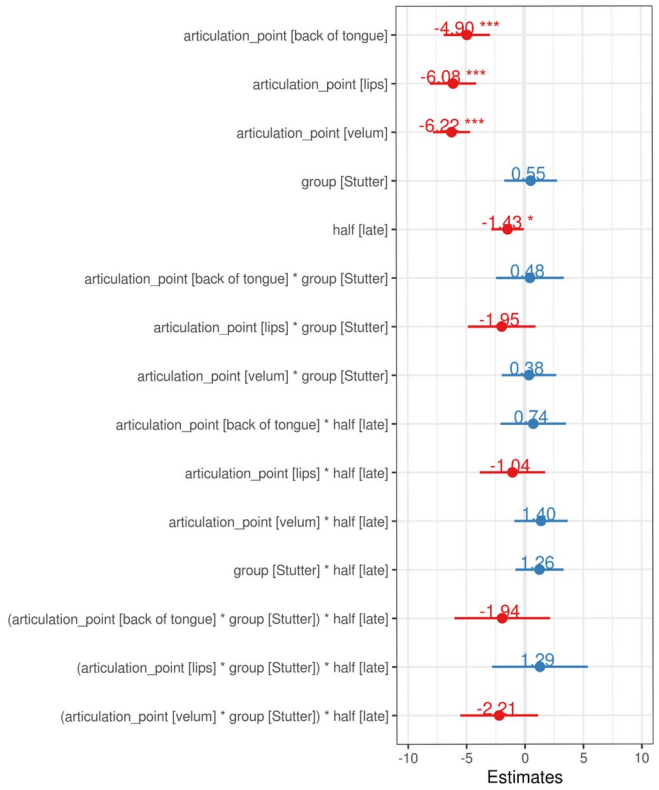
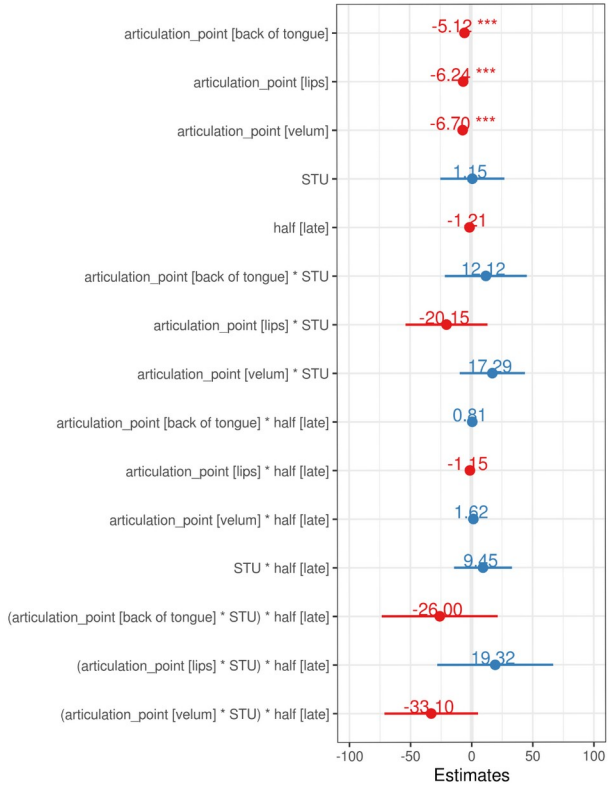
Supplementary table 1



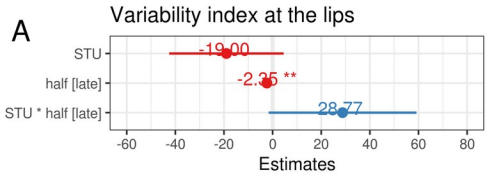
term	estimate	ci	p.value
articulation_point [back of tongue]	-4.90	[-6.88; -2.92]	< 0.001 ***
articulation_point [lips]	-6.08	[-8.06; -4.10]	< 0.001 ***
articulation_point [velum]	-6.22	[-7.81; -4.62]	< 0.001 ***
group [Stutter]	0.55	[-1.71; 2.81]	0.633
half [late]	-1.43	[-2.83; -0.03]	0.045 *
articulation_point [back of tongue] * group [Stutter]	0.48	[-2.42; 3.38]	0.748
articulation_point [lips] * group [Stutter]	-1.95	[-4.85; 0.95]	0.189
articulation_point [velum] * group [Stutter]	0.38	[-1.95; 2.72]	0.747
articulation_point [back of tongue] * half [late]	0.74	[-2.06; 3.54]	0.603
articulation_point [lips] * half [late]	-1.04	[-3.84; 1.76]	0.465
articulation_point [velum] * half [late]	1.40	[-0.88; 3.68]	0.229
group [Stutter] * half [late]	1.26	[-0.81; 3.33]	0.233
(articulation_point [back of tongue] * group [Stutter]) * half [late]	-1.94	[-6.04; 2.16]	0.355
(articulation_point [lips] * group [Stutter]) * half [late]	1.29	[-2.81; 5.39]	0.539
(articulation_point [velum] * group [Stutter]) * half [late]	-2.21	[-5.54; 1.12]	0.194

Supplementary table 2



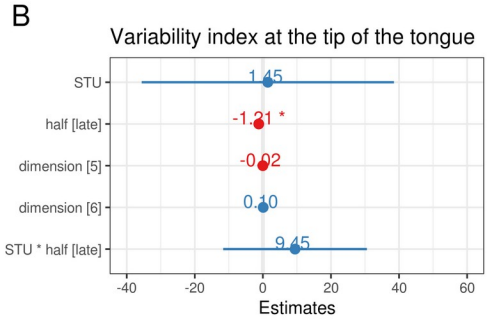
term	estimate	ci	p.value
articulation_point [back of tongue]	-5.12	[-7.03; -3.22]	< 0.001 ***
articulation_point [lips]	-6.24	[-8.15; -4.34]	< 0.001 ***
articulation_point [velum]	-6.70	[-8.24; -5.15]	< 0.001 ***
STU	1.15	[-25.10; 27.41]	0.931
half [late]	-1.21	[-2.56; 0.15]	0.080
articulation_point [back of tongue] * STU	12.12	[-21.44; 45.67]	0.479
articulation_point [lips] * STU	-20.15	[-53.71; 13.40]	0.239
articulation_point [velum] * STU	17.29	[-9.41; 44.00]	0.204
articulation_point [back of tongue] * half [late]	0.81	[-1.88; 3.51]	0.554
articulation_point [lips] * half [late]	-1.15	[-3.85; 1.55]	0.405
articulation_point [velum] * half [late]	1.62	[-0.57; 3.82]	0.147
STU * half [late]	9.45	[-14.29; 33.19]	0.435
(articulation_point [back of tongue] * STU) * half [late]	-26.00	[-73.45; 21.45]	0.283
(articulation_point [lips] * STU) * half [late]	19.32	[-28.13; 66.77]	0.425
(articulation_point [velum] * STU) * half [late]	-33.10	[-71.39; 5.18]	0.090

