Neuropsychology Review (2022) 32:558–565
https://doi.org/10.1007/s11065-022-09545-4

CORRECTION

Correction to: The Impact of Right Temporal Lobe Epilepsy on Nonverbal Memory: Meta-regression of Stimulus- and Task-related Moderators

Adam C. Bentvelzen[1,2] · **Roy P. C. Kessels**[3,4] · **Nicholas A. Badcock**[5,6] · **Greg Savage**[2]

Published online: 13 June 2022

Correction to: Neuropsychology Review
https://doi.org/10.1007/s11065-021-09514-3

In the original published paper, it was belatedly discovered that there was a data entry error in coding one test-related factor for the Benton Visual Retention Test (BVRT) only, for which the factor Format was incorrectly coded as Recognition, when it should have been coded as Recall. While only a minor error in isolation this had widespread ramifications for the paper since a key unique aspect of the analysis was comparing the relative impact of stimulus- and test-related factors on the association between nonverbal memory tests and identifying right (versus left) temporal lobe pathology. In addition, there were $k = 10$ papers on the BVRT, which is enough that it possibly meant that this could impact statistically on the results and therefore the interpretation and conclusions. The section within the Results entitled "Meta-regression of Lateralization Effects By Stimulus Type and Test-related Moderators" effectively required a complete rewrite. It was therefore considered essential to write this erratum. The remaining tests were thoroughly checked, and thankfully this type of error was not replicated elsewhere.

In addition to the edits due to the coding error, there were some additional minor errors in the manuscript I have taken the opportunity to also correct.

Abstract

Page 1

The sentences.

> "Stimulus type significantly moderated the size of the right-lateralization effect (faces > designs) for post-surgical patients, test format moderated the size of the right-lateralization effect for presurgical-postsurgical change (recognition > recall) but learning format and test delay had no right-lateralization effect for either sample. For presurgical patients, none of the task-related factors significantly increased right-lateralization effects."

are replaced by:

> "For presurgical patients the size of the right-lateralization effect was significantly moderated by stimulus type (faces > designs), testing format (recall > recognition), and its interaction with the learning format (repeated trials more affected by format effect than single trials) of the nonverbal memory tests. For postsurgical patients and presurgical-postsurgical change, test format moderated the size of the right-lateralization effect (recognition > recall) and this explained and overshadowed effects of stimulus type (i.e., faces > designs)."

The original article can be found online at https://doi.org/10.1007/s11065-021-09514-3.

✉ Adam C. Bentvelzen
a.bentvelzen@unsw.edu.au

1 Centre for Healthy Brain Ageing (CHeBA), School of Psychiatry, University of New South Wales, Sydney 2052, Australia

2 Department of Psychology, Macquarie University, Sydney, NSW 2109, Australia

3 Donders Institute for Brain, Cognition and Behaviour, Radboud University, 6500 HE Nijmegen, The Netherlands

4 Department of Medical Psychology, Radboud University Medical Center, 6500 HB Nijmegen, The Netherlands

5 Department of Cognitive Science, Macquarie University, Sydney, NSW 2109, Australia

6 School of Psychological Science, University of Western Australia, Sydney, WA 6009, Australia

Results

Page 6

Table 2 had shown incorrect counts for *k, r*, *n_L* and *n_R* for Recall and Recognition moderator variables, the entire table with these corrections is shown below.

Table 2 Counts of papers, rows of data and participants by moderator variables and patient group

		Presurgical				Postsurgical				Postsurgical change			
Moderators	Moderator Level	*k*	*r*	*n_L*	*n_R*	*k*	*r*	*n_L*	*n_R*	*k*	*r*	*n_L*	*n_R*
Stimulus	Designs	103	243	3581	3345	63	133	2066	2046	49	98	1735	1719
	Faces	26	37	737	665	15	21	338	341	10	15	227	233
	Spatial[a]	7	15	217	213	4	10	109	127	2	3	92	103
	Scene	6	10	185	129	3	6	78	74	1	2	7	8
	Associative	3	6	148	128	-	-	-	-	-	-	-	-
	Object	-	-	-	-	1	1	24	23	-	-	-	-
Learning format	Single	104	243	3612	3397	63	144	2005	2002	44	94	1592	1591
	Repeated	44	84	1632	1525	22	41	975	928	21	29	966	919
Test delay	Learning	114	166	3762	3505	70	94	2129	2095	52	64	1731	1700
	Delayed	101	158	3623	3383	56	89	1979	1964	41	58	1610	1603
Test format	Recall	124	242	4114	4114	71	135	2364	2326	51	94	1876	1841
	Recognition	53	67	1665	1665	28	33	772	784	18	23	556	563
Index[b]		26	33	1001	899	15	22	606	567	9	11	483	463

