. Hallucinations (VCI-ND)**

C1. Agitation/Aggression (general)**C2. Agitation/Aggression (subcortical)****C3. Agitation/Aggression (mixed dementia)****C4. Agitation/Aggression (VCI-ND)**

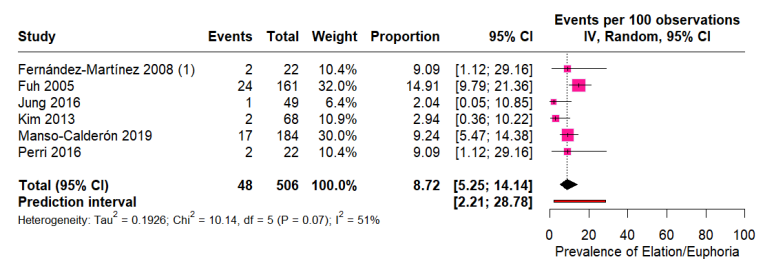
D1. Depression/Dysphoria (general)**D2. Depression/Dysphoria (subcortical)****D3. Depression/Dysphoria (mixed dementia)****D4. Depression/Dysphoria (VCI-ND)**

E1. Anxiety (general)**E2. Anxiety (subcortical)****E3. Anxiety (mixed dementia)****E4. Anxiety (VCI-ND)**

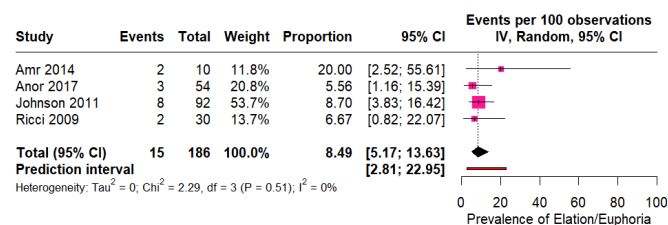
F1. Elation/Euphoria (general)



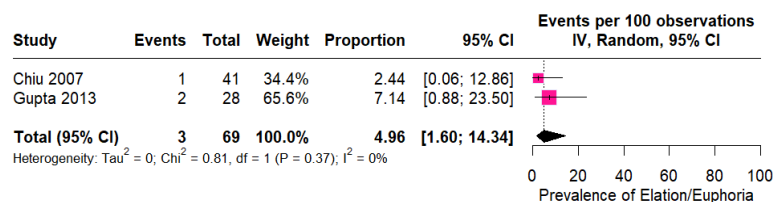
F2. Elation/Euphoria (subcortical)

