Supplementary Material

Reconceptualization of the Erlangen Score for the Assessment of Dementia Risk: The ERlangen Score

Supplementary Table 1. Linear mixed model estimates for the comparison of individual CERAD-NB+[a] subtest z-scores of the ES or ERS groups 1 to 4 compared with ES or ERS group 0 as reference

Outcome variable	Group	Score		*Estimate*	*p*	*95% CI*	
MMSE	1	ES	ΔBaseline	-0.19	0.78	-1.52	1.14
			ΔSlope	0.06	0.73	-0.27	0.38
		ERS	ΔBaseline	-0.19	0.48	-0.73	0.35
			ΔSlope	0.11	0.18	-0.05	0.27
	2	ES	ΔBaseline	-0.22	0.40	-0.75	0.30
			ΔSlope	0.05	0.58	-0.13	0.23
		ERS	ΔBaseline	-0.56	0.46	-2.06	0.94
			ΔSlope	**-1.07**	**<0.001**	**-1.56**	**-0.58**
	3	ES	ΔBaseline	-0.13	0.76	-0.96	0.70
			ΔSlope	**-0.33**	**0.03**	**-0.62**	**-0.04**
		ERS	**ΔBaseline**	**-0.42**	**0.08**	**-0.89**	**0.05**
			ΔSlope	**-0.34**	**<0.001**	**-0.48**	**-0.19**
	4	ES	**ΔBaseline**	**-0.63**	**0.01**	**-1.07**	**-0.19**
			ΔSlope	**-0.43**	**<0.001**	**-0.59**	**-0.26**
		ERS	**ΔBaseline**	**-0.71**	**0.02**	**-1.29**	**-0.12**
			ΔSlope	**-0.56**	**<0.001**	**-0.80**	**-0.32**
Word List Memory	1	ES	ΔBaseline	0.75	0.41	-1.06	2.55
			ΔSlope	0.04	0.78	-0.27	0.35
		ERS	ΔBaseline	-0.05	0.89	-0.75	0.65
			ΔSlope	0.05	0.60	-0.12	0.21
	2	ES	ΔBaseline	0.15	0.66	-0.54	0.84
			ΔSlope	-0.02	0.81	-0.21	0.16
		ERS	ΔBaseline	-0.41	0.69	-2.43	1.61
			ΔSlope	**-0.91**	**0.01**	**-1.58**	**-0.24**
	3	ES	ΔBaseline	-0.67	0.22	-1.73	0.39
			ΔSlope	-0.22	0.19	-0.56	0.11
		ERS	**ΔBaseline**	**-0.90**	**<0.001**	**-1.49**	**-0.32**
			ΔSlope	-0.18	0.06	-0.37	0.01
	4	ES	**ΔBaseline**	**-1.00**	**<0.001**	**-1.59**	**-0.42**
			ΔSlope	**-0.22**	**0.03**	**-0.41**	**-0.02**
		ERS	**ΔBaseline**	**-1.20**	**<0.001**	**-1.98**	**-0.41**
			ΔSlope	**-0.33**	**0.02**	**-0.61**	**-0.04**