k number of papers, *r* number of rows/datapoints (exceeds k when multiple measures within the same category are nested within same paper), *n* number of patients, divided by side of temporal lobe epilepsy/surgery (left: *n_L*; right: *n_R*)

[a]spatial category of materials also includes navigational or route-finding tests

[b]index measures are composites of other individual tests, usually involving the Wechsler Memory Scale index scores, and are mixtures of different kinds of moderator levels (i.e., stimulus types, learning formats, testing delays and testing formats)

The erroneous rows are shown below for comparison, so the extent of the changes can be seen.

		Presurgical				Postsurgical				Postsurgical change			
Moderators		*k*	*r*	*n_L*	*n_R*	*k*	*r*	*n_L*	*n_R*	*k*	*r*	*n_L*	*n_R*
Test format	Recall	121	238	4305	3957	69	133	2309	2288	49	92	1821	1803
	Recognition	59	77	1975	1837	31	37	860	880	21	27	644	659

Please note this corrected table also corrects a minor error where part of the end of the footnotes was incorrectly replicated at the start of the footnotes (the errant text was: "Scale index scores, and are mixtures of different kinds of moderator levels (i.e., stimulus types, learning formats, testing delays and testing formats").

Page 8 to 9

The section entitled "Meta-regression of Lateralization Effects By Stimulus Type and Test-related Moderators" required re-writing due to the number of reported results affected by the coding error. Given the substantial amount of changes required, the entire corrected version is shown below for maximum clarity for the reader:

Meta-regression of Lateralization Effects By Stimulus Type and Test-related Moderators

Presurgical Patients Fig. 3A shows that, for the additive meta-regression model, the moderators collectively did not have a significant effect on lateralization in presurgical patients ($Q_M = 4.46$, $p = 0.48$), and were not significant as individual moderators, *ds* < 0.06, *ps* > 0.35. Figure 3B shows the interactive model was not significant overall, $Q_M = 13.61$, $p = 0.26$; however, there was a significant difference between two Stimulus groups (Faces > Designs, $d = -0.93$, $p = .03$), a significant effect of Format (Recall > Recognition, $d = 0.90$, $p = .04$), and a significant Learning x Format interaction ($d = -0.84$, $p = 0.049$).

The results for Format were notable as Format was not significant in the additive model when the Stimulus factor was present (note that a Stimulus x Format interaction could not, by definition, be included in the interactive model as there were no Faces-Recall tests to complete all cross-combinations of Stimulus x Format). We therefore considered it possible that tests with design stimuli may be disproportionately explaining the right-lateralized Recall effect.

To explore these results further, contrasts with Bonferroni-correction to account for multiple comparisons (i.e., $p = 0.05/2 = 0.025$) showed that the right-lateralization effect for Faces-Recognition was not significantly larger than for Designs-Recognition, and the right-lateralization effect for Designs-Recall was not significantly larger than for