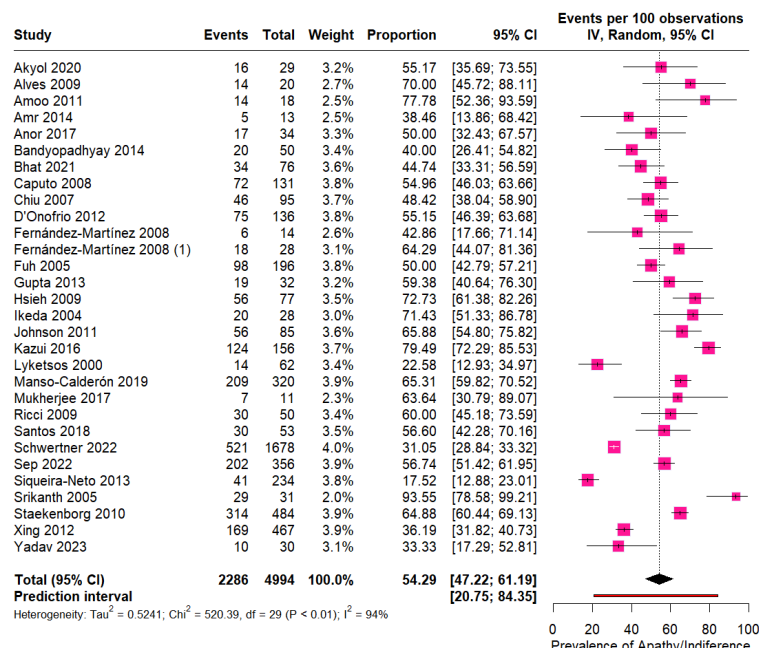
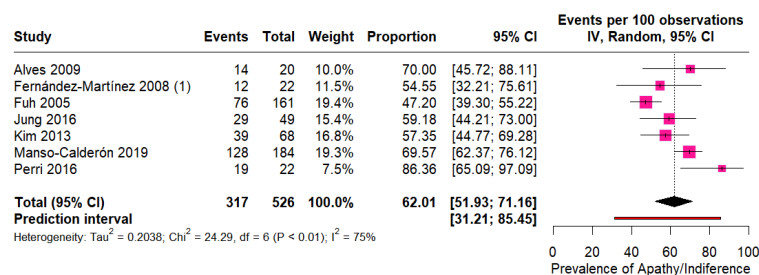
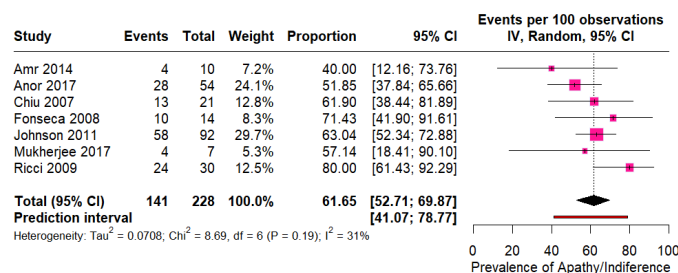
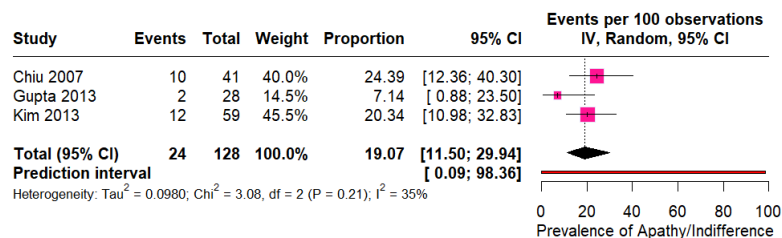


F3. Elation/Euphoria (mixed dementia)

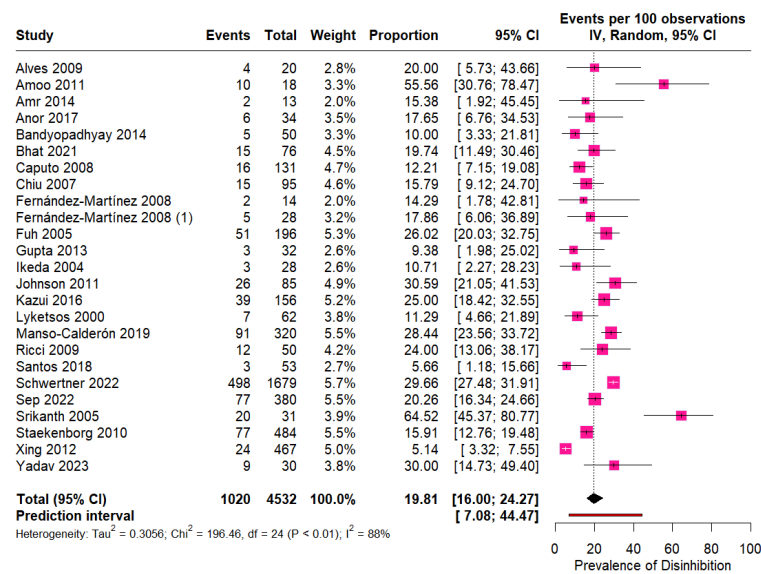


F4. Elation/Euphoria (VCI-ND)

