

## Supplementary Materials

**Table S1.** Task order for the training sessions.

Training Session 1	Training Session 2
Tone Introduction	EEG Application & Impedance Check
Phonetic Categorization - Pre <sup>P</sup>	Pre-tVNS Mood Questionnaires
Dynamic Pupil Range <sup>P</sup>	Tone Introduction
EEG Application & Impedance Check	Video & tVNS Priming <sup>S-Priming</sup>
Pre-tVNS Mood Questionnaires	Phonetic Categorization - Training <sup>S-Peristim</sup>
Video & tVNS Priming <sup>S-Priming</sup>	Word Learning - Passive <sup>E, P, S-Peristim</sup>
Oddball Task - Pre <sup>E, P, S-Peristim</sup>	Word Learning – Active <sup>S-Peristim</sup>
Video & tVNS Priming <sup>S-Priming</sup>	Video & tVNS Priming <sup>S-Priming</sup>
Phonetic Categorization - Training <sup>S-Peristim</sup>	Match/Mismatch Test <sup>E, P, S-Peristim</sup>
Word Learning - Passive <sup>E, P, S-Peristim</sup>	Video & tVNS Priming <sup>S-Priming</sup>
Word Learning – Active <sup>S-Peristim</sup>	Oddball Task - Post <sup>E, P, S-Peristim</sup>
Video & tVNS Priming <sup>S-Priming</sup>	Phonetic Categorization - Post <sup>P</sup>
Match/Mismatch Test <sup>E, P, S-Peristim</sup>	Dynamic Pupil Range <sup>P</sup>
Post-tVNS Mood and Comfort Questionnaires	Post-tVNS Mood and Comfort Questionnaires
Word Recall	Word Recall
	Post-Experiment Questionnaire

<sup>E</sup> EEG data collected, <sup>P</sup> pupillometry data collected, <sup>S-Peristim</sup> tVNS for peristim groups only, <sup>S-Priming</sup> tVNS for priming groups only.

*Notes.* The Video & tVNS Priming task was not administered to the peristim groups. tVNS involved calibration and ramping (for active and sham) and stimulation during the task (for active only).

**Table S2.** Descriptives for each group on PCID and musicianship.

	Peristimulus	Priming	Sham
Pitch Contour Identification (PCID)	67.2 (10.3)	68.2 (12.1)	67.3 (8.7)
Musicianship (Non-Musician)	5 (29.4%)	2 (11.8%)	8 (22.9%)
Musicianship (Music-Loving Non-Musician)	6 (35.3%)	9 (52.9%)	17 (48.6%)
Musicianship (Amateur Musician)	4 (23.5%)	3 (17.6%)	7 (20%)
Musicianship (Serious Amateur Musician)	2 (11.8%)	3 (17.6%)	3 (8.6%)
Musicianship (Semi-Professional Musician)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Musicianship (Professional Musician)	0 (0.0%)	0 (0.0%)	0 (0.0%)

*Notes.* Mean (SD) presented for PCID. Frequency (percentage) presented for musicianship.

**Table S3.** tVNS group means and standard deviations for lexical recognition and recall tests.

<b>Word Learning Outcome Measure</b>	<b>Peristimulus</b>		<b>Priming</b>		<b>Sham</b>	
	<i>Day 1</i>	<i>Day 2</i>	<i>Day 1</i>	<i>Day 2</i>	<i>Day 1</i>	<i>Day 2</i>
<b><i>Accuracy (% correct)</i></b>						
Recall	52.8 (37.3)	69.4 (33.3)	54.2 (29.9)	84.3 (24.2)	34.8 (28.7)	65.0 (30.3)
Recognition - Match	73.6 (14.5)	84.1 (11.2)	78.0 (13.2)	90.2 (8.35)	70.4 (12.4)	84.5 (12.2)
Recognition - Mismatch	65.4 (19.1)	76.8 (18.4)	61.7 (18.9)	80.4 (18.7)	55.8 (16.9)	73.7 (18.9)
<b><i>Reaction Time (ms)</i></b>						
Recognition - Match	922 (113)	846 (144)	955 (128)	835 (117)	932 (157)	888 (138)
Recognition - Mismatch	1001 (125)	917 (143)	1069 (98)	940 (129)	1016 (162)	988 (155)