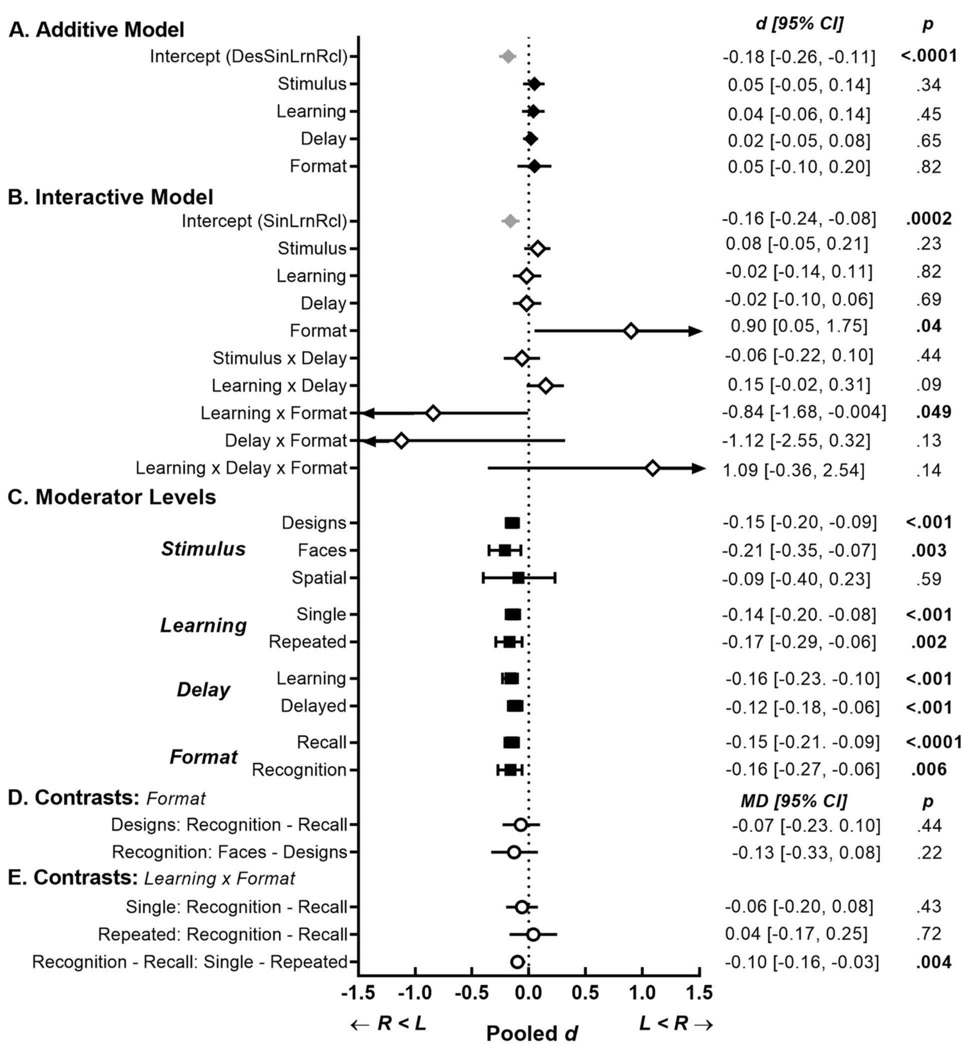

Fig. 3 Standardized effect sizes (Cohen's *d*) and 95% confidence intervals of lateralization (left minus right TLE performance) for presurgical patients, by type of moderator analysis and individual moderator levels. Negative effect sizes indicate poorer performance for right than left TLE patients. Arrows indicate that the confidence intervals exceed the scale. Sample size (*k*, studies) inferential statistics, heterogeneity and fail-safe N measures are in Supplementary Table 9. Contrasts used mean differences and *t*-statistic.

Designs-Recognition (see Fig. 3D), together suggesting that the Stimulus effect (right-lateralized Faces) and Format effect (right-lateralized Recall) were independent.

Bonferroni contrasts to explore the Learning x Format effect (i.e., $p = 0.05/3 = 0.017$) showed a right-lateralization effect of Format (Recall > Recognition) that was stronger for tests with repeated learning trials than for tests with single learning trials ($d = -0.10$, $p = .004$), while the Format effect was not significant within individual learning trial (i.e., each of single and repeated learning trial types; see Fig. 3E).

Figure 3C shows the results for specific moderator levels. Taken together, for presurgical patients, the small-sized performance decrement on nonverbal memory tests for RTLE versus LTLE patients was significantly moderated by both stimulus type and task-based factors (testing format on its own and interacting with learning format) of the nonverbal memory tests.

Postsurgical Patients Fig. 4A shows that for the additive meta-regression model, the moderators were significant as a group, $Q_M = 20.43$, $p < 0.001$, but there was only a borderline significant trend for the Stimulus effect on right-lateralization (Faces > Designs, $d = -0.25$, $p = 0.052$). No other moderators were significant. Figure 4B shows the moderators were collectively significant for the interactive model, $Q_M = 20.15$, $p = 0.003$, with a significant effect of Format (Recognition > Recall, $d = -0.38$, $p < 0.001$), but no other moderators were significant.