A



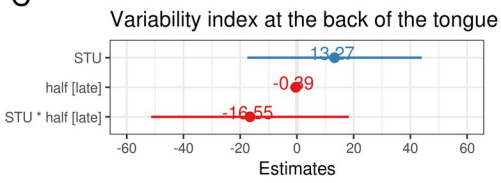
term	estimate	ci	p.value	
STU	-19.0	[-42.5; 4.54]	0.114	
half [late]	-2.4	[-4.1; -0.63]	0.008	**
STU * half [late]	28.8	[-1.6; 59.17]	0.064	

B



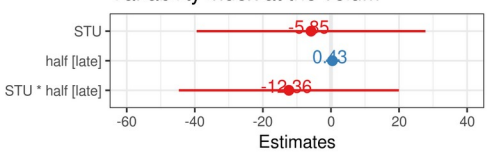
term	estimate	ci	p.value	
STU	1.45	[-35.6; 38.5]	0.939	
half [late]	-1.21	[-2.4; 0.0]	0.049	*
dimension [5]	-0.02	[-1.1; 1.1]	0.975	
dimension [6]	0.10	[-1.0; 1.2]	0.868	
STU * half [late]	9.45	[-11.7; 30.6]	0.380	

C



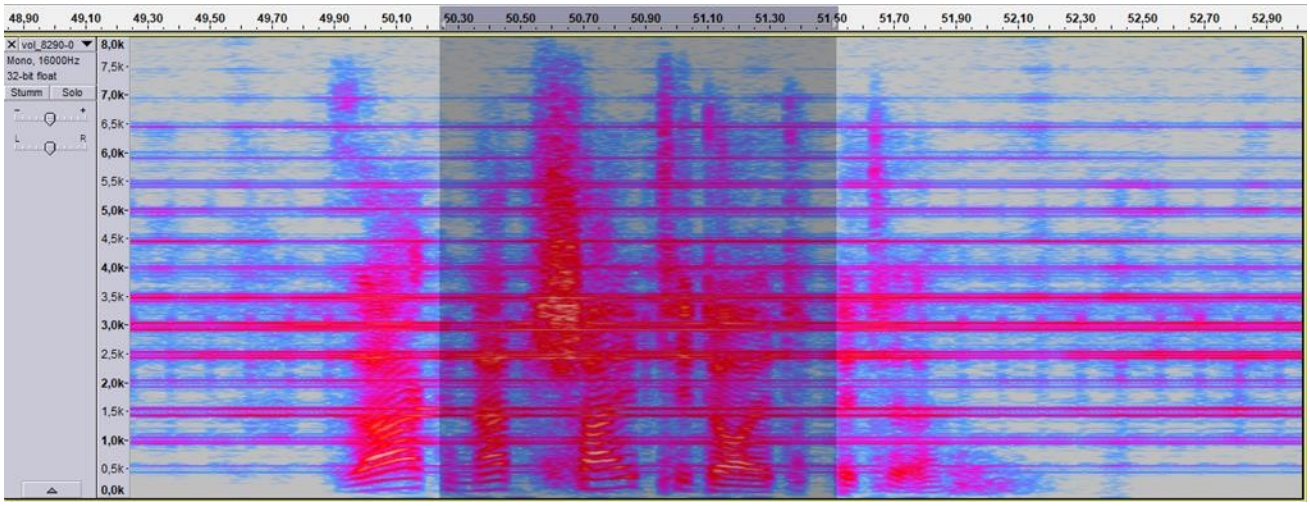
term	estimate	ci	p.value
STU	13.27	[-17.5; 44.0]	0.398
half [late]	-0.39	[-2.4; 1.6]	0.699
STU * half [late]	-16.55	[-51.4; 18.3]	0.352

D

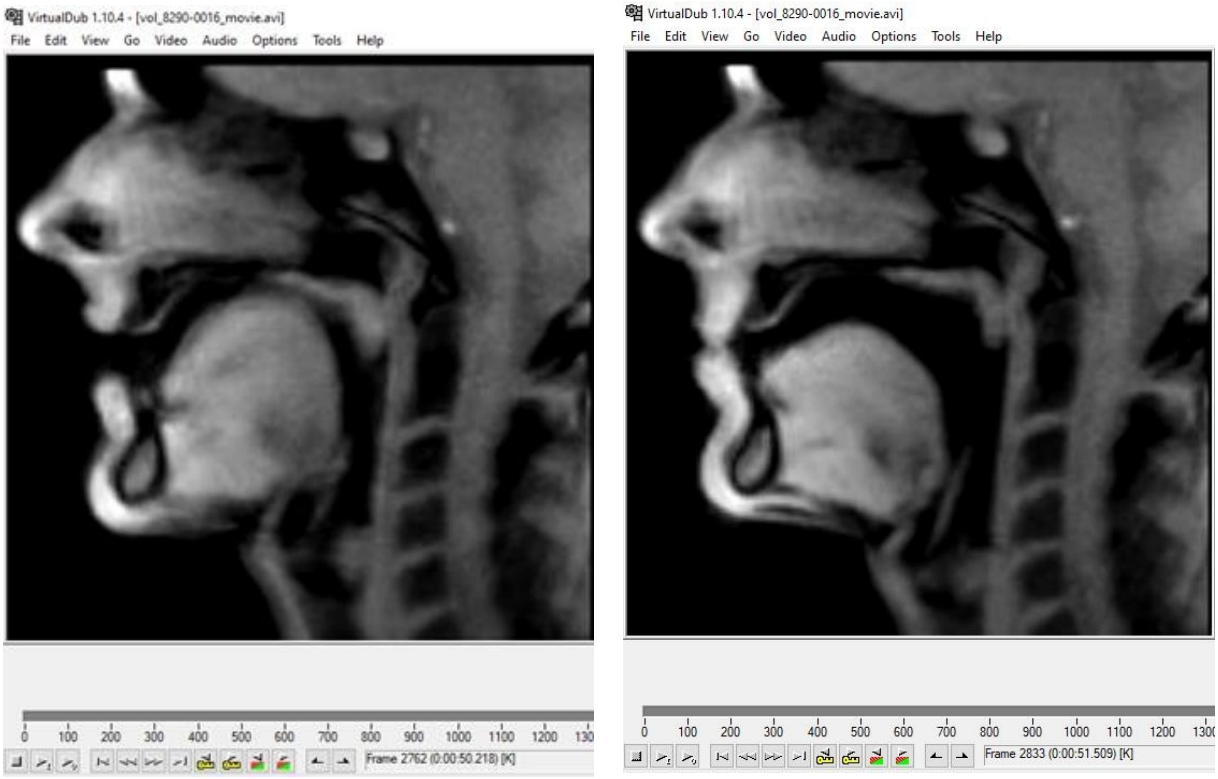


term	estimate	ci	p.value
STU	-5.85	[-39.5; 27.8]	0.733
half [late]	0.43	[-1.4; 2.3]	0.653
STU * half [late]	-12.36	[-44.7; 20.0]	0.454