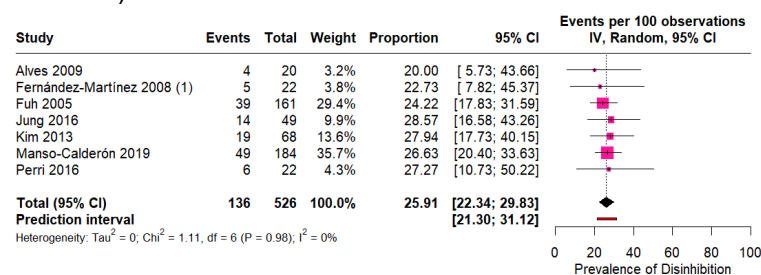


G1. Apathy/Indifference (general)**G2. Apathy/Indifference (subcortical)****G3. Apathy/Indifference (mixed dementia)****G4. Apathy/Indifference (VCI-ND)**

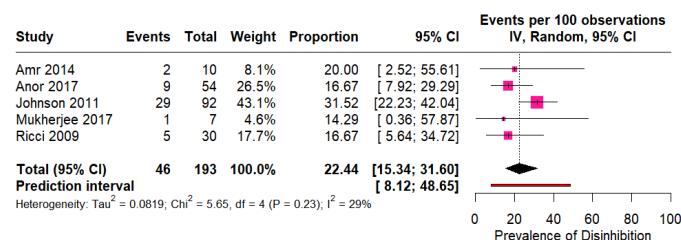
H1. Disinhibition (general)



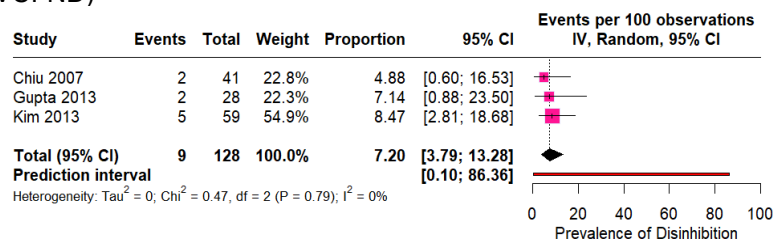
H2. Disinhibition (subcortical)

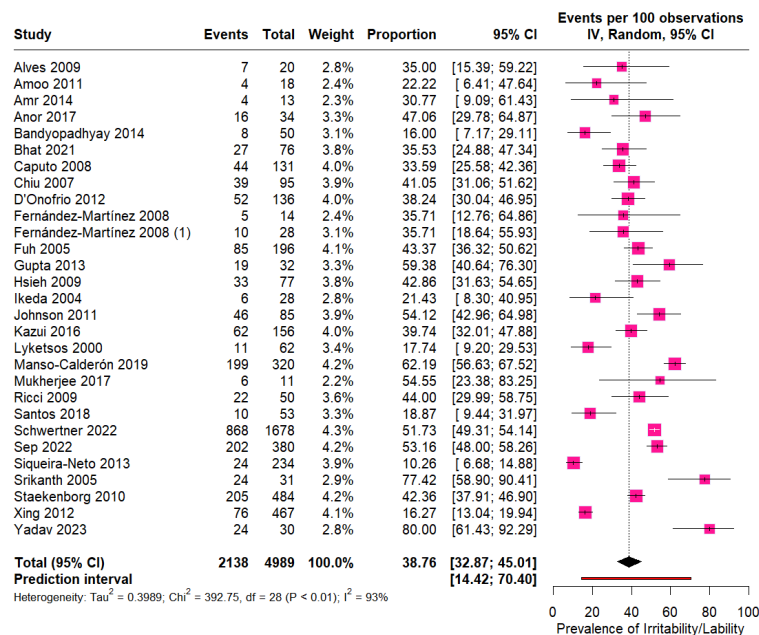
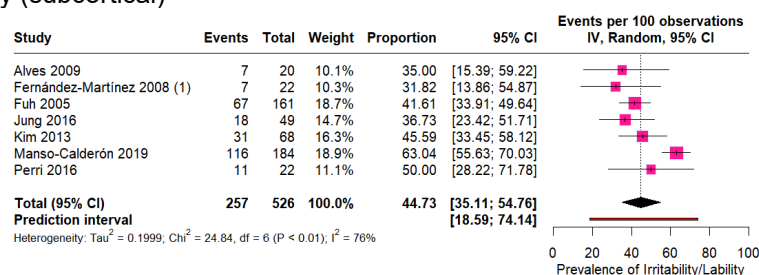
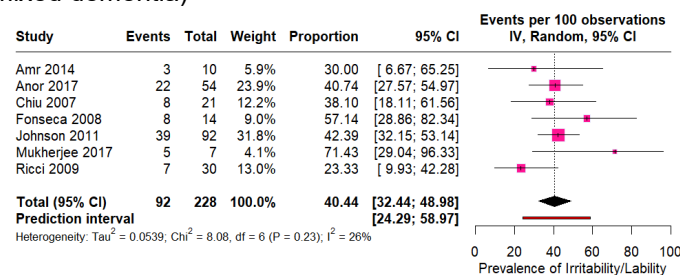
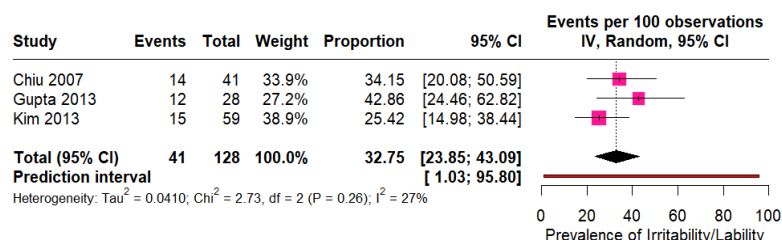


