Supplementary Materials

Age, Not Autism, Influences Multisensory Integration of Speech Stimuli among Adults in a McGurk/MacDonald Paradigm

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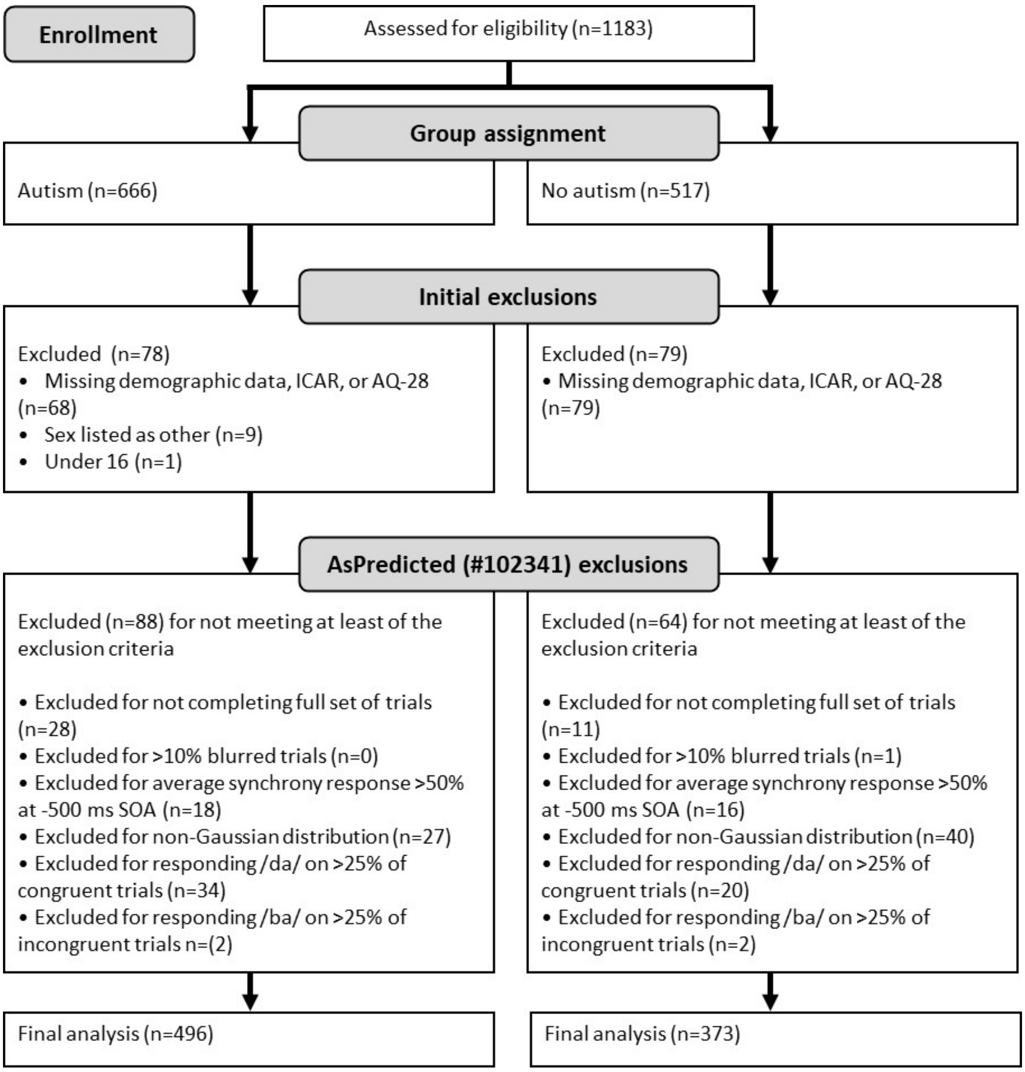


Supplementary Figure 1: Flowchart describing the reasons for exclusion for each group. ICAR: International Cognitive Ability Resource (abbreviated intelligence quotient test). AQ: Autism Quotient. SOA: Stimulus onset asynchrony.