Word List DR	1	ES	ΔBaseline	0.41	0.67	-1.53	2.35
			ΔSlope[e]	0.09	0.46	-0.16	0.35
		ERS	ΔBaseline	-0.06	0.85	-0.69	0.57
			ΔSlope[e]	-0.02	0.75	-0.14	0.10
	2	ES	ΔBaseline	-0.02	0.94	-0.64	0.59
			ΔSlope[e]	-0.04	0.53	-0.16	0.08
		ERS	ΔBaseline	-0.95	0.34	-2.91	1.01
			ΔSlope[e]	-0.43	0.22	-1.17	0.31
	3	ES	ΔBaseline	-0.76	0.13	-1.74	0.23
			ΔSlope[e]	-0.10	0.36	-0.32	0.12
		ERS	**ΔBaseline**	**-1.00**	**<0.001**	**-1.56**	**-0.44**
			ΔSlope	-0.07	0.40	-0.23	0.10
	4	ES	**ΔBaseline**	**-0.99**	**<0.001**	**-1.54**	**-0.44**
			ΔSlope	-0.11	0.12	-0.26	0.03
		ERS	**ΔBaseline**	**-0.79**	**0.04**	**-1.53**	**-0.05**
			ΔSlope[e]	**-0.32**	**<0.001**	**-0.53**	**-0.11**
Constructional Praxis DR	1	ES	ΔBaseline	0.23	0.80	-1.59	2.06
			ΔSlope[e]	0.12	0.35	-0.13	0.36
		ERS	ΔBaseline	-0.50	0.19	-1.25	0.25
			ΔSlope[e]	0.07	0.32	-0.06	0.20
	2	ES	ΔBaseline	-0.33	0.36	-1.04	0.38
			ΔSlope[e]	0.03	0.69	-0.10	0.15
		ERS	ΔBaseline	-0.50	0.71	-3.20	2.21
			ΔSlope[e]	**-0.70**	**0.04**	**-1.37**	**-0.02**
	3	ES	ΔBaseline	-0.07	0.89	-1.15	1.01
			ΔSlope[e]	**-0.30**	**0.01**	**-0.52**	**-0.08**
		ERS	ΔBaseline	-0.55	0.09	-1.18	0.09
			ΔSlope[e]	**-0.22**	**<0.001**	**-0.34**	**-0.11**
	4	ES	**ΔBaseline**	**-0.79**	**0.02**	**-1.44**	**0.15**
			ΔSlope[e]	**-0.21**	**<0.001**	**-0.33**	**-0.08**
		ERS	**ΔBaseline[d]**	**-1.02**	**0.03**	**-1.92**	**-0.11**
			ΔSlope[e]	**-0.26**	**0.01**	**-0.47**	**-0.06**
Phonematic verbal fluency	1	ES	ΔBaseline	-0.50	0.46	-1.84	0.84
			ΔSlope[e]	0.06	0.52	-0.13	0.26
		ERS	ΔBaseline	0.28	0.36	-0.31	0.86
			ΔSlope[e]	-0.06	0.24	-0.16	0.04
	2	ES	ΔBaseline	0.11	0.71	-0.48	0.70
			ΔSlope[e]	-0.07	0.21	-0.17	0.04
		ERS	ΔBaseline	-0.82	0.36	-2.60	0.96
			ΔSlope[e]	-0.34	0.15	-0.83	0.14
	3	ES	ΔBaseline	-0.12	0.79	-0.96	0.73
			ΔSlope[e]	-0.15	0.11	-0.33	0.03
		ERS	ΔBaseline	-0.13	0.62	-0.65	0.38

		Δ**Slope**[e]	**-0.18**	**0.01**	**-0.30**	**-0.05**
	ES	ΔBaseline	-0.12	0.64	-0.61	0.37
4		Δ**Slope**[e]	**-0.19**	**0.01**	**-0.33**	**-0.06**
	ERS	ΔBaseline	-0.12	0.72	-0.77	0.53
		ΔSlope[e]	-0.21	0.07	-0.44	0.02

[a] The Consortium to Establish a Registry for Alzheimer's Disease (CERAD) neuropsychological battery plus (NB+)

MMSE, Mini-Mental State Examination; DR, Delayed Recall; ΔBaseline, Difference at baseline compared to ES 0 (ERS 0); ΔSlope, Difference in longitudinal slope compared to ES 0 (ERS 0)
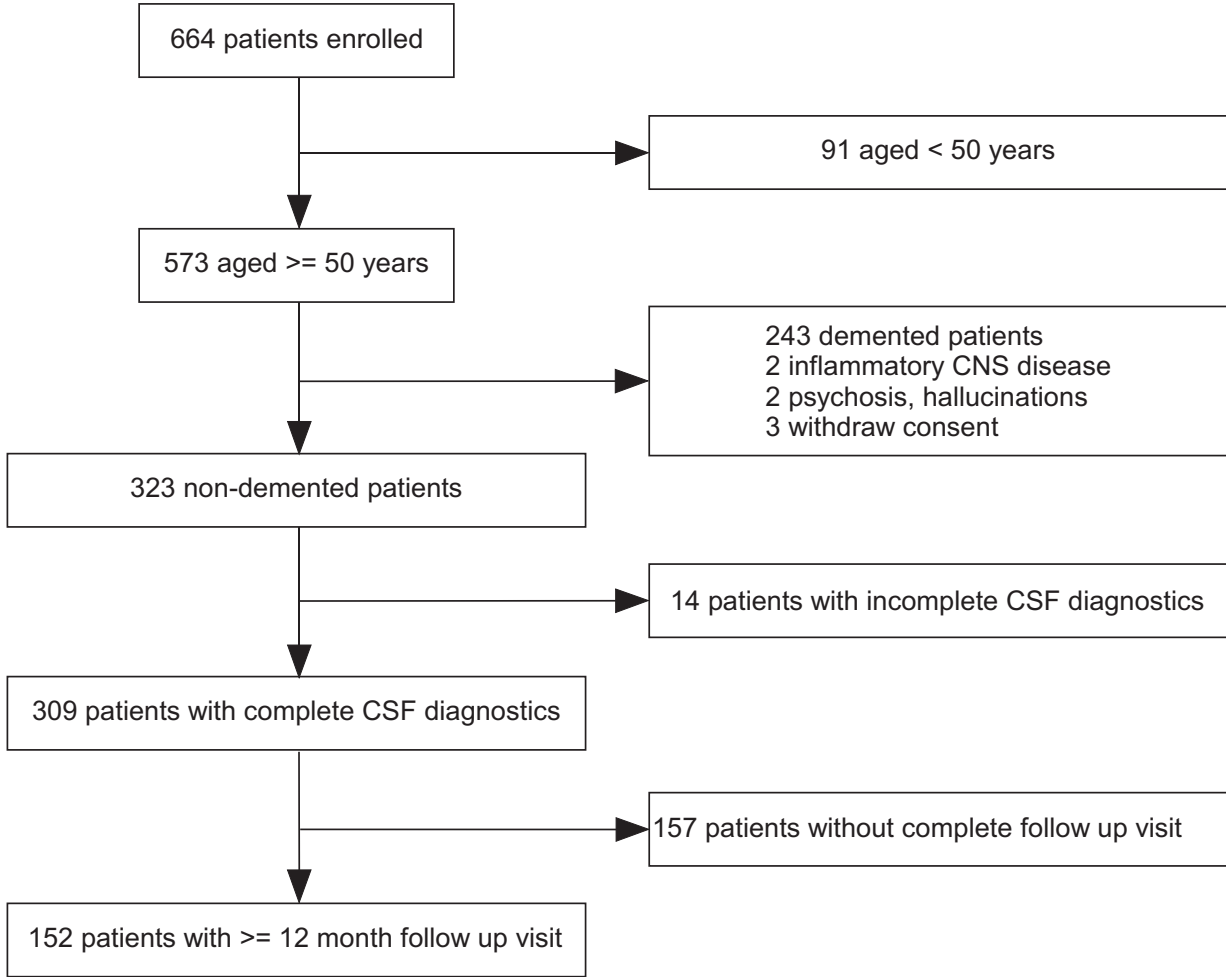
Supplementary Table 2. Linear mixed model estimates for the comparison of individual CERAD-NB+[a] subtest z-scores between the groups 1 to 4 of the ES without considering the $A\beta_{42}/A\beta_{40}$ ratio (w/o R) compared with group 0 as reference

