Posed and spontaneous nonverbal vocalizations of positive emotions: Acoustic analysis and perceptual judgments

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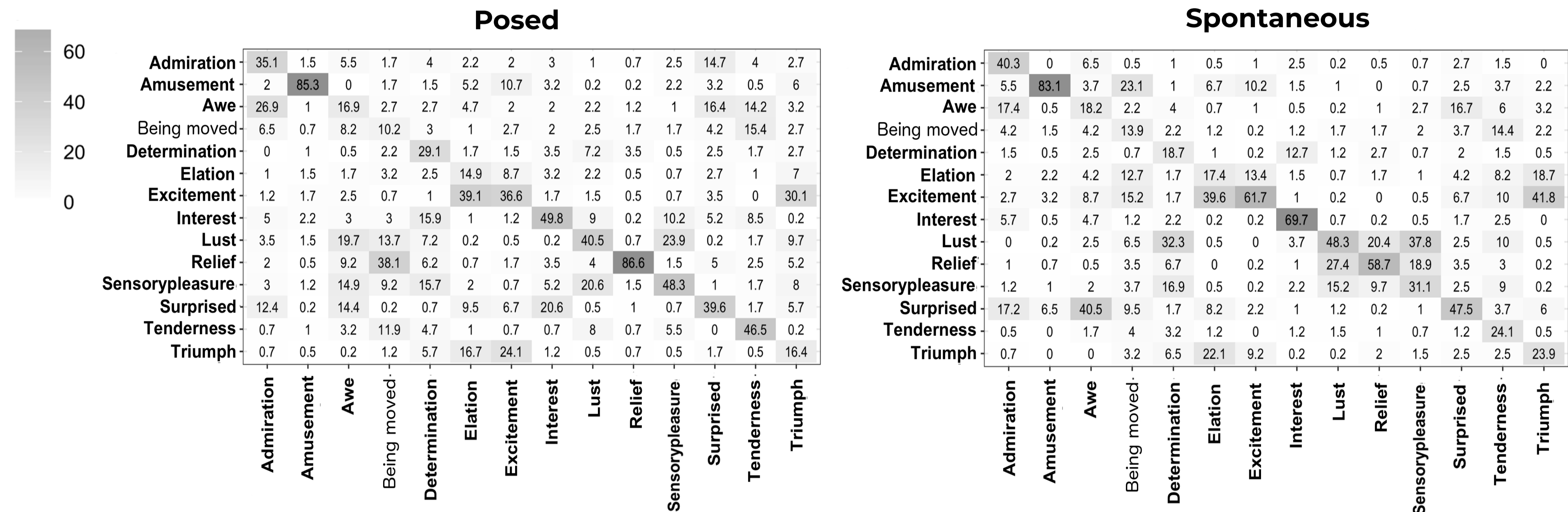
AIM

We aim to:

1. test whether listeners accurately map posed and spontaneous nonverbal vocalisations to 14 positive emotions