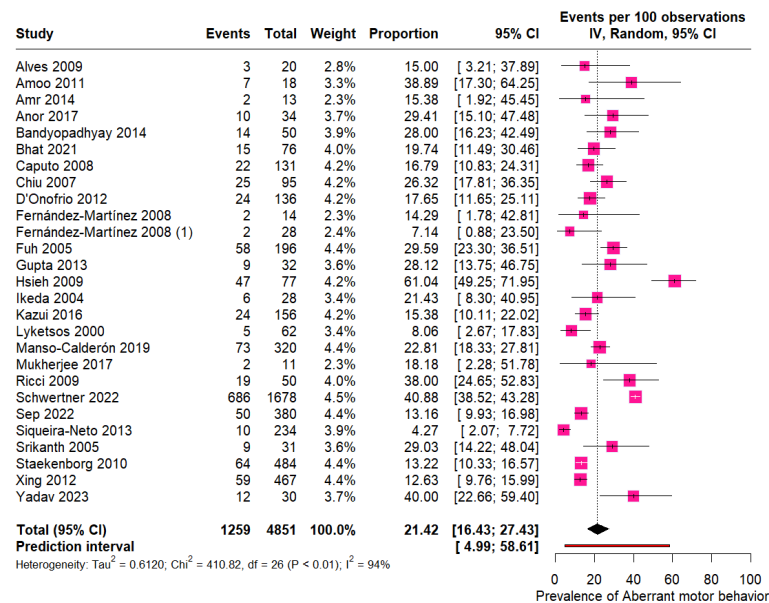
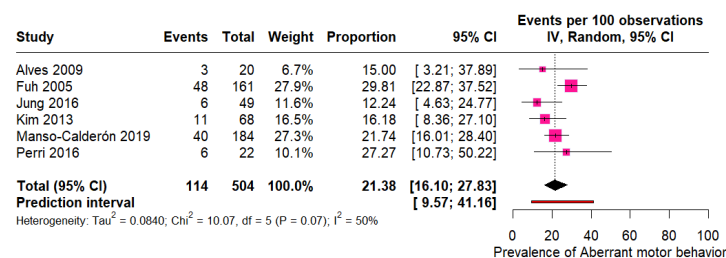
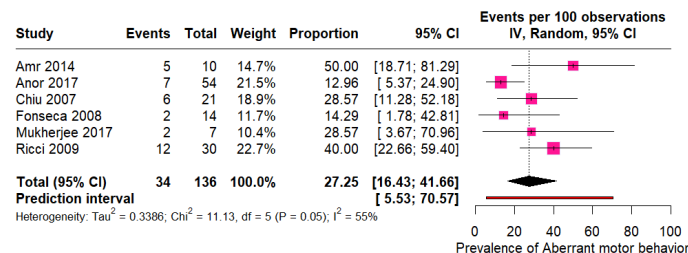
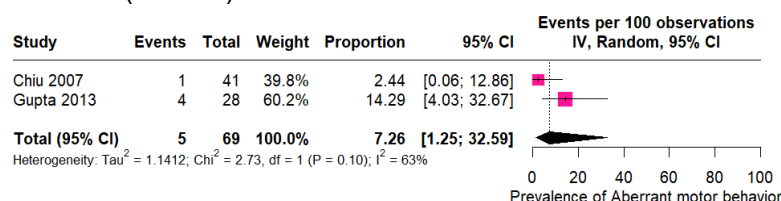
H3. Disinhibition (mixed dementia)