Outcome variable			*Estimate*	*p*	*95% CI*	
MMSE	ES w/o R 1	ΔBaseline	-0.43	0.36	-1.36	0.49
		ΔSlope	-0.16	0.29	-0.47	0.14
	ES w/o R 2	ΔBaseline	-0.34	0.12	-0.76	0.09
		ΔSlope	-0.14	0.09	-0.30	0.02
	ES w/o R 3	ΔBaseline	-0.73	0.12	-1.64	0.18
		ΔSlope	-0.35	0.12	-0.79	0.10
	ES w/o R 4	ΔBaseline	-0.69	0.06	-1.41	0.04
		ΔSlope	**-0.83**	**<0.001**	**-1.19**	**-0.46**
Word List Memory	ES w/o R 1	ΔBaseline	0.55	0.41	-0.75	1.84
		ΔSlope	-0.18	0.27	-0.51	0.14
	ES w/o R 2	ΔBaseline	-0.46	0.11	-1.02	0.10
		ΔSlope	-0.09	0.34	-0.26	0.09
	ES w/o R 3	**ΔBaseline**	**-1.76**	**0.02**	**-3.24**	**-0.29**
		ΔSlope	0.02	0.95	-0.52	0.55
	ES w/o R 4	ΔBaseline	-0.82	0.12	-1.85	0.21
		ΔSlope	**-0.58**	**0.01**	**-1.01**	**-0.15**
Word List DR	ES w/o R 1	ΔBaseline	0.10	0.89	-1.37	1.57
		ΔSlope	-0.04	0.77	-0.32	0.24
	ES w/o R 2	ΔBaseline	-0.57	0.03	-1.08	-0.06
		ΔSlope	-0.04	0.50	-0.16	0.08
	ES w/o R 3	ΔBaseline	-1.02	0.11	-2.27	0.22
		ΔSlope	-0.31	0.10	-0.68	0.06
	ES w/o R 4	ΔBaseline	-0.62	0.20	-1.58	0.33
		ΔSlope	**-0.34**	**0.02**	**-0.61**	**-0.07**
Constructional Praxis DR	ES w/o R 1	ΔBaseline	0.27	0.74	-1.24	1.78
		ΔSlope	-0.05	0.14	-0.34	0.23
	ES w/o R 2	ΔBaseline	-0.49	0.28	-1.05	0.07
		ΔSlope	-0.07	0.06	-0.18	0.05
	ES w/o R 3	ΔBaseline	-0.99	0.67	-2.33	0.34
		ΔSlope	-0.23	0.18	-0.58	0.11
	ES w/o R 4	ΔBaseline	-0.99	0.52	-2.02	0.03
		ΔSlope	-0.29	0.16	-0.60	0.02
Phonematic verbal fluency	ES w/o R 1	ΔBaseline	-0.43	0.41	-1.47	0.61
		ΔSlope	-0.02	0.88	-0.20	0.17
	ES w/o R 2	ΔBaseline	0.04	0.59	-0.46	0.53
		ΔSlope	-0.12	0.69	-0.23	-0.01
	ES w/o R 3	ΔBaseline	-0.33	0.85	-1.56	0.91
		ΔSlope	**-0.04**	**0.03**	**-0.50**	**0.41**
	ES w/o R 4	ΔBaseline	-0.16	0.84	-0.96	0.64
		ΔSlope	**-0.31**	**<0.001**	**-0.53**	**-0.10**