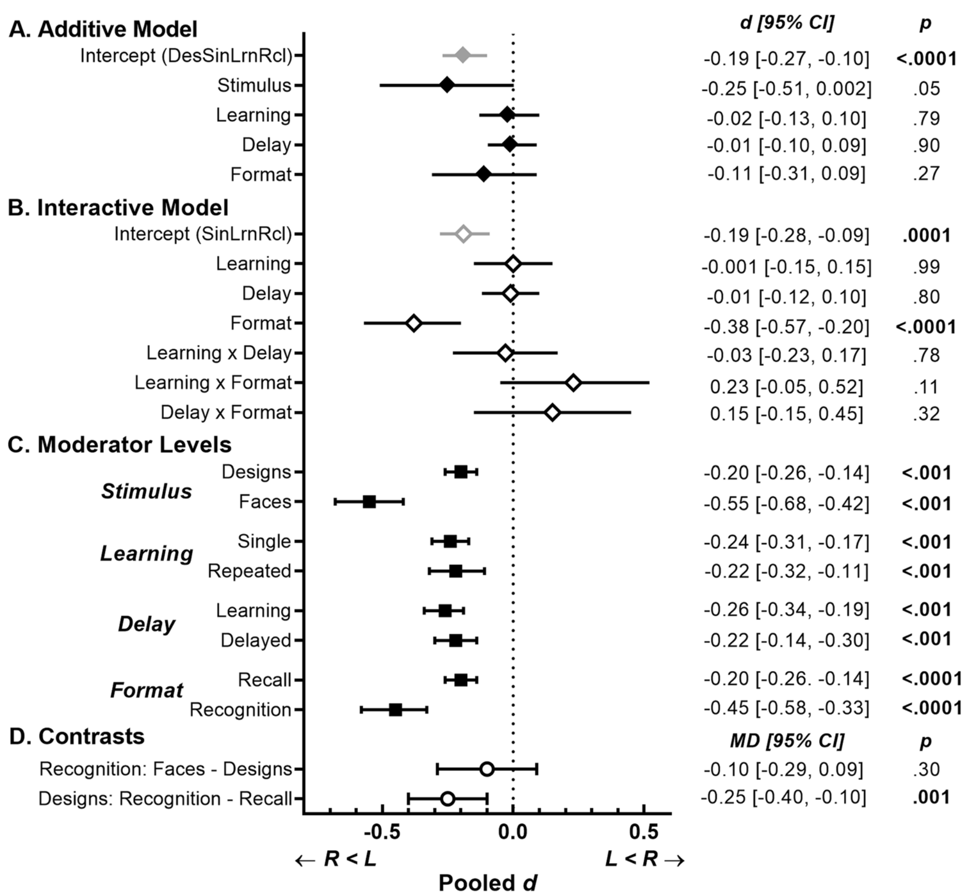

Fig. 4 Standardized effect sizes (Cohen's d) and 95% confidence intervals of lateralization (left minus right TLR performance) for postsurgical patients, by type of moderator analysis and individual moderator levels. Negative effect sizes indicate poorer performance for right than left TLR patients. Sample size (*k*, studies) inferential statistics, heterogeneity and fail-safe N measures are in Supplementary Table 10. Contrasts used mean differences and *t*-statistic

For the same reasons as described in the section above for the presurgical sample, we used Bonferroni-corrected contrasts (i.e., $p = 0.05/2 = 0.025$) to determine whether this Format effect for the right TLR group was influenced by the borderline significant effect of Stimulus (see Fig. 4D). These showed the right-lateralization effect for Designs-Recognition was significantly larger than for Designs-Recall, while the effect size for Faces-Recognition was not significantly larger than for Designs-Recognition (see Fig. 4D). Therefore, when taken together, for postsurgical patients the lateralization effects (right < left performance) were affected by testing format (recognition > recall) that appeared to overshadow and explain the effects of stimulus type (faces > designs).

Postsurgical Change For postsurgical change, the additive meta-regression model showed that for left TLR patients the moderators were significant as a group, $Q_M = 12.95$, $p = 0.01$, with a significant effect of Format (Recognition more left-lateralized than Recall, $d = 0.22$, $p = 0.4$), but no other moderators were significant (see Fig. 5A). The interactive model (Fig. 5B) was also significant, $Q_M = 15.15$, $p = 0.01$, again with a significant effect of Format only (Recognition more left-lateralized than Recall, $d = 0.25$, $p = 0.007$).

