

CORRECTION

Open Access



Correction to: Cerebrovascular and amyloid pathology in predementia stages: the relationship with neurodegeneration and cognitive decline

Isabelle Bos^{1*}, Frans R. Verhey¹, Inez H. G. B. Ramakers¹, Heidi I. L. Jacobs¹, Hilka Soininen^{2,3}, Yvonne Freund-Levi⁴, Harald Hampel^{5,6}, Magda Tsolaki⁷, Åsa K. Wallin⁸, Mark A. van Buchem⁹, Ania Oleksik¹⁰, Marcel M. Verbeek¹¹, Marcel Olde Rikkert¹², Wiesje M. van der Flier¹³, Philip Scheltens¹³, Pauline Aalten¹, Pieter Jelle Visser^{1,13} and Stephanie J. B. Vos^{1*}

Correction

Upon publication of this article [1], it was noticed that there were some inconsistencies in Tables 1, 2 and 3. Some of the superscript letters were incorrectly assigned. Please see below the correct tables:

Author details

¹Department of Psychiatry and Neuropsychology, School of Mental Health and Neuroscience, Alzheimer Center Limburg, Maastricht University, Maastricht, The Netherlands. ²Institute of Clinical Medicine, Neurology, University of Eastern Finland, Kuopio, Finland. ³Neurocenter and Department of Neurology, Kuopio University Hospital, Kuopio, Finland. ⁴Department of Neurobiology, Caring Sciences and Society (NVS), Karolinska University Hospital Huddinge, Stockholm, Sweden. ⁵AXA Research Fund and UPMC Chair Sorbonne Universités, Université Pierre et Marie Curie (UPMC), Paris, France. ⁶Institut du cerveau et de la moelle (ICM), Hôpital Pitié-Salpêtrière, Paris, France. ⁷Memory and Dementia Center, 3rd Department of Neurology, Aristotle University of Thessaloniki, G Papanicolau" General Hospital, Thessaloniki, Greece. ⁸Department of Clinical Sciences Malmö, Clinical Memory Research Unit, Lund University, Lund, Sweden. ⁹Department of Radiology, Leiden University Medical Center, Leiden, The Netherlands. ¹⁰Department of Gerontology and Geriatrics, Leiden University Medical Center, Leiden, The Netherlands. ¹¹Departments of Neurology and Laboratory Medicine, Donders Institute for Brain, Cognition and Behaviour, Radboud Alzheimer Center, Radboud University Medical Center, Nijmegen, The Netherlands. ¹²Radboud Alzheimer Centre, Department of Geriatric Medicine, Radboud University Medical Center, Nijmegen, The Netherlands. ¹³Department of Neurology, Alzheimer Centre, Neuroscience Campus Amsterdam, VU University Medical Center, Amsterdam, Netherlands.

Received: 20 February 2018 Accepted: 30 May 2018

Published online: 20 June 2018

Reference

1. Bos I, Verhey FR, Ramakers IHGB, Jacobs HIL, Soininen H, Freund-Levi Y, Hampel H, Tsolaki M, Wallin ÅK, van Buchem MA, Oleksik A, Verbeek MM, Olde Rikkert M, van der Flier WM, Scheltens P, Aalten P, Visser PJ, Vos SJB. Cerebrovascular and amyloid pathology in predementia stages: the relationship with neurodegeneration and cognitive decline. *Alzheimers Res Ther*. 2017;9:101. <https://doi.org/10.1186/s13195-017-0328-9>.

* Correspondence: isabelle.bos@maastrichtuniversity.nl

¹Department of Psychiatry and Neuropsychology, School of Mental Health and Neuroscience, Alzheimer Center Limburg, Maastricht University, Maastricht, The Netherlands



Table 1 Comparisons of baseline and follow-up characteristics by A β and WMH status

	A β - WMH- n = 140	A β - WMH+ n = 39	A β + WMH- n = 63	A β + WMH+ n = 29
Baseline characteristics				
Age	61.7 (8.3) ^{B,C,D}	71.3 (7.7) ^{A,C}	66.7 (7.8) ^{A,B,D}	74.1 (5.0) ^{A,C}
Female, n	94 (67) ^C	23 (59)	32 (51) ^A	16 (55)
Education in years	10.9 (3.1)	11.9 (3.3)	11.1 (3.1)	10.3 (2.9)
Hypertension, n*	43 (34)	9 (25)	15 (25)	9 (32)
Obesity, n*	15 (14)	3 (11)	4 (8)	4 (21)
Diabetes, n*	16 (21)	3 (15)	3 (7)	5 (28)
APOE- ϵ 4 carrier, n*	33 (51) ^B	5 (24) ^{A,C,D}	29 (62) ^B	10 (56) ^B
Diagnosis MCI, n	70 (50) ^D	21 (54) ^D	40 (64)	22 (76) ^{A,B}
amnesic MCI (% within MCI group)	40 (57)	15 (71)	27 (68)	17 (77)
non-amnesic MCI (% within MCI group)	30 (43)	6 (29)	13 (33)	5 (23)
CSF A β 1–42, pg/ml	973.6 (312.0) ^{C,D}	885.0 (242.0) ^{C,D}	404.3 (102.6) ^{A,B}	419.3 (97.2) ^{A,B}
White matter hyperintensities [†]	0.7 (0.5) ^{B,D}	2.3 (0.4) ^{A,C}	0.8 (0.4) ^{B,D}	2.4 (0.5) ^{A,C}
Follow-up characteristics				
Follow-up time	2.1 (1.5)	2.2 (1.3)	2.1 (1.2)	2.4 (1.2)
Time to progression to dementia	1.3 (0.5) ^B	2.0 (0.7) ^A	1.7 (0.7)	2.1 (1.2)
Progression to dementia, n	8 (6) ^{B,C,D}	9 (23) ^A	18 (29) ^A	11 (38) ^A
- AD-type dementia, n	2 (1) ^{B,C,D}	7 (18) ^A	18 (29) ^A	10 (35) ^A
- Vascular dementia, n	0 (0)	2 (5)	0 (0)	1 (3)
- Frontotemporal dementia, n	4 (3)	0 (0)	0 (0)	0 (0)
- Lewy Body dementia, n	1 (1)	0 (0)	0 (0)	0 (0)
- Dementia with unknown etiology, n	1 (1)	0 (0)	0 (0)	0 (0)