Supplementary Figure 1. Study population flow chart

```
┌─────────────────────────┐
│  664 patients enrolled  │
└─────────────────────────┘
            │                          ┌──────────────────────────────┐
            ├─────────────────────────▶│    91 aged < 50 years        │
            ▼                          └──────────────────────────────┘
┌─────────────────────────┐
│  573 aged >= 50 years   │
└─────────────────────────┘
            │                          ┌──────────────────────────────┐
            │                          │ 243 demented patients         │
            ├─────────────────────────▶│ 2 inflammatory CNS disease    │
            │                          │ 2 psychosis, hallucinations   │
            ▼                          │ 3 withdraw consent            │
┌─────────────────────────────┐       └──────────────────────────────┘
│ 323 non-demented patients   │
└─────────────────────────────┘
            │                          ┌──────────────────────────────────────────┐
            ├─────────────────────────▶│ 14 patients with incomplete CSF diagnostics│
            ▼                          └──────────────────────────────────────────┘
┌───────────────────────────────────────┐
│ 309 patients with complete CSF         │
│ diagnostics                            │
└───────────────────────────────────────┘
            │                          ┌──────────────────────────────────────────┐
            ├─────────────────────────▶│157 patients without complete follow up visit│
            ▼                          └──────────────────────────────────────────┘
┌──────────────────────────────────────────────┐
│ 152 patients with >= 12 month follow up visit │
└──────────────────────────────────────────────┘
```

CNS, central nervous system; CSF, cerebrospinal fluid

Supplementary Figure 2. Comparison of dementia risk between the Erlangen Score groups without the Aβ₄₂/Aβ₄₀ ratio. Kaplan-Meier curves show the risk of dementia onset in nondemented individuals (A) for the different ES groups when the Aβ₄₂/Aβ₄₀ ratio is not accounted. Nondemented individuals with an ES of 2 or higher showed an increased risk of dementia onset compared with controls. The hazard ratios of groups 2 and 3 in univariate and a multivariate Cox regression model with age, education, and MMSE at baseline as covariates were also found to be significantly increased in comparison with the control group.
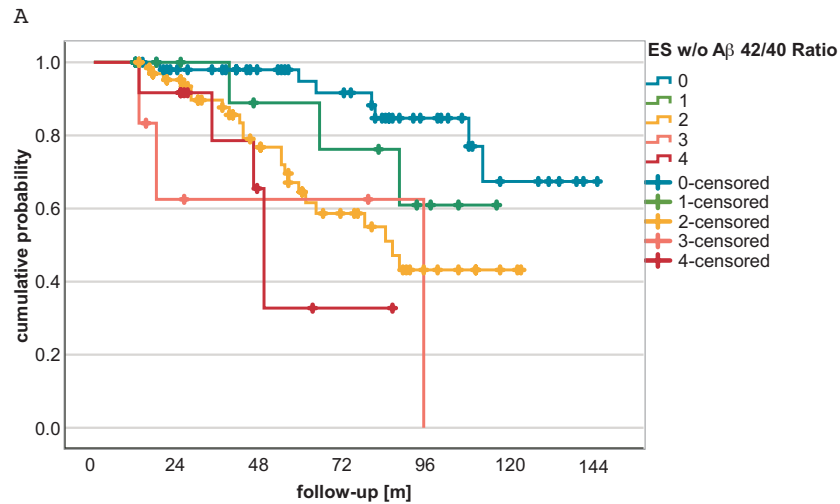
number entering interval/(withdrawing) [months]

		0	24	48	72	96	120	144
	0	55 (9)	45 (10)	35 (4)	29 (12)	15 (7)	6 (5)	1 (1)
	1	12 (2)	10 (2)	7 (0)	6 (2)	3 (3)		
ES	2	66 (8)	55 (12)	34 (9)	18 (7)	7 (5)	2 (2)	
	3	6 (1)	3 (1)	2 (0)	2 (1)			
	4	12 (0)	11 (5)	4 (1)	1 (1)			
		151 (20)	124 (30)	82 (14)	56 (23)	25 (15)	8 (7)	1 (1)