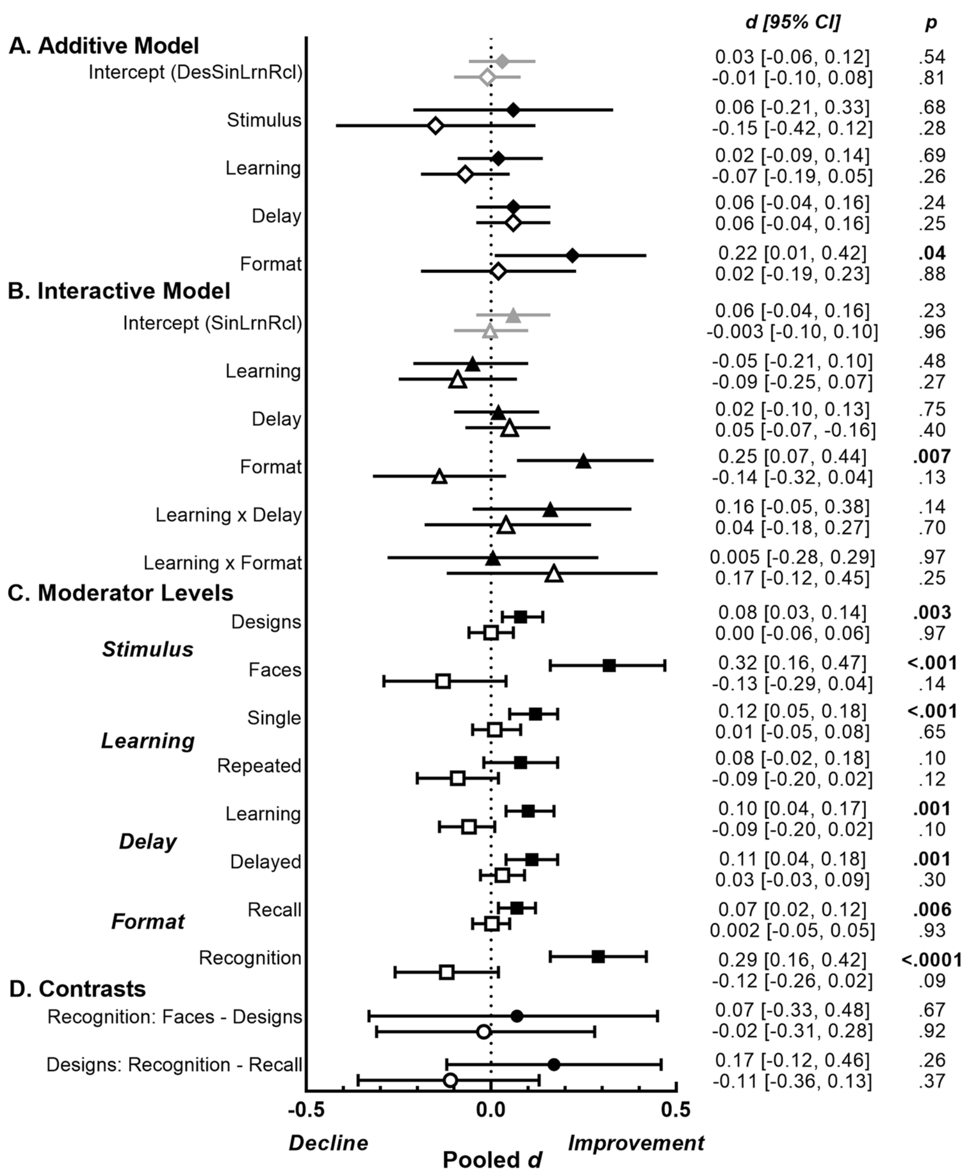

Fig. 5 Standardized effect sizes (Cohen's *d*) and 95% confidence intervals of postsurgical change in performance (postsurgical minus presurgical) by hemisphere of TLR (left: black markers; right: white), type of moderator analysis and individual moderator levels. Negative effect sizes indicate poorer postsurgical than presurgical performance. Sample size (*k*, studies) inferential statistics, heterogeneity and fail-safe N measures are in Supplementary Tables 11 (left TLR) and 12 (right TLR). Contrasts used mean differences and *t*-statistic

To determine whether this Format effect for the right TLR group was influenced by Stimulus (for the same reasons as described in the section above for the presurgical and postsurgical sample, see Fig. 5D), we used Bonferroni-corrected contrasts. These showed no significant differences between Faces-Recognition and Designs-Recognition or between Designs-Recognition and Designs-Recall, suggesting that Stimulus did not confound the Format effect. For right TLR patients the additive and interactive analyses showed no significant lateralization effects.

