Supplemental Materials

Table S1 Summary values peaks gesture kinematics

	Velocity z (pos. peaks) *M* (*SD*)	**Velocity z (neg. peaks)** *M* (*SD*)	**Speed** *M* (*SD*)	***Acceleration (positive peaks)*** *M* (*SD*)	***Acceleration (neg. peaks)*** *M* (*SD*)
Overall	7.60 cm/s (*8.80*)	-7.40 cm/s (8.39)	25.78 cm/s (14.20)	0.46 cm/s^2 (0.44)	-0.43 cm/s^2 (0.41)
Low peaks 0-33% quantile	1.56 cm/s (1.15)	-1.52 cm/s (1.13)	14.11 cm/s (4.39)	0.11 cm/s^2 0.07	-0.10 cm/s^2 0.07
Middle peaks 33-66% quantile	5.46 cm/s (2.24)	-5.22 cm/s (2.38)	23.45 cm/s (5.92)	0.36 cm/s^2 (0.12)	-0.34 cm/s^2 (0.12)
High peaks 66-100% quantile	16.18 cm/s (10.76)	-15.61 cm/s (9.82)	40.04 cm/s (14.41)	0.91 cm/s^2 (0.48)	-0.85 cm/s^2 (0.44)

Table S2. Summary vocal acoustics during and without gesturing

	Performer 1 ***female*** ***M* (*SD*)**	**Performer 2** ***female*** ***M* (*SD*)**	**Performer 3** ***male*** ***M* (*SD*)**	***Performer 4*** ***male*** ***M* (*SD*)**	***Overall*** ***M* (*SD*)**
F0 (Hz)					
During gesture	296.41(82.24)	312.40 (85.30)	201.50(57.21)	207.94 (54.51)	239.88 (83.02)
No gesture	308.22 (82.30)	298.45 (80.02)	211.23(60.52)	184.89 (48.81)	245.87(83.36)
|ΔF0| (Hz/s)					
During gesture	228.71 (289.76)	316.86 (410.85)	142.15 204.62)	146.81 (203.16)	192.60 (282.14)
No gesture	241.17 (309.80)	232.815 297.56)	134.72 (199.25)	77.43(134.49)	172.00 (249.50)
ENV (a.u)					
During gesture	0.212 (0.148)	0.218 (0.147)	0.178 (0.118)	0.148 (0.128)	0.182 (0.135)
No gesture	0.179 (0.160)	0.131 (0.162)	0.134 (0.144)	0.049 (0.087)	0.139 (0.150)
|ΔENV| (a.u./s)					
During gesture	0.593 (0.834)	0.786 (1.085)	0.478 (0.781)	0.506 (0.815)	0.568 (0.866)
No gesture	0.545 (0.850)	0.596 (1.194)	0.388 (0.781)	0.227 (0.676)	0.440 (0.856)

Note. The amplitude envelope is rescaled from 0 to 1 so these are arbitrary units (a.u.) and are not directly comparable between performers.