Supplementary Table 1: Statistics resulting from a repeated measures ANOVA on /da/ response rates from the age-matched sub-sample with stimulus onset asynchrony (SOA) and congruency as within subjects factors and group and age as between subjects factors.

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p
Congruency	None	0.020	1.000	0.020	0.208	0.649
Congruency ✻ group	None	0.236	1.000	0.236	2.435	0.121
Congruency ✻ Age	None	1.604	1.000	1.604	16.570	< .001
Residuals	None	11.328	117.000	0.097		
SOA	None	0.088 [a]	4.000 [a]	0.022 [a]	1.360 [a]	0.247 [a]
	Huynh-Feldt	0.088	2.272	0.039	1.360	0.258
SOA ✻ group	None	0.097 [a]	4.000 [a]	0.024 [a]	1.488 [a]	0.205 [a]
	Huynh-Feldt	0.097	2.272	0.043	1.488	0.226
SOA ✻ Age	None	0.482 [a]	4.000 [a]	0.121 [a]	7.428 [a]	< .001 [a]
	Huynh-Feldt	0.482	2.272	0.212	7.428	< .001
Residuals	None	7.596	468.000	0.016		
	Huynh-Feldt	7.596	265.779	0.029		
Congruency ✻ SOA	None	0.096 [a]	4.000 [a]	0.024 [a]	1.443 [a]	0.219 [a]
	Huynh-Feldt	0.096	2.383	0.040	1.443	0.236
Congruency ✻ SOA ✻ group	None	0.124 [a]	4.000 [a]	0.031 [a]	1.869 [a]	0.115 [a]
	Huynh-Feldt	0.124	2.383	0.052	1.869	0.148
Congruency ✻ SOA ✻ Age	None	0.505 [a]	4.000 [a]	0.126 [a]	7.623 [a]	< .001 [a]
	Huynh-Feldt	0.505	2.383	0.212	7.623	< .001
Residuals	None	7.753	468.000	0.017		
	Huynh-Feldt	7.753	278.839	0.028		

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type III Sum of Squares

[a] Mauchly's test of sphericity indicates that the assumption of sphericity is violated (p < .05).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
group	0.282	1	0.282	2.728	0.101
Age	1.717	1	1.717	16.623	< .001
Residuals	12.084	117	0.103		

Note. Type III Sum of Squares

Supplementary Table 2: Bayesian ANCOVA comparing the likelihood of alternative models in explaining the rate of /da/ responses on incongruent trials (collapsed across stimulus onset asynchronies, SOA) with group as a between subjects factor and age as a covariate. Uniform priors were adopted.

Model Comparison

Models	P(M)	P(M|data)	BF_M	BF_{01}	error %
Age	0.250	0.923	35.785	1.000	
Age + group	0.250	0.077	0.252	11.928	1.196
group	0.250	8.259×10^{-12}	2.478×10^{-11}	$1.117\times10^{+11}$	0.002
Null model	0.250	6.363×10^{-13}	1.909×10^{-12}	$1.450\times10^{+12}$	9.026×10^{-4}

The Bayesian ANCOVA suggests that the best model was provided by age on its own. Compared to this model, the model including age and group was 11.928 times less likely to explain the given results, the model including group alone was 1.117×10^{11} times less likely to do so, and the null model was 1.450×10^{12} less likely to do so.

Supplementary Table 3: Statistics resulting from a repeated measures ANOVA on /ba/ response rates with stimulus onset asynchrony (SOA) and congruency as within subjects factors and group as a between subjects factor.

