Supplemental Material

Mills, Woodhead, and Parker

Orthographic neighbourhood effects during lateralised lexical decision are abolished with bilateral presentation

Characterising hemispheric dominance for language is by no means trivial. In the main body of text we used an LI cut off of +/-5 to identify those who reliably showed a right ear advantage, where an LI greater than 5 indicated a reliable right ear advantage reflecting left hemisphere dominance for language processing. Using the right ear advantage to classify participants as left and non-left hemisphere dominant for language in this way maximised the number of participants in each group. Hence our decision to pre-register the +/-5 threshold for determining hemishperic dominance for language when using a dichotic listening task. However, this approach may not have been as reliable as alternate methods given its arbitrary nature. It appears that a Bayesian inference approach for categorising laterality based on performance on a dichotic listening task reported by Sørensen and Westerhausen (2020) may have been a more efficient way of categorising laterality. Within Sørensen and Westerhausen's approach an LI of 5 would likely indicate left-hemispheric dominance for both left- and right-handers, thus causing concern for our pre-registered approach. In these Supplemental Materials we rerun our planned analyses for Experiment 1 using the same Bayesian approach and consider how the results supplement our pre-registered analyses.

Categorising laterality

To identify those with a reliable right ear advantage and to categorise laterality, continuous dichotic listening LIs and handedness classification were inputted into the *predict_dominance()* function from the *Bayesian-Laterality* package [version 0.1.1] (Sørensen, 2021) for each participant. This generated probabilities that participants were left, right, or not lateralised on the dichotic listening task. For example, a participant with a dichotic listening LI of 9.3 is categorised as being left (right ear advantage), right (left ear advantage), or not laterialised (no ear advantage) at a probability of 0.82, 0.18, and 0.00 respectively. We then took the classification with the highest probability to define laterality. In the example given, we would assign the

Table 1: Proportion of correct responses and reaction times for word targets as a function of laterality group, visual field, and neighbourhood size (N).

		LVF		RVF	
		High N	Low N	High N	Low N
Left Lat.	Prop. correct	0.64 (0.48)	0.65 (0.48)	0.79 (0.41)	0.79 (0.41)
	Reaction time (ms)	827 (191.5)	816 (188.8)	809 (182.7)	801 (183)
Right Lat.	Prop. correct	0.71 (0.45)	0.7 (0.46)	0.76 (0.43)	0.74 (0.44)
	Reaction time (ms)	794 (197.7)	785 (188.2)	800 (186.3)	801 (184.1)

participant with the label of left lateralised because left received the highest probability. Out of the 140 participants in Experiment 1, 111 were categorised as left hemisphere dominant and 29 were categorised as right hemisphere dominant on the dichotic listening task. Of interest, no participants were defined as bilateral.

Mixed-effects analysis

The proportion of correct responses and reaction times per experimental condition are shown in Table 1 for left and right hemisphere dominance participants. In the main body of text, our analytic approach consisted of two stages. First, we fitted linear mixed-effects models to the data for participants showing a right ear advantage. Second, we fitted models to data for participants who did and did not show a right ear advantage on the dichtoic listening task. We additionally calculated Bayes factors for each fixed effect within each model. In these supplemental materials we take an identical approach. However, it is important to note that we no longer refer to a right ear advantage as the Bayesian approach aims to categorise hemisphere dominance taking into account both the ear advantage and categorical handedness. Thus, we refer to participants as being right or left lateralised based on the output from the *predict_dominance()* function. All models reported here include random intercepts for participants and items only as models with random slopes failed to converge.

Regarding the right lateralised participants, Model 1A *(lmer(dv~ N x VF + (1|participant) + (1|item))* indicated that the N effect was not significant in the LVF (see Table 2). The N x VF interaction was not significant, indicating that the N effect did not differ across visual fields. Model 1B *(lmer(dv~ N + (1|participant) + (1|item))* confirmed that the N effect was not significant in the RVF. Together, like in the main body of text, these results do not confirm any of our pre-registered predictions and suggest N effects are absent under bilateral presentation. However, the Bayesian evidence for the N effect in the LVF was unequivocal and suggested the need for more data. On a more positive note, we do report faster reaction times in the RVF for low-N words which did not differ for high-N words.

Table 2: Linear mixed-effects results for reaction times for left hemisphere dominant particiants.

	Model 1A: NxVF+(1|participant)+(1|item)				Model 1B: N+(1|participant)+(1|item)			
Fixed effect	b	SE	t	BF10	b	SE	t	BF10
(intercept)	6.698	0.011	592.068	-	6.678	0.012	573.771	-
N	-0.011	0.006	-1.916	0.034	-0.009	0.005	-1.645	0.022
VF	-0.024	0.004	-5.698	1.080e+15	-	-	-	-
N x VF	0.003	0.006	0.512	0.007	-	-	-	-
Random.effect	Var.	SD	-	-	Var.	SD	-	-
Participant (Intercept)	0.012	0.110	-	-	0.116	0.013	-	-
Item (Intercept)	0.038	0.023	-	-	0.021	<0.001	-	-
Residual	<0.001	0.195	-	-	0.189	0.036	-	-

Table 3: Linear mixed-effects results for reaction times in left and right hemisphere dominant particiants.

	Model 2A: NxVFxLaterality+(1|participant)+(1|item)				Model 2B: NXLaterality+(1|participant)+(1|item)			
Fixed effect	b	SE	t	BF10	b	SE	t	BF10
(intercept)	6.677	0.013	527.331	-	6.674	0.013	516.484	-
N	-0.009	0.006	-1.44	0.017	-0.007	0.006	-1.116	0.011
VF	-0.006	0.005	-1.331	0.011	-	-	-	-
Laterality	0.031	0.017	1.762	0.079	0.006	0.018	0.354	0.018
N x VF	0.003	0.006	0.426	0.007	-	-	-	-
N x Laterality	-0.003	0.007	-0.528	0.008	-0.003	0.006	-0.541	0.007
VF x Laterality	-0.025	0.006	-3.974	7.681	-	-	-	-
N x VF x Laterality	<0.001	0.009	0.052	0.009	-	-	-	-
Random.effect	Var.	SD	Corr.	-	Var.	SD	Corr.	-
Participant (Intercept)	0.013	0.114	-	-	0.014	0.117	-	-
Item (Intercept)	<0.001	0.022	-	-	<0.001	0.022	-	-
Residual	0.038	0.195	-	-	0.036	0.190	-	-

Moving onto our comparison of left and right hemisphere dominant participants, Model 2A indicated that the N x Laterality interaction was not statistically significant (see Table 3). This indicates that the N effect in the LVF did not differ between laterality groups. Furthermore, the N x VF x Laterality interaction was not significant, indicating that the difference in N effects across visual fields did not differ between laterality groups. The N x Laterality interaction in Model 2B confirmed that the N effect in the RVF did not differ between laterality groups. Thus, our statistical analyses did not support hypothesis 2. Bayes factors for these analyses provided evidence in support of the null. However, the effect of VF in model 2A indicated that reaction times did not differ across VFs for right hemisphere dominant participants, which contrasts findings for the left hemisphere dominant participants. Accordingly, the VF x Laterality interaction was significant for model 2A indicating a difference in the RVF advantage across groups.

Summary

Ultimately, our supplemental analyses yielded near identical results to our pre-registered analyses. We interpret these results as showing strong evidence that results from Experiment 1 were not an artefact of misclassifying laterality when using a cut off of +/-5.