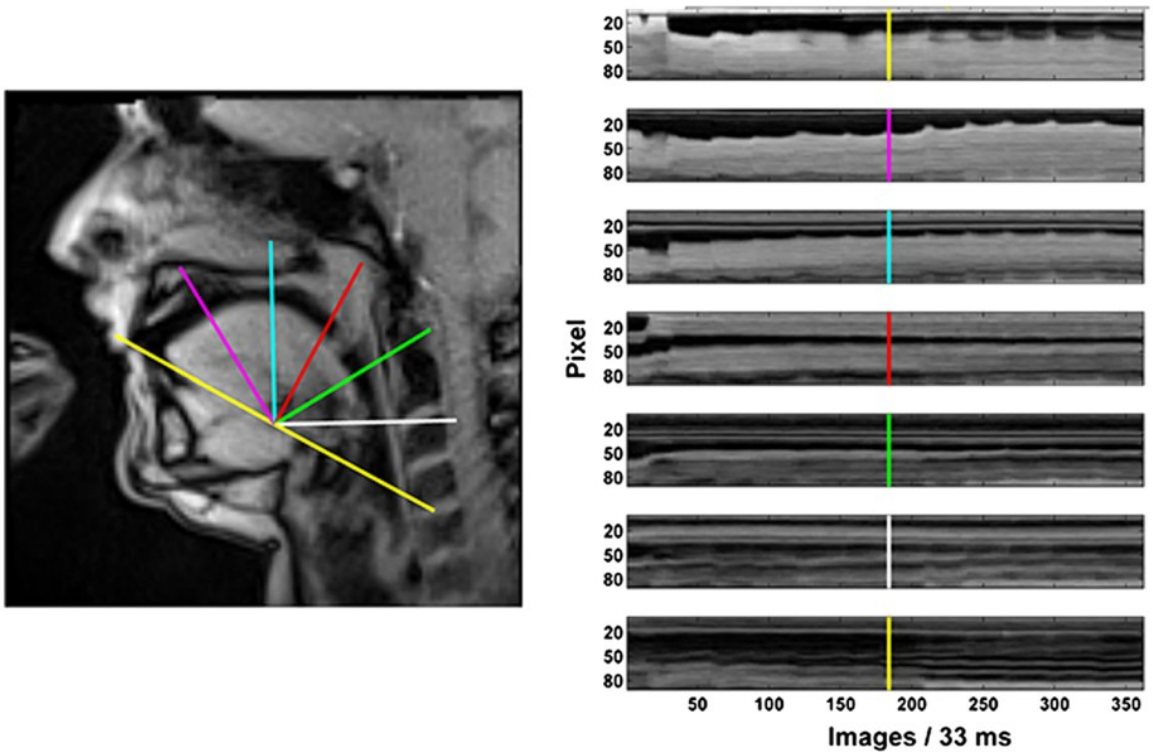
Supplementary table 3



Supplementary figure 1

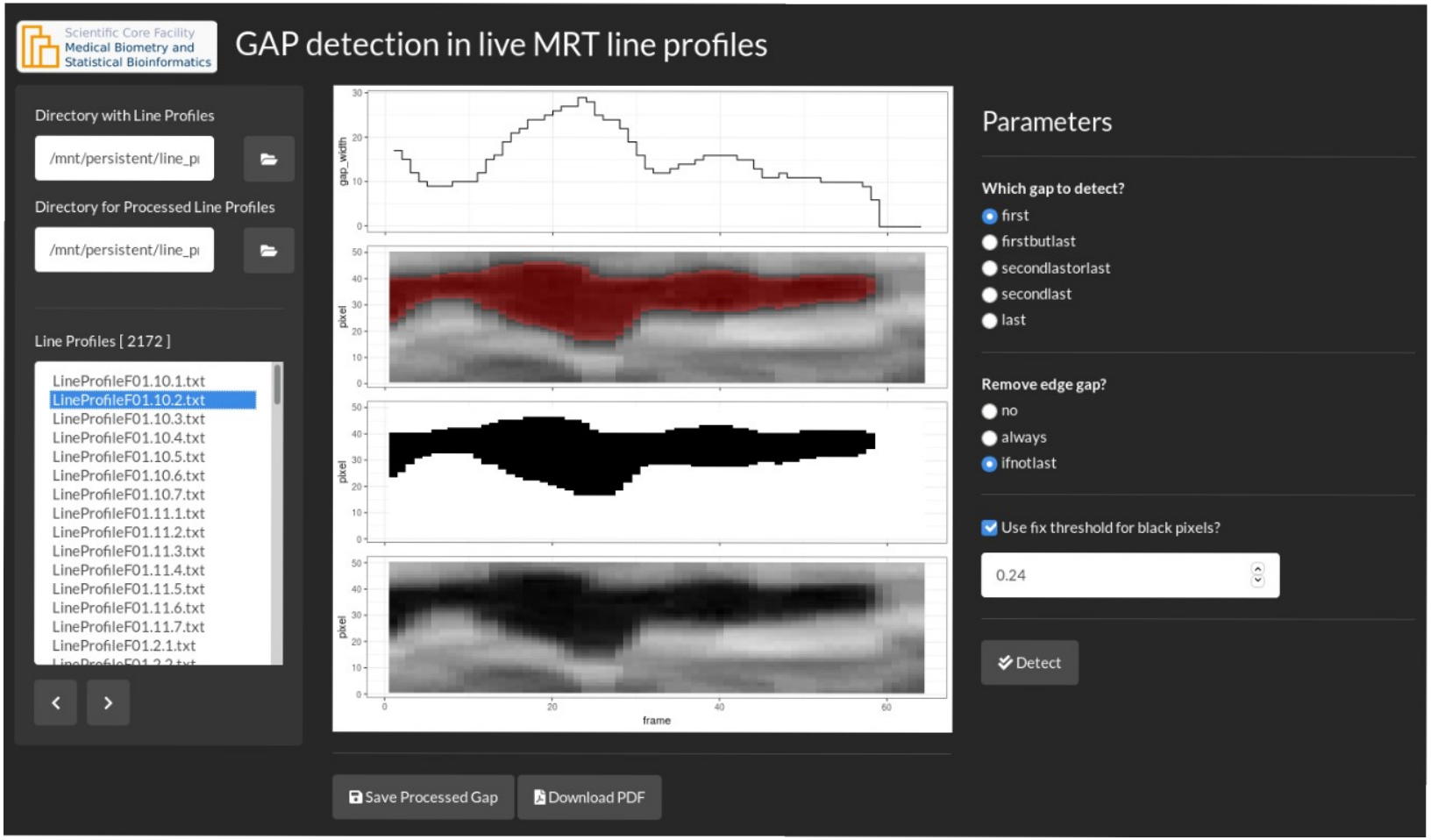


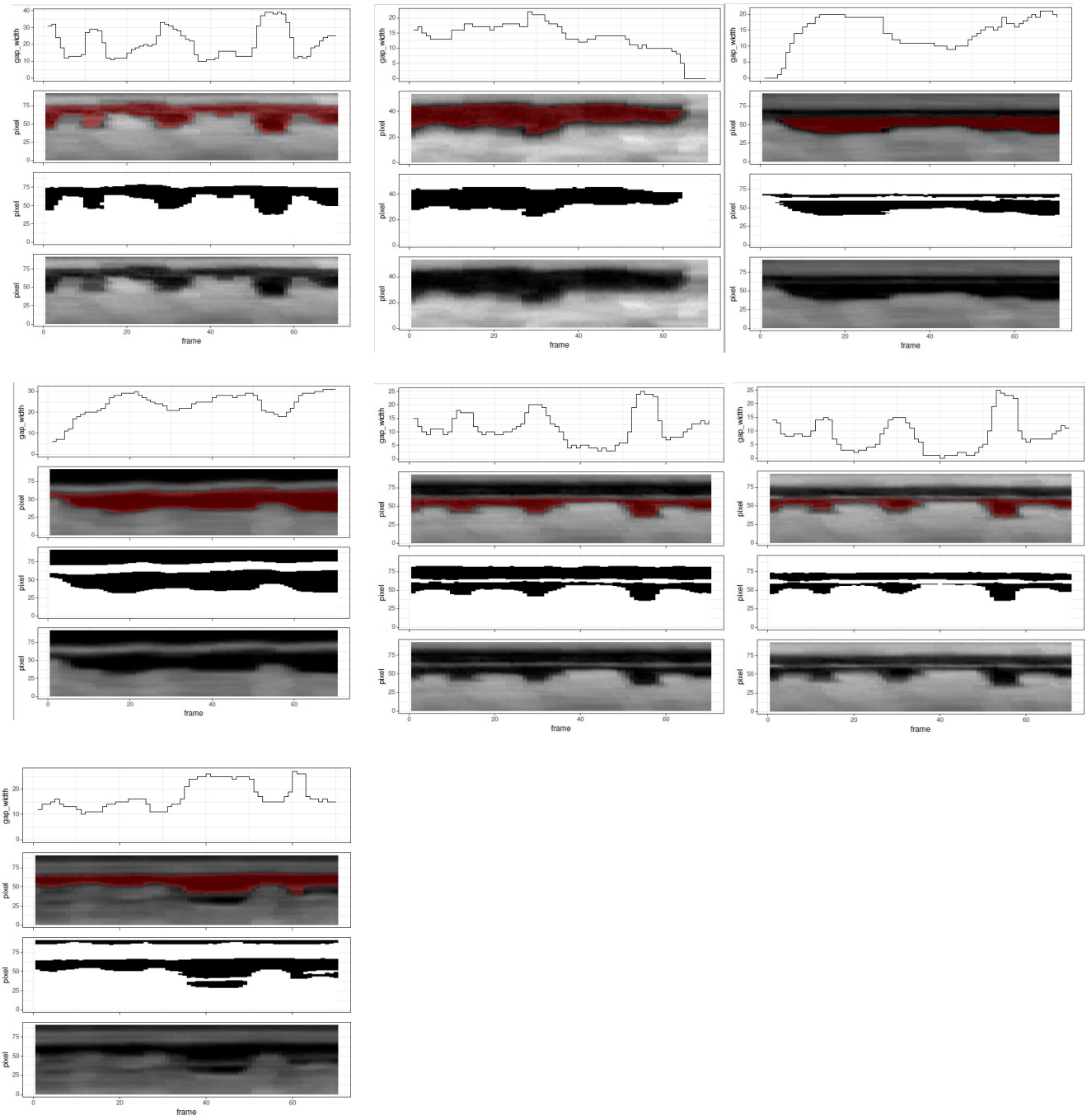
Supplementary figure 2



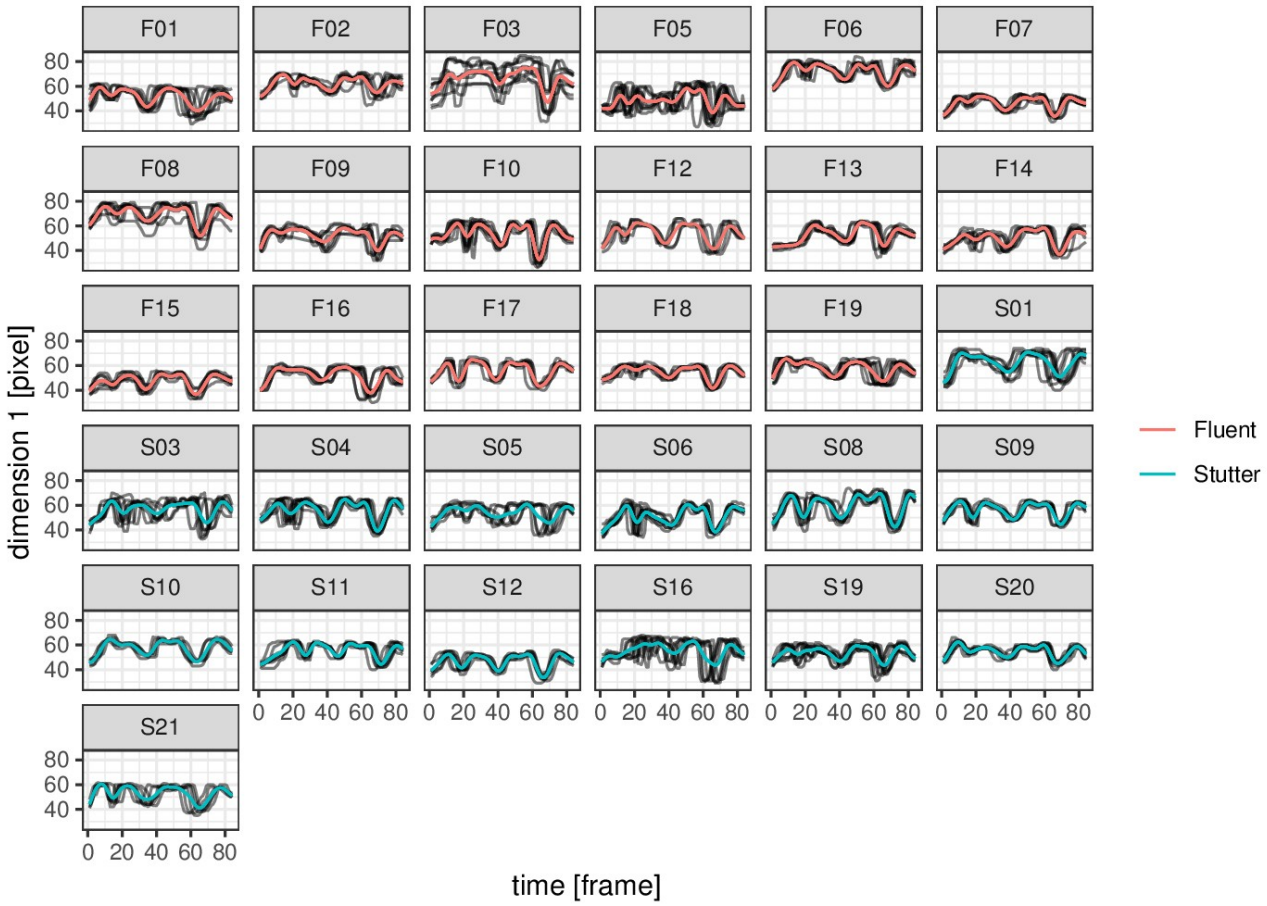
Supplementary figure 3

Supplementary figure 4

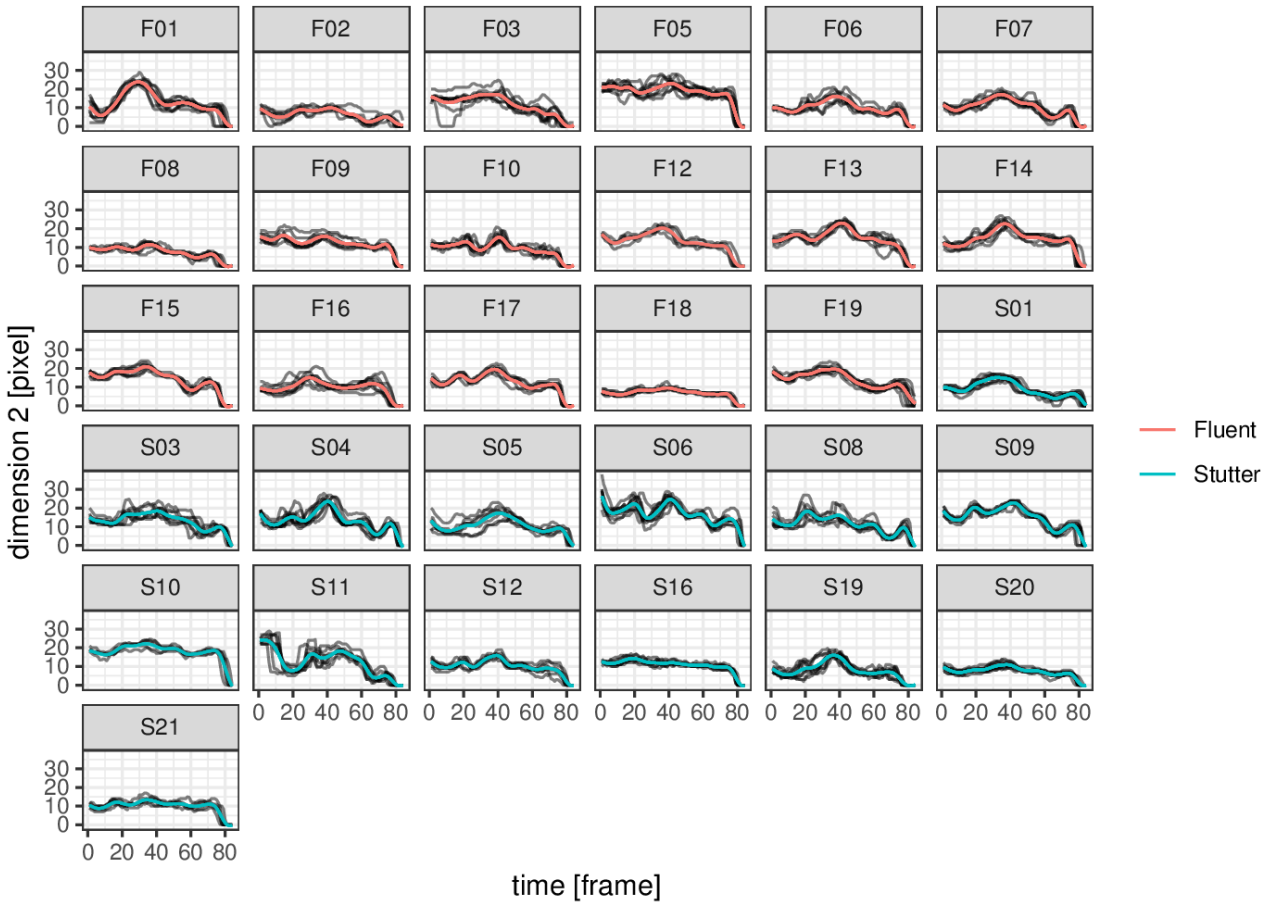




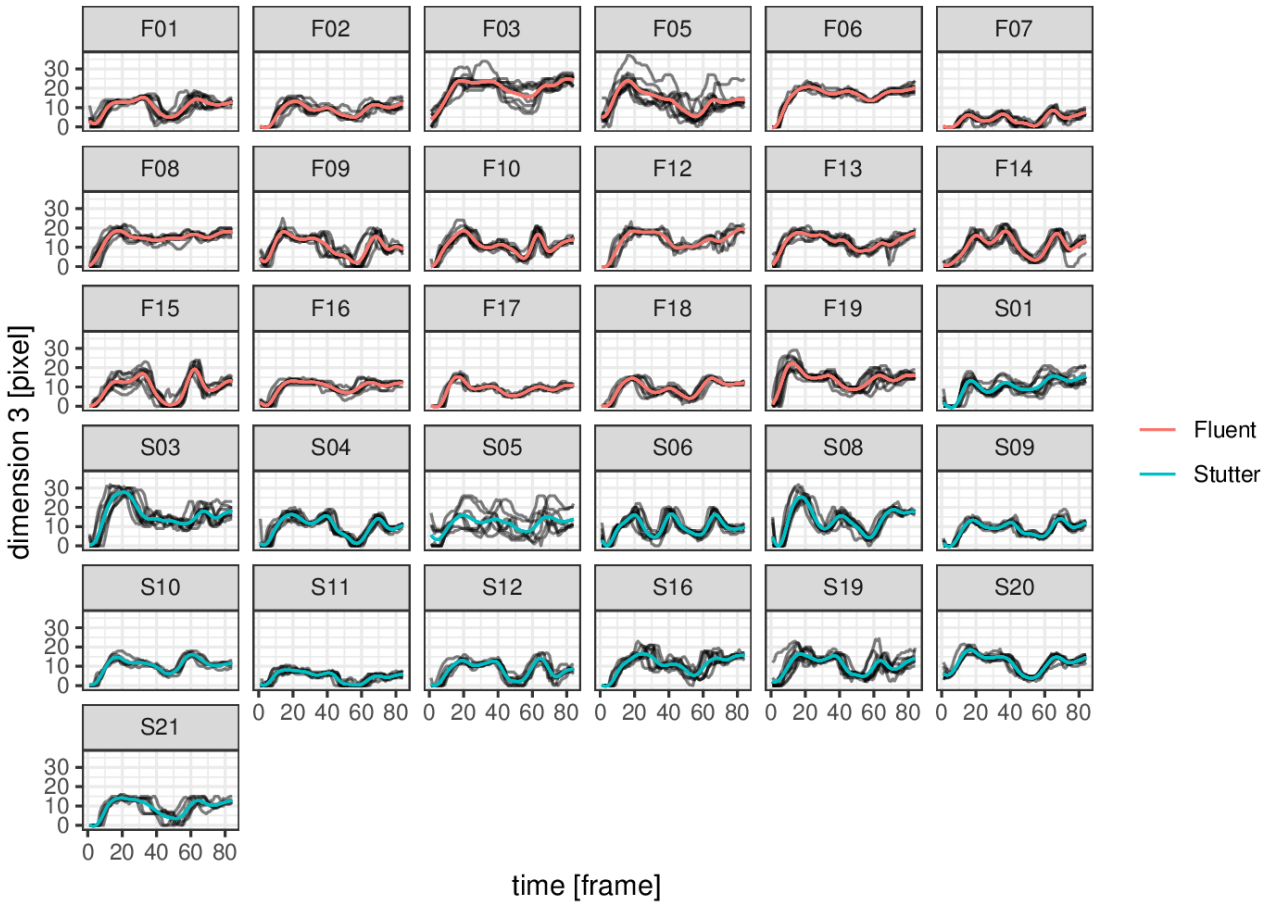
Supplementary figure 5



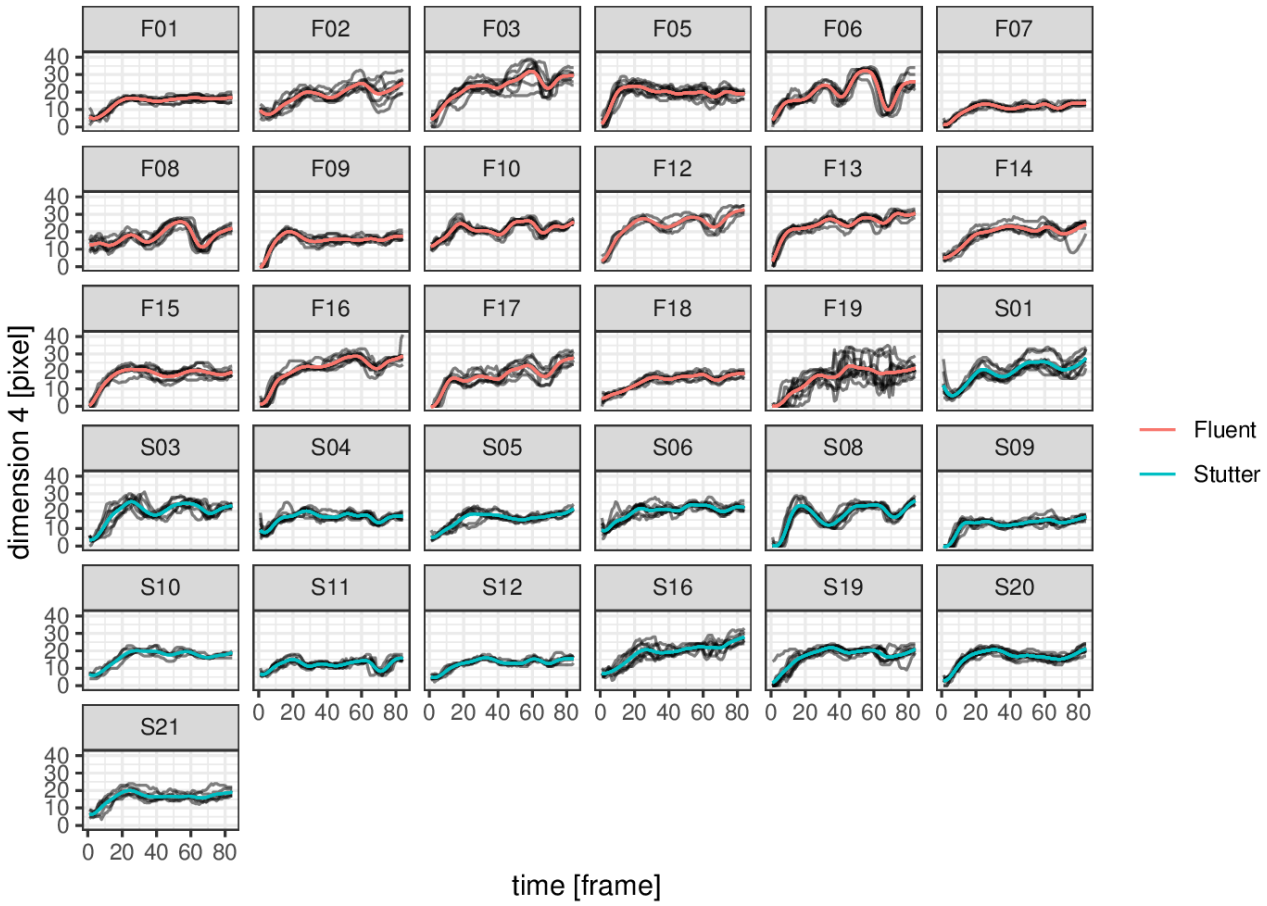