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p
Congruency	None	1374.084	1.000	1374.084	10983.236	< .001
Congruency ✻ group	None	2.022	1.000	2.022	16.165	< .001
Residuals	None	108.468	867.000	0.125		
SOA	None	18.807 [a]	4.000 [a]	4.702 [a]	285.980 [a]	< .001 [a]
	Huynh-Feldt	18.807	2.107	8.926	285.980	< .001
SOA ✻ group	None	1.136 [a]	4.000 [a]	0.284 [a]	17.267 [a]	< .001 [a]
	Huynh-Feldt	1.136	2.107	0.539	17.267	< .001
Residuals	None	57.016	3468.000	0.016		
	Huynh-Feldt	57.016	1826.831	0.031		
Congruency ✻ SOA	None	18.244 [a]	4.000 [a]	4.561 [a]	278.175 [a]	< .001 [a]
	Huynh-Feldt	18.244	2.098	8.694	278.175	< .001
Congruency ✻ SOA ✻ group	None	1.005 [a]	4.000 [a]	0.251 [a]	15.320 [a]	< .001 [a]
	Huynh-Feldt	1.005	2.098	0.479	15.320	< .001
Residuals	None	56.861	3468.000	0.016		
	Huynh-Feldt	56.861	1819.332	0.031		

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type III Sum of Squares

[a] Mauchly's test of sphericity indicates that the assumption of sphericity is violated (p < .05).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
group	2.090	1	2.090	16.657	< .001
Residuals	108.809	867	0.126		

Note. Type III Sum of Squares

Supplementary Table 4: Statistics resulting from a repeated measures ANOVA on /ba/ response rates with stimulus onset asynchrony (SOA) and congruency as within subjects factors and group and age as between subjects factors.

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p
Congruency	None	227.578	1.000	227.578	1976.913	< .001
Congruency ✻ group	None	0.018	1.000	0.018	0.160	0.690
Congruency ✻ Age	None	8.776	1.000	8.776	76.234	< .001
Residuals	None	99.692	866.000	0.115		
SOA	None	0.175 [a]	4.000 [a]	0.044 [a]	2.820 [a]	0.024 [a]
	Huynh-Feldt	0.175	2.203	0.079	2.820	0.054
SOA ✻ group	None	0.085 [a]	4.000 [a]	0.021 [a]	1.363 [a]	0.244 [a]
	Huynh-Feldt	0.085	2.203	0.038	1.363	0.256
SOA ✻ Age	None	3.220 [a]	4.000 [a]	0.805 [a]	51.840 [a]	< .001 [a]
	Huynh-Feldt	3.220	2.203	1.462	51.840	< .001
Residuals	None	53.796	3464.000	0.016		
	Huynh-Feldt	53.796	1908.050	0.028		
Congruency ✻ SOA	None	0.152 [a]	4.000 [a]	0.038 [a]	2.440 [a]	0.045 [a]
	Huynh-Feldt	0.152	2.183	0.070	2.440	0.082
Congruency ✻ SOA ✻ group	None	0.066 [a]	4.000 [a]	0.016 [a]	1.053 [a]	0.378 [a]
	Huynh-Feldt	0.066	2.183	0.030	1.053	0.353
Congruency ✻ SOA ✻ Age	None	2.920 [a]	4.000 [a]	0.730 [a]	46.872 [a]	< .001 [a]
	Huynh-Feldt	2.920	2.183	1.337	46.872	< .001
Residuals	None	53.942	3464.000	0.016		
	Huynh-Feldt	53.942	1890.809	0.029		

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type III Sum of Squares

[a] Mauchly's test of sphericity indicates that the assumption of sphericity is violated (p < .05).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
group	0.028	1	0.028	0.241	0.623
Age	8.630	1	8.630	74.599	< .001
Residuals	100.180	866	0.116		

Note. Type III Sum of Squares

Supplementary Table 5: Statistics resulting from a repeated measures ANOVA on /ga/ response rates with stimulus onset asynchrony (SOA) and congruency as within subjects factors and group as a between subjects factor.