**Table S4.** Logistic MEM for lexical recognition accuracy.

<b>Fixed effects</b>	<b>Estimate</b>	<b>SE</b>	<b>p</b>	
Intercept (Mismatch, Training Day 1, Sham)	-0.128	0.230	.579	
Task Condition (Match)	0.718	0.141	<.001	
Training Day (Day 2)	1.072	0.118	<.001	
tVNS Condition (Peristim)	0.581	0.192	.002	
tVNS Condition (Priming)	0.184	0.194	.343	
Task Cond. (Match) X Day (Day 2)	0.012	0.095	.897	
tVNS Cond (Peristim) X Task Cond (Match)	-0.314	0.176	.073	
tVNS Cond (Priming) X Task Cond (Match)	0.219	0.178	.219	
Musicianship	0.190	0.088	.032	
Non-Linguistic Tone Aptitude	0.349	0.090	<.001	
<b>Random effects</b>	<b>Variance</b>	<b>SD</b>	<b>Correlation</b>	
Intercepts   Participant	0.432	0.657		
Task Cond. (Match)   Participant	0.371	0.610	-.47	
Day (Day 2)   Participant	0.613	0.783	.19 .24	
Task Cond. (Match) X Day (2)   Participant	0.259	0.509	.17 -.51 -.77	
Intercepts   Item (presented sound)	0.076	0.276		
Task Cond (Match)   Item	0.144	0.379	-.21	
Day (Day 2)   Item	0.046	0.213	.27 .19	

Number of obs.: 29,794, Participants: 69, Items (unique presented sound files): 18

**Table S5.** Linear MEM for lexical recognition RTs.

<b>Fixed effects</b>	<b>Estimate</b>	<b>SE</b>	<b><i>p</i></b>		
Intercept (Mismatch, Training Day 1, Sham)	6.878	0.025	<.001		
Task Condition (Match)	-0.108	0.019	<.001		
Training Day (Day 2)	-0.028	0.022	.204		
tVNS Condition (Peristim)	-0.015	0.041	.715		
tVNS Condition (Priming)	0.050	0.041	.225		
Task Cond. (Match) X Day (Day 2)	-0.005	0.017	.793		
tVNS Cond (Peristim) X Day (Day 2)	-0.048	0.036	.182		
tVNS Cond (Priming) X Day (Day 2)	-0.107	0.036	.004		
<b>Random effects</b>	<b>Variance</b>	<b>SD</b>	<b>Correlation</b>		
Intercepts   Participant	0.019	0.138			
Task Cond (Match)   Participant	0.009	0.096	-0.17		
Day (Day 2)   Participant	0.014	0.117	-0.32	-0.03	
Task Cond (Match) X Day (Day 2)   Participant	0.006	0.077	.21	-0.66	-0.16
Intercepts   Item (presented sound)	0.001	0.036			
Task Cond (Match)   Item	0.004	0.060	-0.42		
Day (Day 2)   Item	0.001	0.025	-0.16	-0.35	
Task Cond (Match) X Day (Day 2)   Item	0.002	0.048	.03	.51	-0.38
Residual	0.090	0.301			

Number of obs.: 21,949, Participants: 69, Items (unique presented sound files): 18

**Table S6.** Logistic MEM for lexical recall accuracy.

<b>Fixed effects</b>	<b>Estimate</b>	<b>SE</b>	<b><i>p</i></b>	
Intercept (Training Day 1, Sham)	-0.867	0.309	.005	
Training Day (Day 2)	1.872	0.244	<.001	
tVNS Condition (Peristim)	0.917	0.510	.072	
tVNS Condition (Priming)	1.179	0.500	.001	
Non-Linguistic Tone Aptitude	0.676	0.211	.018	
<b>Random effects</b>	<b>Variance</b>	<b>SD</b>	<b>Correlation</b>	
Intercepts   Participant	2.402	1.550		
Day (Day 2)   Participant	1.531	1.237	-.23	
Intercepts   Item	0.076	0.276		

Number of obs.: 1,236, Participants: 69, Items: 9

**Table S7.** GAMM summary table for passive word learning pupillometry analysis.

<b>Parametric coefficients</b>	<b>Estimate</b>	<b>SE</b>	<b>p</b>
Intercept (Training Day 1, Sham)	0.934	6.154	.879
Day 1 X Peristim	-3.020	9.556	.752
Day 1 X Priming	-9.081	10.197	.373
Day 2 X Sham	2.422	3.462	.484
Day 2 X Peristim	-9.348	9.533	.327
Day 2 X Priming	-3.165	10.151	.755
<b>Approx. significance of smooth terms</b>	<b>edf</b>	<b>Ref.df</b>	<b>p</b>
s(Time):Day 1 X Sham	8.307	8.620	<.001
s(Time):Day 1 X Peristim	3.018	3.744	.431
s(Time):Day 1 X Priming	1.068	1.097	.323
s(Time):Day 2 X Sham	8.282	8.603	<.001
s(Time):Day 2 X Peristim	7.436	8.324	<.001
s(Time):Day 2 X Priming	5.441	6.825	.104
s(X gaze position, Y gaze pos.)	28.836	28.998	<.001
te(Time, Non-Ling. Tone Aptitude)	60.109	67.753	<.001
s(Time, Participant)	289.765	331.000	<.001
s(Time, Item)	371.879	449.000	<.001

Number of obs.: 719,951, Participants: 67, Items: 90