Results are mean (SD) for continuous variables or frequency (%). Hypertension, obesity, diabetes and APOE ϵ 4 genotype were only available in a subgroup of the sample

Abbreviations: A β amyloid-beta, AD Alzheimer's disease, APOE Apolipoprotein E, MCI mild cognitive impairment

[†]WMH measured by the Fazekas scale, range 0–3

^Ap < 0.05 compared to A β - WMH-

^Bp < 0.05 compared to A β - WMH+

^Cp < 0.05 compared to A β + WMH-

^Dp < 0.05 compared to A β + WMH+

Table 2 Values of neurodegenerative markers by A β /WMH groups

	A β - WMH- n = 140	A β - WMH+ n = 39	A β + WMH- n = 63	A β + WMH+ n = 29
Neurodegeneration markers				
MTA score	1.2 (1.2) ^{B,C,D}	2.6 (1.6) ^{A,D}	2.1 (1.6) ^{A,D}	3.4 (1.8) ^{A,B,C}
MTA abnormal, n	62 (45) ^{B,C,D}	32 (82) ^A	41 (67) ^{A,D}	26 (93) ^{A,C}
P-tau, pg/ml	54.5 (27.7) ^C	63.2 (29.3)	77.0 (56.3) ^A	65.2 (38.2)
P-tau abnormal, n	53 (38) ^C	22 (58)	45 (71) ^A	15 (52)
T-tau, pg/ml	314.7 (202.0) ^{B,C,D}	438.4 (248.0) ^A	499.3 (413.8) ^A	426.2 (275.2) ^A
T-tau abnormal, n	36 (26) ^{B,C,D}	20 (53) ^A	36 (57) ^A	14 (48) ^A

Results are mean (SD) and number (%). All analyses were adjusted for study, baseline diagnosis and demographics

Abbreviations: A β amyloid-beta, MTA medial temporal lobe atrophy, P-tau phosphorylated tau, T-tau Total tau, WMH white matter hyperintensities

^Ap < 0.05 compared to A β - WMH-

^Bp < 0.05 compared to A β - WMH+.

^Cp < 0.05 compared to A β + WMH-.

^Dp < 0.05 compared to A β + WMH+.

Table 3 Cognitive performance and decline by A β /WMH groups

		A β - WMH-	A β - WMH+	A β + WMH-	A β + WMH+
MMSE ^a	n	140	39	62	27
	Baseline	27.79 (27.39, 28.19)	27.52 (26.83, 28.21)	27.20 (26.62, 27.78)	27.40 (26.54, 28.25)
	Slope	-0.01 (-0.15, 0.12)	-0.29 (-0.55, -0.02)	-0.22 (-0.44, -0.01)	-0.31 (-0.62, 0.00)
Memory delayed recall z-score	n	133	37	58	27
	Baseline	-0.48 (-0.72, -0.24) ^{B,C,D}	-1.04 (-1.48, -0.61) ^A	-1.04 (-1.41, -0.68) ^A	-1.33 (-1.86, -0.80) ^A
	Slope	0.05 (-0.03, 0.13)	0.02 (-0.12, 0.17)	0.02 (-0.11, 0.14)	-0.07 (-0.24, 0.09)
Executive functioning z-score	n	130	37	60	24
	Baseline	-0.48 (-0.76, -0.21)	-0.41 (-0.92, 0.09)	-0.78 (-1.18, -0.37)	-1.12 (-1.73, -0.50)
	Slope	0.06 (-0.02, 0.13)	-0.00 (-0.15, 0.15)	-0.03 (-0.16, 0.10)	-0.04 (-0.23, 0.15)

Results are mean (95% confidence interval). Bold slope estimates = $p < 0.05$. All analyses were adjusted for study. The analyses on MMSE scores were also corrected for demographics and baseline diagnosis

Abbreviations: A β amyloid-beta, MMSE mini mental state examination, WMH white matter Hyperintensities

^A $p < 0.05$ compared to A β - WMH-

^B $p < 0.05$ compared to A β - WMH+.

^C $p < 0.05$ compared to A β + WMH-.

^D $p < 0.05$ compared to A β + WMH+.