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p
Congruency	None	2000.164	1.000	2000.164	123553.362	< .001
Congruency ✻ group	None	0.164	1.000	0.164	10.125	0.002
Residuals	None	14.036	867.000	0.016		
SOA	None	0.234 [a]	4.000 [a]	0.058 [a]	29.456 [a]	< .001 [a]
	Huynh-Feldt	0.234	3.151	0.074	29.456	< .001
SOA ✻ group	None	0.046 [a]	4.000 [a]	0.011 [a]	5.759 [a]	< .001 [a]
	Huynh-Feldt	0.046	3.151	0.014	5.759	< .001
Residuals	None	6.875	3468.000	0.002		
	Huynh-Feldt	6.875	2732.267	0.003		
Congruency ✻ SOA	None	0.050 [a]	4.000 [a]	0.013 [a]	6.336 [a]	< .001 [a]
	Huynh-Feldt	0.050	3.248	0.015	6.336	< .001
Congruency ✻ SOA ✻ group	None	0.009 [a]	4.000 [a]	0.002 [a]	1.148 [a]	0.332 [a]
	Huynh-Feldt	0.009	3.248	0.003	1.148	0.330
Residuals	None	6.854	3468.000	0.002		
	Huynh-Feldt	6.854	2815.861	0.002		

Note. Sphericity corrections not available for factors with 2 levels.

Note. Type III Sum of Squares

[a] Mauchly's test of sphericity indicates that the assumption of sphericity is violated (p < .05).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
group	0.100	1	0.100	7.584	0.006
Residuals	11.437	867	0.013		

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p

Note. Type III Sum of Squares

Supplementary Table 6: Statistics resulting from a repeated measures ANOVA on /ga/ response rates with stimulus onset asynchrony (SOA) and congruency as within subjects factors and group and age as between subjects factors.

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p
Congruency	None	238.694	1.000	238.694	15196.399	< .001
Congruency ✻ group	None	0.013	1.000	0.013	0.796	0.373
Congruency ✻ Age	None	0.433	1.000	0.433	27.570	< .001
Residuals	None	13.603	866.000	0.016		
SOA	None	0.035 [a]	4.000 [a]	0.009 [a]	4.427 [a]	0.001 [a]
	Huynh-Feldt	0.035	3.187	0.011	4.427	0.003
SOA ✻ group	None	0.010 [a]	4.000 [a]	0.003 [a]	1.318 [a]	0.261 [a]
	Huynh-Feldt	0.010	3.187	0.003	1.318	0.266
SOA ✻ Age	None	0.107 [a]	4.000 [a]	0.027 [a]	13.687 [a]	< .001 [a]
	Huynh-Feldt	0.107	3.187	0.034	13.687	< .001
Residuals	None	6.768	3464.000	0.002		
	Huynh-Feldt	6.768	2760.349	0.002		
Congruency ✻ SOA	None	0.020 [a]	4.000 [a]	0.005 [a]	2.573 [a]	0.036 [a]
	Huynh-Feldt	0.020	3.268	0.006	2.573	0.047
Congruency ✻ SOA ✻ group	None	0.003 [a]	4.000 [a]	7.963×10^{-4} [a]	0.406 [a]	0.805 [a]
	Huynh-Feldt	0.003	3.268	9.745×10^{-4}	0.406	0.766
Congruency ✻ SOA ✻ Age	None	0.052 [a]	4.000 [a]	0.013 [a]	6.613 [a]	< .001 [a]
	Huynh-Feldt	0.052	3.268	0.016	6.613	< .001
Residuals	None	6.802	3464.000	0.002		
	Huynh-Feldt	6.802	2830.459	0.002		

Note. Sphericity corrections not available for factors with 2 levels.