Postsurgical Change: Left Versus Right TLR Fig. 6 shows postsurgical change for left TLR versus right TLR patients. The only significant moderator was Format (Recognition greater left-lateralization than Recall) for the interactive model only. Additional contrasts showed the left-lateralization effect for Designs-Recognition was significantly larger than for Designs-Recall, while the effect size for Faces-Recognition was not significantly larger than for Designs-Recognition (see Fig. 6D). All within-moderator groups showed statistical sensitivity to TLR lateralization (right < left) except for Delayed and Recall (trends only), with Faces showing the largest effect, $M_{diff} = -0.44$, $p = 0.01$, followed by Recognition, $M_{diff} = -0.41$, $p < 0.001$.

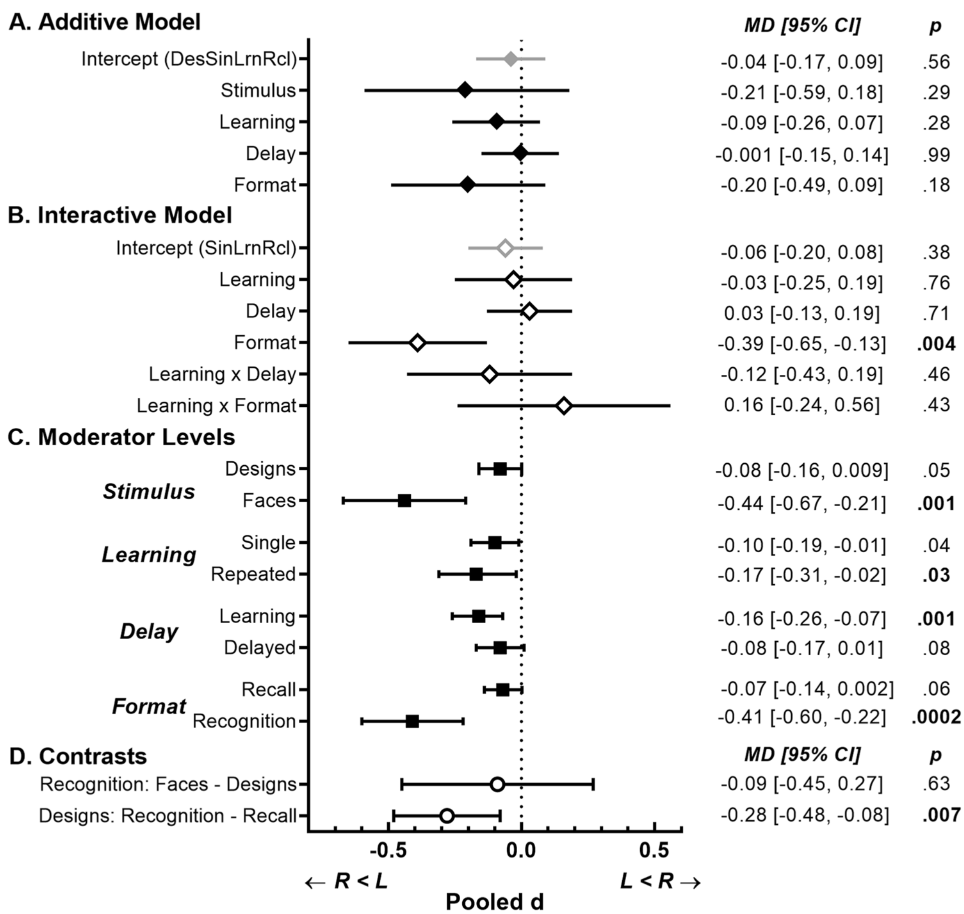

Fig. 6 Standardized effect sizes (Cohen's *d*) and 95% confidence intervals for lateralization of postsurgical change (i.e., difference between postsurgical minus presurgical change in performance for left minus right TLR patients), by type of moderator analysis and individual moderator levels. Negative effect sizes indicate poorer postsurgical than presurgical performance, positive values indicate better postsurgical than presurgical performance. Sample size (*k*, studies) inferential statistics, heterogeneity and fail-safe N measures are in Supplementary Table 13. Contrasts used mean differences and *t*-statistic