Supplementary figure 6



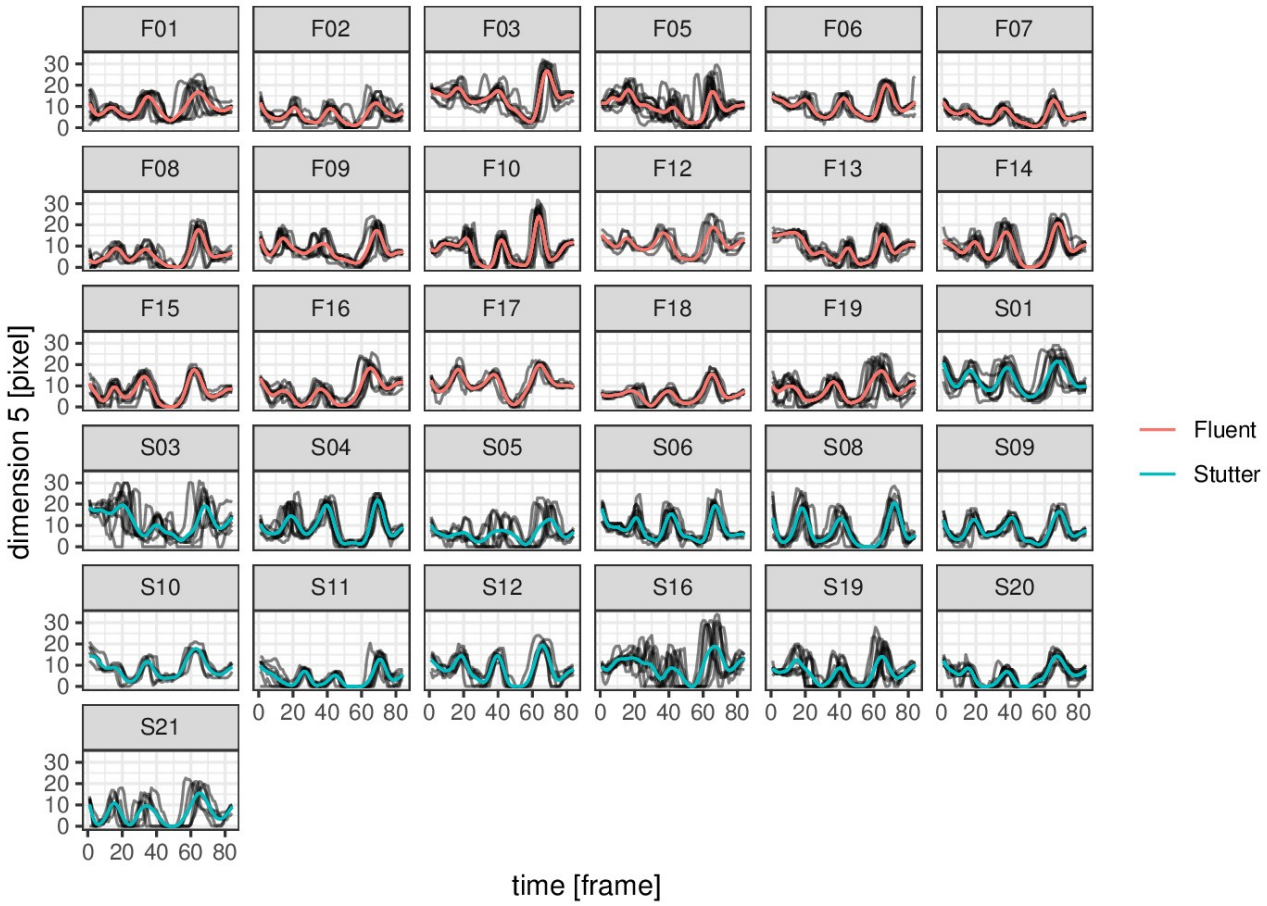
Supplementary figure 7



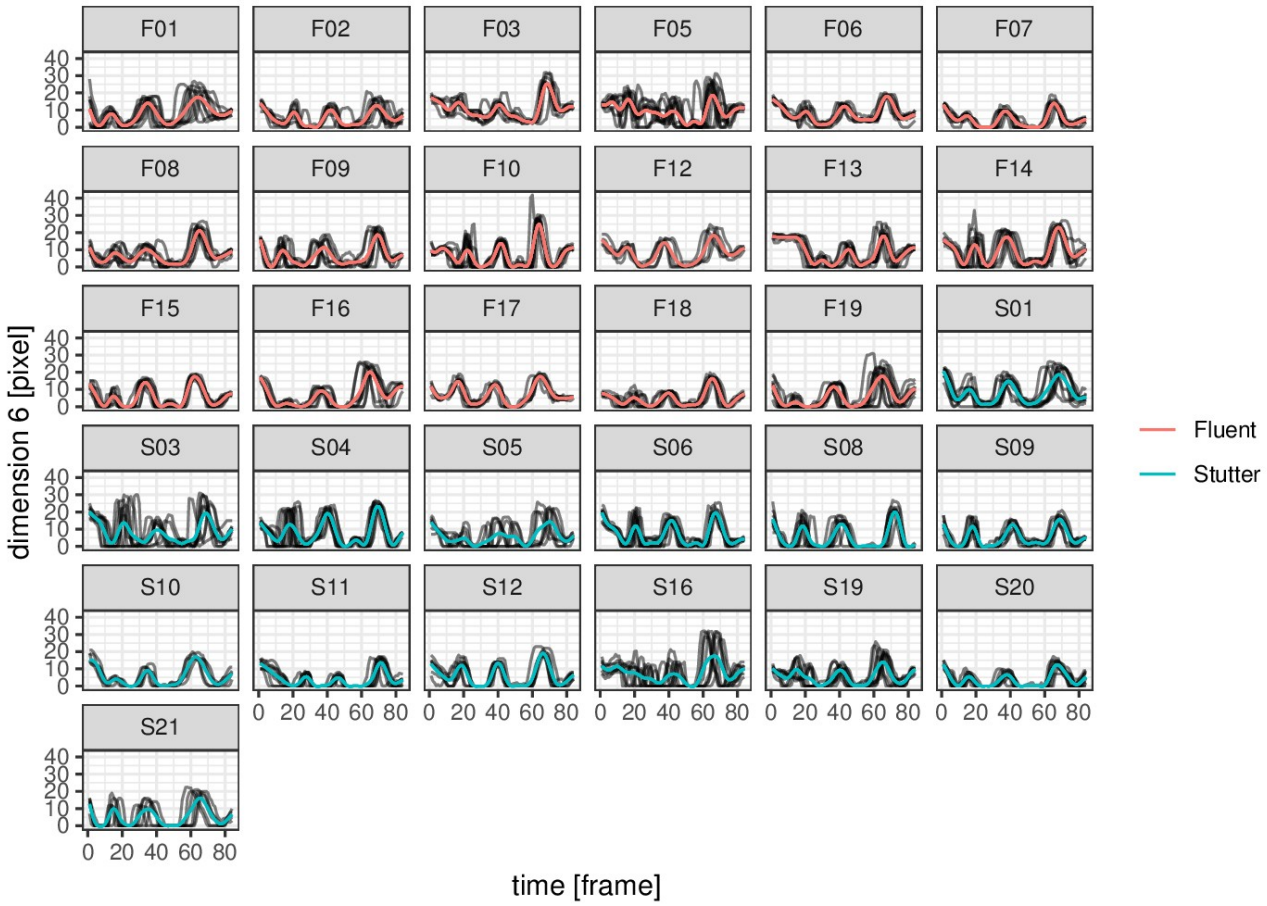
Supplementary figure 8



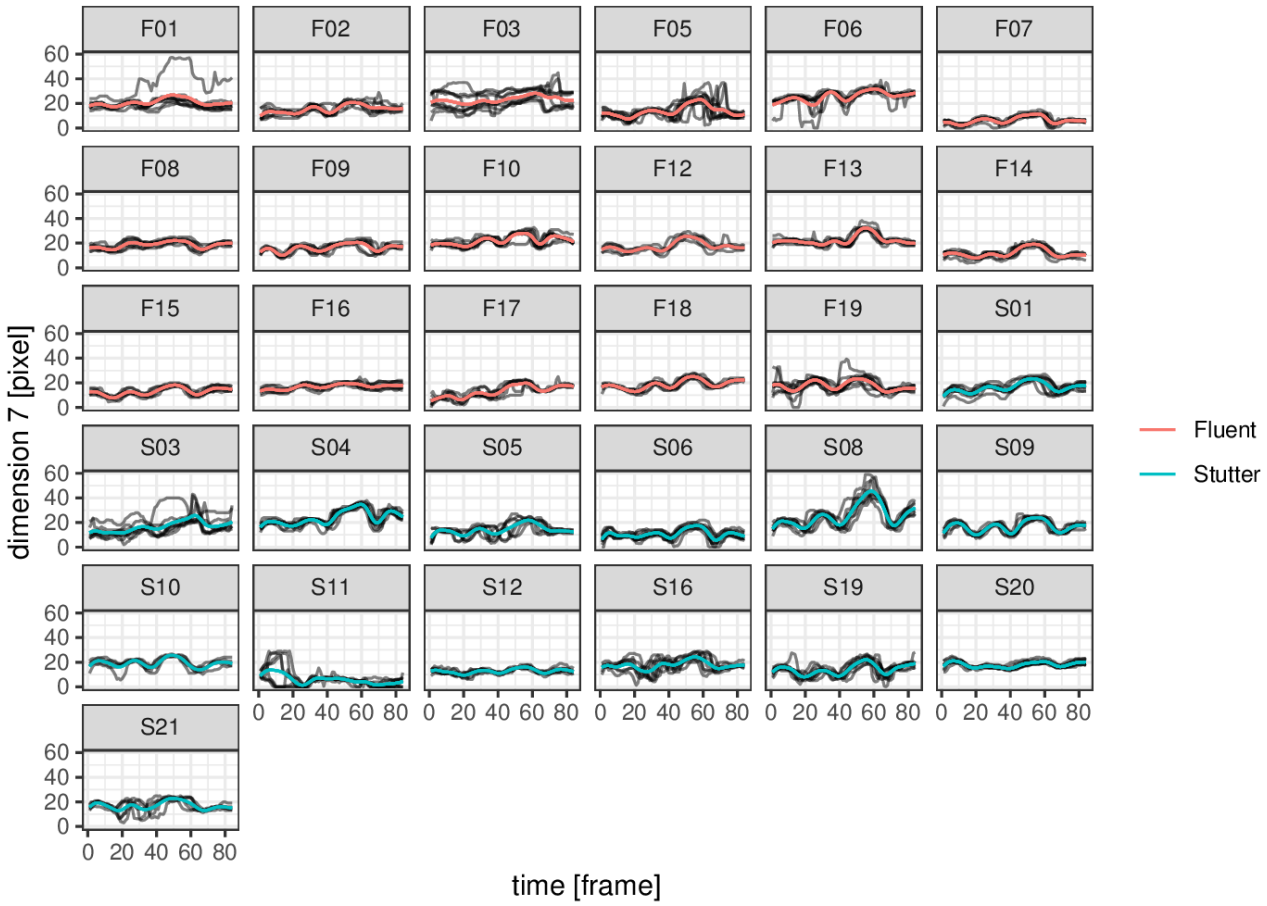
Supplementary figure 9



Supplementary figure 10



Supplementary figure 11



Supplementary figure 12

Dimension 1

Constant coefficients:

term	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	56.0	0.45	123.0	< 0.001

Smooth terms & functional coefficients:

term	edf	Ref.df	F	p-value
Intercept(yindex)	17.0	19.0	12.01	< 0.001
group(yindex)	1.0	1.0	0.71	0.399
s(proband)	628.0	773.0	55.17	< 0.001

Dimension 2

Constant coefficients:

term	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	12.0	0.29	40.0	< 0.001

Smooth terms & functional coefficients:

term	edf	Ref.df	F	p-value
Intercept(yindex)	17.0	19.0	15.1	< 0.001
group(yindex)	19.0	20.0	3.8	< 0.001
s(proband)	534.0	773.0	80.8	< 0.001

Dimension 3

Constant coefficients:

term	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	11.0	0.29	38.0	< 0.001

Smooth terms & functional coefficients:

term	edf	Ref.df	F	p-value
Intercept(yindex)	17.3	19.0	21.65	< 0.001
group(yindex)	1.8	1.9	0.43	0.585
s(proband)	551.8	773.0	58.84	< 0.001

Dimension 4

Constant coefficients:

term	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	17.0	0.32	54.0	< 0.001

Smooth terms & functional coefficients:

term	edf	Ref.df	F	p-value
Intercept(yindex)	17.0	19.0	17.0	< 0.001
group(yindex)	1.0	1.0	6.0	0.014
s(proband)	506.0	773.0	63.0	< 0.001

Dimension 5

Constant coefficients:

term	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	8.30	0.23	37.0	< 0.001

Smooth terms & functional coefficients:

term	edf	Ref.df	F	p-value
Intercept(yindex)	17.2	19.0	18.3	< 0.001
group(yindex)	1.1	1.1	1.9	0.180
s(proband)	622.5	773.0	29.6	< 0.001

Dimension 6

Constant coefficients:

term	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	6.50	0.21	31.0	< 0.001

Smooth terms & functional coefficients:

term	edf	Ref.df	F	p-value
Intercept(yindex)	17.0	19.0	23.6	< 0.001
group(yindex)	1.0	1.0	2.8	0.095
s(proband)	644.0	773.0	22.6	< 0.001

Dimension 7

Constant coefficients:

term	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	17.0	0.44	39.0	< 0.001

Smooth terms & functional coefficients:

Supplementary table 4