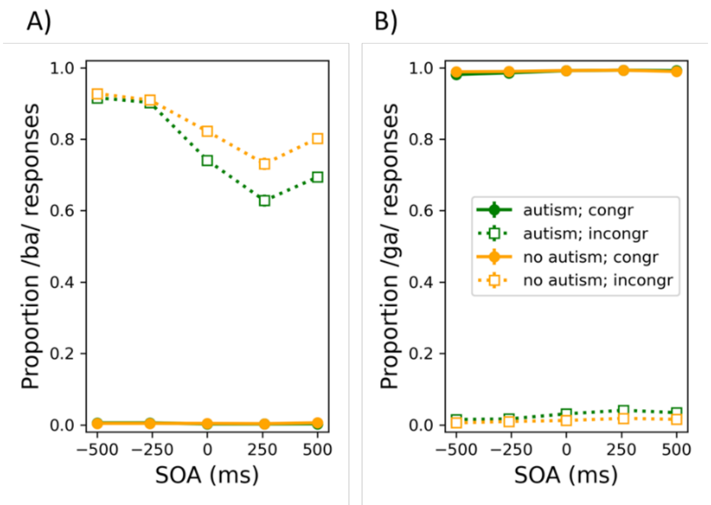
Note. Type III Sum of Squares

[a] Mauchly's test of sphericity indicates that the assumption of sphericity is violated (p < .05).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
group	0.005	1	0.005	0.407	0.524
Age	0.305	1	0.305	23.713	< .001
Residuals	11.133	866	0.013		

Note. Type III Sum of Squares



Supplementary Figure 2. A) Proportion of /ba/ responses per group as a function of stimulus onset asynchrony (SOA) for congruent and incongruent trials. B) Proportion of /ga/ responses per group as a function of SOA for congruent and incongruent trials. Here, negative SOAs indicate that the voice was leading the lip movements, and vice versa. Error bars indicate the standard error of the mean.

Supplementary Table 7: Statistics resulting from a repeated measures ANOVA on /da/ response rates with stimulus onset asynchrony (SOA) and congruency as within subjects factors and group, gender, and age as between subjects factors.

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p
Congruency	None	0.047	1.000	0.047	0.451	0.502
Congruency ✻ Age	None	5.649	1.000	5.649	54.381	< .001
Congruency ✻ Gender	None	0.280	1.000	0.280	2.692	0.101
Congruency ✻ group	None	0.009	1.000	0.009	0.082	0.774
Congruency ✻ Gender ✻ group	None	0.742	1.000	0.742	7.138	0.008
Residuals	None	89.749	864.000	0.104		
SOA	None	0.129 [a]	4.000 [a]	0.032 [a]	2.213 [a]	0.065 [a]
	Huynh-Feldt	0.129	2.211	0.059	2.213	0.104
SOA ✻ Age	None	2.393 [a]	4.000 [a]	0.598 [a]	40.905 [a]	< .001 [a]
	Huynh-Feldt	2.393	2.211	1.082	40.905	< .001
SOA ✻ Gender	None	0.057 [a]	4.000 [a]	0.014 [a]	0.975 [a]	0.420 [a]
	Huynh-Feldt	0.057	2.211	0.026	0.975	0.384
SOA ✻ group	None	0.025 [a]	4.000 [a]	0.006 [a]	0.423 [a]	0.792 [a]
	Huynh-Feldt	0.025	2.211	0.011	0.423	0.676
SOA ✻ Gender ✻ group	None	0.152 [a]	4.000 [a]	0.038 [a]	2.603 [a]	0.034 [a]
	Huynh-Feldt	0.152	2.211	0.069	2.603	0.068
Residuals	None	50.545	3456.000	0.015		
	Huynh-Feldt	50.545	1910.356	0.026		
Congruency ✻ SOA	None	0.131 [a]	4.000 [a]	0.033 [a]	2.292 [a]	0.057 [a]
	Huynh-Feldt	0.131	2.257	0.058	2.292	0.094
Congruency ✻ SOA ✻ Age	None	2.368 [a]	4.000 [a]	0.592 [a]	41.317 [a]	< .001 [a]
	Huynh-Feldt	2.368	2.257	1.049	41.317	< .001
Congruency ✻ SOA ✻ Gender	None	0.085 [a]	4.000 [a]	0.021 [a]	1.480 [a]	0.205 [a]

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p
	Huynh-Feldt	0.085	2.257	0.038	1.480	0.226
Congruency ✻ SOA ✻ group	None	0.035 [a]	4.000 [a]	0.009 [a]	0.614 [a]	0.652 [a]
	Huynh-Feldt	0.035	2.257	0.016	0.614	0.560
Congruency ✻ SOA ✻ Gender ✻ group	None	0.097 [a]	4.000 [a]	0.024 [a]	1.701 [a]	0.147 [a]
	Huynh-Feldt	0.097	2.257	0.043	1.701	0.178
Residuals	None	49.510	3456.000	0.014		
	Huynh-Feldt	49.510	1949.905	0.025		

Note. Sphericity corrections not available for factors with 2 levels.