In summary, for postsurgical change, there was an effect of testing format in favor of improved recognition over recall for left TLR patients, and when comparing left and right TLR the lateralization effects (left > right improvement) were affected by testing format (recognition > recall) that appeared to overshadow and explain the effects of stimulus type (faces > designs).

Discussion

Page 12

For clarity we replace the entire second and third paragraph concerning the moderating effects of stimulus-related and task-related factors, and the initial section of the following paragraph, corrected version:

> This study revealed several novel findings. Taking all nonverbal memory tests together, patients with RTLE performed slightly worse than patients with LTLE, in both the presurgical and postsurgical patient groups, with larger differences for the postsurgical group compared to the presurgical groups. For presurgical patients, lateralization effects (right < left) were consistently small and differed by stimulus type (faces > designs) and testing format (recall > recognition), in a manner that interacted with learning type, i.e., larger effect size change for repeated than single learning trials). For postsurgical patients, lateralization effects (right < left) also differed by format but in the opposite direction (recognition > recall), that appeared to overshadow and explain the borderline non-significant effects of stimulus type (faces > designs). Change in nonverbal memory performance following TLR showed an overall pattern of mild improvement in left TLR patients and no change in right TLR patients. In left TLR patients, the degree of improvement differed by format (recognition > recall) that appeared to overshadow and explain the borderline non-significant effects of stimulus type (faces > designs). In right TLR patients, the effect size was not significant and did not differ for any of the moderators. This advantage for recognition over recall was maintained when comparing postsurgical change for left and right TLR patients and did not appear to differ by the type of stimulus. Patient age (at the time of the assessment) had no significant effect on nonverbal memory performance in any patient sample, while patients with left TLR performed worse on nonverbal memory tests following surgery when the age of epilepsy onset was younger.

Our meta-analysis shows that the testing format moderates the capacity of nonverbal memory tests to reveal memory decline following surgery (i.e., recognition > recall) for right TLR patients and that recognition tests better discriminate postsurgical change of left and right TLR patients. This suggests that a recognition format may more specifically test memory consolidation and storage functions linked to the medial temporal lobe than a recall format (Lowndes & Savage, 2007; Mayes et al., 2007). In contrast, other test attributes including stimulus type, learning format and test delay did not impact the right-lateralization effect for the postsurgical change group (cf. Jones-Gotman et al., 2000; Majdan et al., 1996). For presurgical patients there was a more complex pattern that indicated a slight advantage of recall over recognition that depended on an interaction with learning type. The interpretation of this finding is less clear but suggests that for presurgical patients tests with particular combinations of learning and format type (e.g., learning with repeated trials, tested via recall) may on average slightly outperform tests with other combinations. Our findings support the recommendations of the International League Against Epilepsy (ILAE; Wilson et al., 2015) report regarding the use of recognition testing alongside recall measures for comparison, from the same tests where applicable.

Page 13

For the fifth paragraph under the heading "Limitations and Further Research", we changed the original version of the first sentence:

> Given the modest effect sizes of most tests examined and the lack of moderating effects of test-related factors on the capacity of nonverbal memory tests to indicate impairment in RTLE presurgical samples, there remains a clear and urgent need for improved tests to predict the effects of right temporal lobe pathology.

To the corrected version:

> Given the modest effect sizes of most tests examined particularly for presurgical patients, there remains a clear and urgent need for improved tests to predict the effects of right temporal lobe pathology.

For the first sentence under “Conclusion” we changed:

> “This comprehensive meta-analysis has shown the value of nonverbal recognition measures in detecting postsurgical change in right TLR patients.”

To the corrected version:

> This comprehensive meta-analysis has shown the value of nonverbal recall measures in detecting presurgical right TLE, and the value of recognition measures in detecting postsurgical performance in right TLR patients and postsurgical improvement in left TLR patients.

The original article has been corrected.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.