Table S3. Generalized additive modeling coefficients

Models	Parametric effects Peak magnitude	Parametric effects *p*-val	Smooth Components	F [edf, ref.df]	*p*-val	Deviance explained
|ΔENV| ~ velocity z (positive peaks)	Low vs. High: -0.00017 Middle vs. High: -0.00010	<.001 <.001	Recentered time:low Recentered time: middle Recentered time: high random(Perform., Raga)	26.8 [8.57, 8.95] 79.3 [8.72, 8.98] 103.6 [8.95, 8.98] 1379.4 [27.98, 28.00]	< .001 < .001 < .001 < .001	6.08%
|ΔENV| ~ velocity z (negative peaks)	Low vs. High: -0.00016 Middle vs. High: -0.00006	<.001 <.001	Recentered time: low Recentered time: middle Recentered time: high random(Perform., Raga)	35.7 [6.79, 9.00] 18.2 [8.44, 8.91] 41.3 [8.91, 8.99] 1135.8 [27.98. 28.00]	< .001 < .001 < .001 < .001	4.38%
|ΔENV| ~ speed (positive peaks)	Low vs. High: -0.00047 Middle vs. High: -0.00009	<.001 <.001	Recentered time: low Recentered time: middle Recentered time: high random(Perform., Raga)	129.9 [7.92, 8.69] 142.9 [8.27, 8.85] 145.0 [7.92, 8.69] 1139.6 [27.98, 28.00]	< .001 < .001 < .001 < .001	5.31%
|ΔENV| ~ acceleration (positive peaks)	Low vs. High: -0.00038 Middle vs. High: -0.00007	<.001 <.001	Recentered time: low Recentered time: middle Recentered time: high random(Perform., Raga)	93.58 [8.88, 8.99] 278.74 8.77, 9.00] 544.94 [8.77, 8.99] 1420.5 [27.98, 28.00]	< .001 < .001 < .001 < .001	5.29%
|ΔENV| ~ acceleration (negative peaks)	Low vs. High: -0.00015 Middle vs. High: -0.00007	<.001 <.001	Recentered time: low Recentered time: middle Recentered time: high random(Perform., Raga)	44.38 [7.47, 8.42] 271.8 [7.74, 8.61] 274.8 [8.85, 8.99] 1372.9 [27.98, 28.00]	< .001 < .001 < .001 < .001	5.43%

Table S4. Performance ML classifier raga

Seed init.	Accuracy	Accuracy 95%CI[lower, upper]	Kappa	*p*-value Accuracy
1	15.38%	[1.92%, 45.45%]	.006	.617
2	23.08%	[0.50%, 53.81%]	.115	.323
3	15.39%	[0.19%, 45.45%]	.034	.617
Mean	17.95%	[2.96%, 48.24%]	.052	.519

GT CL	***Anandabhairavi***	***Atana***	***Bhairavi***	***Bilahari***	***Kalyani***	***Shankarabharanam***	***Todi***	***Varaali***
Anandabhairavi	***17%***	***50%***	***0***	***3/6***	***0***	***0***	***0***	***0***
Atana	***33%***	***17%***	***0***	***17%***	***0***	***0***	***33%***	***33%***
Bhairavi	***17%***	***0***	***33%***	***0***	***0***	***0***	***0***	***0***
Bilahari	***0***	***0***	***67%***	***0***	***17%***	***0***	***17%***	***33%***
Kalyani	***17%***	***0***	***0***	***17%***	***0***	***0***	***33%***	***0***
Shankarabharanam	***0***	***0***	***0***	***0***	***0***	***100%***	***17%***	***0***
Todi	***0***	***17%***	***0***	***17%***	***67%***	***0***	***0***	***0***
Varaali	***17%***	***17%***	***0***	***0***	***17%***	***0***	***0***	***33%***

Note. GT = ground truth, CL = classification. Given that the dataset has not many data points, random initialization of the testing and training set can yield different results. Therefore we repeat the procedure with different seed initializations to assess reproducibility within the dataset. GT = ground truth, CL = classification. The average accuracy performance was about 18% which is not statistically reliable against what could be expected from chance guessing.

Table S5. Performance ML classifier performer

Seed init.	Accuracy	Accuracy 95%CI[lower, upper]	Kappa	P-value Accuracy	**Combined classifications (CL) relative to ground truth (GT)**
1	64.29%	[35.14%, 87.24%]	.524	.006	
2	50.00%	[28.86%, 82.33%]	.429	.024	
3	35.71%	[12.75%, 64.49%]	.125	.369	
Mean	52.38%	[25.58%, 78.15%]	.359	.133	

GT CL	p1	p2	p3	p4
p1	**67%**	**0**	**0**	**17%**
p2	**22%**	**67%**	**8%**	**8%**
p3	**11%**	**0**	**75%**	**66%**
p4	**0**	**33%**	**17%**	**8%**

Note. GT = ground truth, CL = classification.The average accuracy performance was about 52% which was statistically different against chance guessing for two of the three attempts, but not statistically reliable on average. Thus while we should be careful in interpreting these performances, it is clear that performer rather than raga performance seems to capture more the variability in the data.