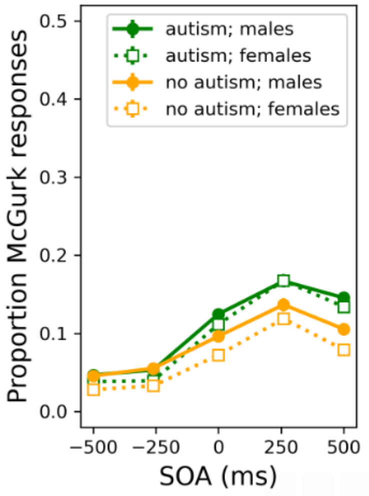
Note. Type III Sum of Squares

[a] Mauchly's test of sphericity indicates that the assumption of sphericity is violated ($p < .05$).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Age	5.953	1	5.953	57.062	< .001
Gender	0.257	1	0.257	2.465	0.117
group	5.470×10^{-5}	1	5.470×10^{-5}	5.243×10^{-4}	0.982
Gender ✻ group	0.600	1	0.600	5.754	0.017
Residuals	90.132	864	0.104		

Note. Type III Sum of Squares



Supplementary Figure 3: Proportion of /da/ responses per group and gender as a function of SOA for incongruent trials. Here, negative SOAs indicate that the voice was leading the lip movements, and vice versa.

Supplementary Table 8: Statistics resulting from a repeated measures ANOVA on synchrony response rates with stimulus onset asynchrony (SOA) and congruency as within subjects factors and group, gender, and age as between subjects factors.

Within Subjects Effects

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p
Congruency	None	20.891	1.000	20.891	349.401	< .001
Congruency ✻ Age	None	1.790	1.000	1.790	29.939	< .001
Congruency ✻ Gender	None	0.128	1.000	0.128	2.147	0.143
Congruency ✻ group	None	0.962	1.000	0.962	16.096	< .001
Congruency ✻ Gender ✻ group	None	0.040	1.000	0.040	0.675	0.412
Residuals	None	51.659	864.000	0.060		
SOA	None	43.675 [a]	4.000 [a]	10.919 [a]	202.867 [a]	< .001 [a]
	Huynh-Feldt	43.675	2.686	16.260	202.867	< .001
SOA ✻ Age	None	12.834 [a]	4.000 [a]	3.208 [a]	59.612 [a]	< .001 [a]
	Huynh-Feldt	12.834	2.686	4.778	59.612	< .001
SOA ✻ Gender	None	5.578 [a]	4.000 [a]	1.394 [a]	25.909 [a]	< .001 [a]
	Huynh-Feldt	5.578	2.686	2.077	25.909	< .001
SOA ✻ group	None	0.914 [a]	4.000 [a]	0.229 [a]	4.247 [a]	0.002 [a]
	Huynh-Feldt	0.914	2.686	0.340	4.247	0.007
SOA ✻ Gender ✻ group	None	0.121 [a]	4.000 [a]	0.030 [a]	0.562 [a]	0.690 [a]
	Huynh-Feldt	0.121	2.686	0.045	0.562	0.621
Residuals	None	186.012	3456.000	0.054		
	Huynh-Feldt	186.012	2320.781	0.080		
Congruency ✻ SOA	None	4.580 [a]	4.000 [a]	1.145 [a]	46.115 [a]	< .001 [a]
	Huynh-Feldt	4.580	3.395	1.349	46.115	< .001
Congruency ✻ SOA ✻ Age	None	0.769 [a]	4.000 [a]	0.192 [a]	7.746 [a]	< .001 [a]
	Huynh-Feldt	0.769	3.395	0.227	7.746	< .001
Congruency ✻ SOA ✻ Gender	None	0.186 [a]	4.000 [a]	0.047 [a]	1.876 [a]	0.112 [a]
	Huynh-Feldt	0.186	3.395	0.055	1.876	0.123
Congruency ✻ SOA ✻ group	None	0.108 [a]	4.000 [a]	0.027 [a]	1.086 [a]	0.361 [a]
	Huynh-Feldt	0.108	3.395	0.032	1.086	0.357
Congruency ✻ SOA ✻ Gender ✻ group	None	0.070 [a]	4.000 [a]	0.017 [a]	0.700 [a]	0.592 [a]
	Huynh-Feldt	0.070	3.395	0.020	0.700	0.569
Residuals	None	85.802	3456.000	0.025		
	Huynh-Feldt	85.802	2933.324	0.029		