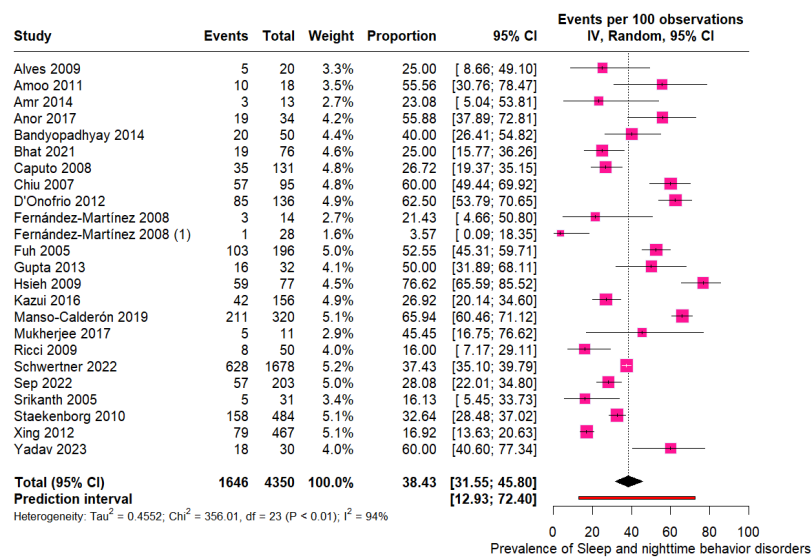
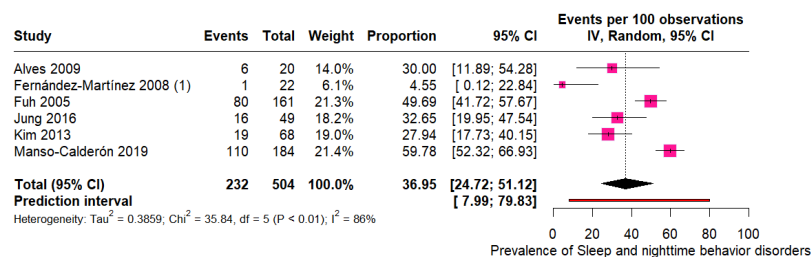
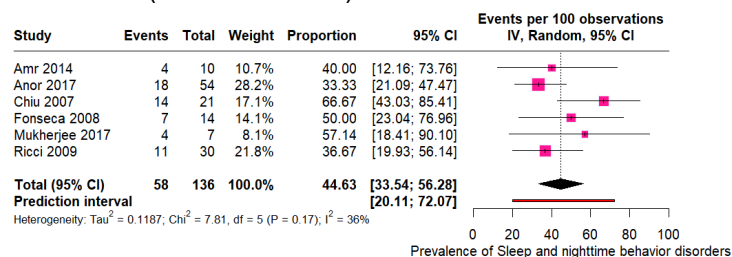
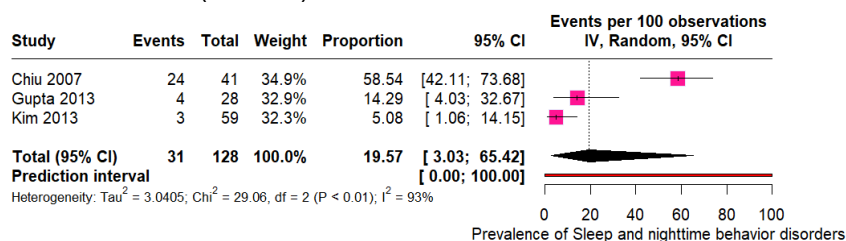


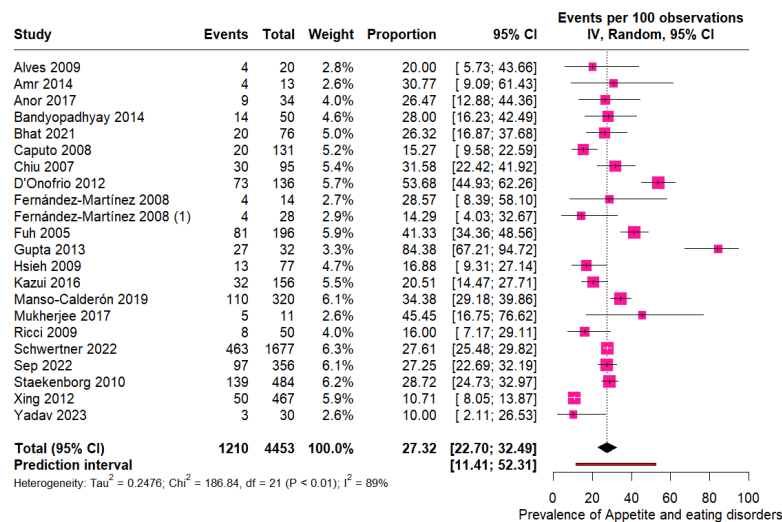
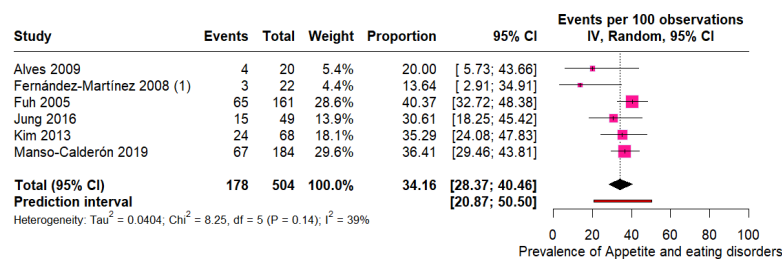
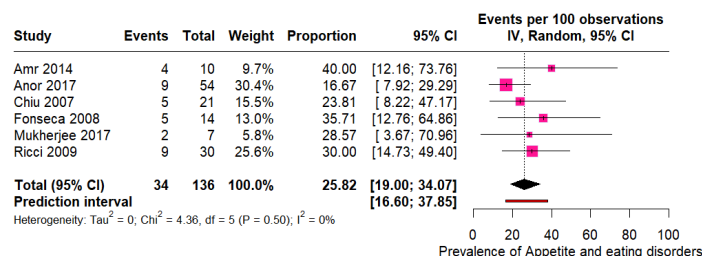
H4. Disinhibition (VCI-ND)



I1. Irritability/Lability (general)**I2. Irritability/Lability (subcortical)****I3. Irritability/Lability (mixed dementia)****I4. Irritability/Lability (VCI-ND)**

J1. Aberrant motor behavior (general)**J2. Aberrant motor behavior (subcortical)****J3. Aberrant motor behavior (mixed dementia)****J4. Aberrant motor behavior (VCI-ND)**

K1. Sleep and nighttime disorders (general)**K2. Sleep and nighttime disorders (subcortical)****K3. Sleep and nighttime disorders (mixed dementia)****K4. Sleep and nighttime disorders (VCI-ND)**

L1. Appetite and eating disorders (general)**L2. Appetite and eating disorders (subcortical)****L3. Appetite and eating disorders (mixed dementia)****L4. Appetite and eating disorders (VCI-ND)**