Note. Sphericity corrections not available for factors with 2 levels.

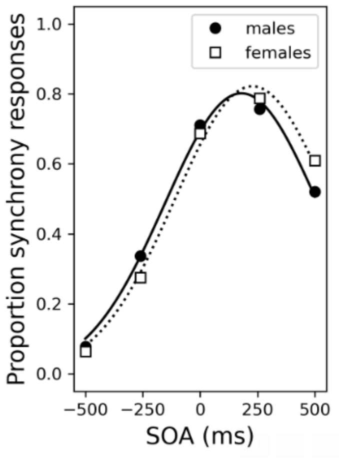
Note. Type III Sum of Squares

[a] Mauchly's test of sphericity indicates that the assumption of sphericity is violated (p < .05).

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Age	0.002	1	0.002	0.008	0.929
Gender	0.005	1	0.005	0.026	0.872
group	0.604	1	0.604	3.019	0.083
Gender ∗ group	6.034×10^{-4}	1	6.034×10^{-4}	0.003	0.956
Residuals	172.749	864	0.200		

Note. Type III Sum of Squares



Supplementary Figure 4: Proportion of synchrony responses by gender as a function of SOA (collapsed across congruency conditions). Here, negative SOAs indicate that the voice was leading the lip movements, and vice versa.

Supplementary Table 9: Statistics resulting from a repeated measures ANOVA on mean PSS with previous modality order as a within subjects factor and group, gender, and age as between subjects factors.

Within Subjects Effects

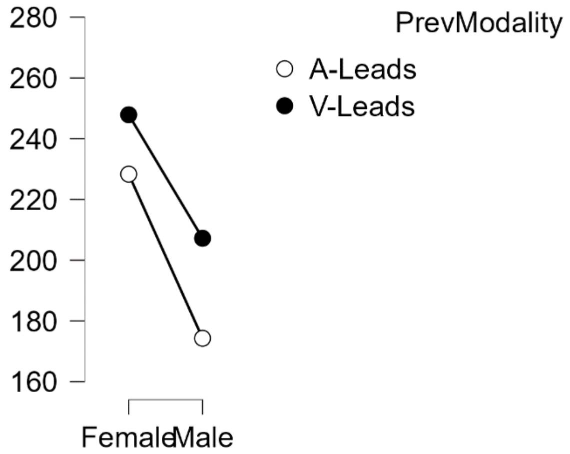
Cases	Sum of Squares	df	Mean Square	F	p
PrevModality	79777.756	1	79777.756	13.637	< .001
PrevModality ✻ group	13457.155	1	13457.155	2.300	0.130
PrevModality ✻ Age	15217.156	1	15217.156	2.601	0.107
PrevModality ✻ Gender	26890.104	1	26890.104	4.596	0.032
PrevModality ✻ group ✻ Gender	3798.055	1	3798.055	0.649	0.421
Residuals	$5.049\times10^{+6}$	863	5850.223		

Note. Type III Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
group	148543.596	1	148543.596	7.608	0.006
Age	$1.134\times10^{+6}$	1	$1.134\times10^{+6}$	58.082	< .001
Gender	875851.844	1	875851.844	44.857	< .001
group ✻ Gender	15541.138	1	15541.138	0.796	0.373
Residuals	$1.685\times10^{+7}$	863	19525.279		

Note. Type III Sum of Squares



Supplementary Figure 5: Mean point of subjective simultaneity according to previous modality order and gender.