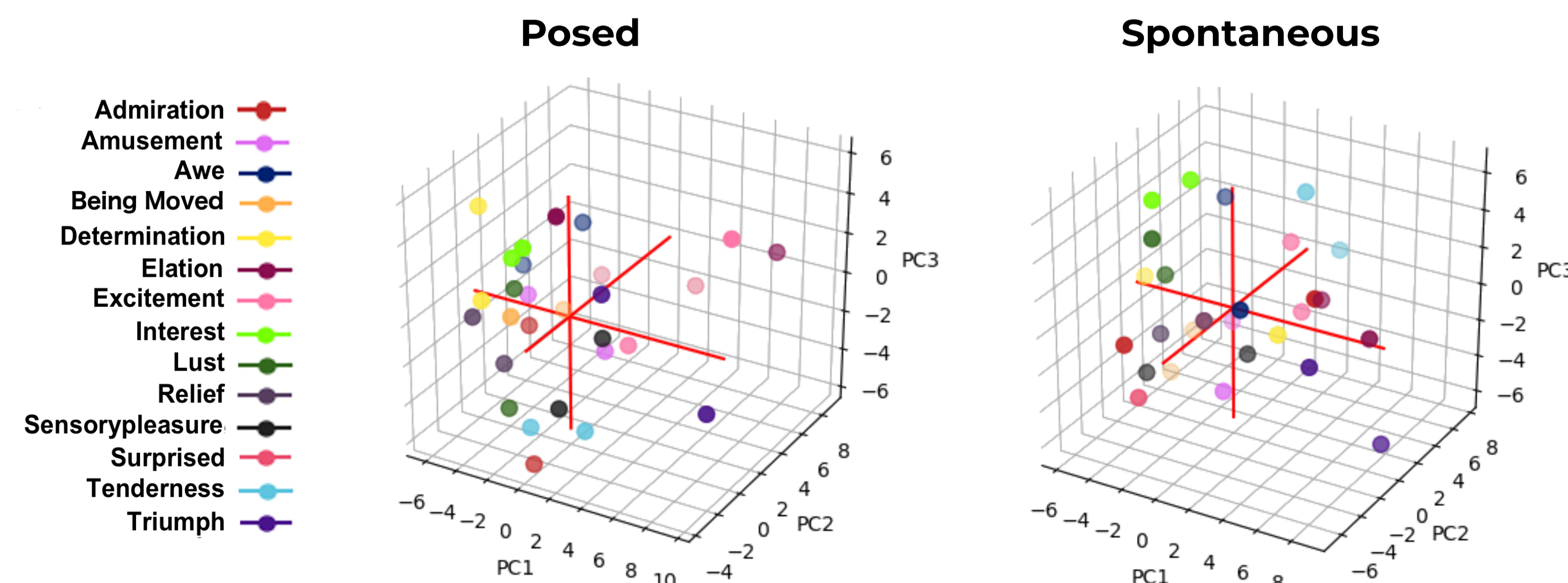2. examine acoustic features characterizing these vocalisations

METHODS

- 201 naïve listeners

- 28 posed and 28 spontaneous vocalisations of 14 positive emotions

- Forced-choice emotion categorization from 14 categories

- Extracting 88 acoustic features and performing Principal Component Analysis (PCA)

RESULTS

1. Human listeners recognized 13 of the 14 positive emotions significantly better than the chance level (random guessing) from both posed and spontaneous vocalisations. Confusion matrices showing percentages of responses per emotion category:

Posed

	Admiration	Amusement	Awe	Being moved	Determination	Elation	Excitement	Interest	Lust	Relief	Sensorypleasure	Surprised	Tenderness	Triumph
Admiration	35.1	1.5	5.5	1.7	4	2.2	2	3	1	0.7	2.5	14.7	4	2.7
Amusement	2	85.3	0	1.7	1.5	5.2	10.7	3.2	0.2	0.2	2.2	3.2	0.5	6
Awe	26.9	1	16.9	2.7	2.7	4.7	2	2	2.2	1.2	1	16.4	14.2	3.2
Being moved	6.5	0.7	8.2	10.2	3	1	2.7	2	2.5	1.7	1.7	4.2	15.4	2.7
Determination	0	1	0.5	2.2	29.1	1.7	1.5	3.5	7.2	3.5	0.5	2.5	1.7	2.7
Elation	1	1.5	1.7	3.2	2.5	14.9	8.7	3.2	2.2	0.5	0.7	2.7	1	7
Excitement	1.2	1.7	2.5	0.7	1	39.1	36.6	1.7	1.6	0.5	0.7	3.5	0	30.1
Interest	5	2.2	3	3	15.9	1	1.2	49.8	9	0.2	10.2	5.2	8.5	0.2
Lust	3.5	1.5	19.7	13.7	7.2	0.2	0.5	0.2	40.5	0.7	23.9	0.2	1.7	9.7
Relief	2	0.5	9.2	38.1	6.2	0.7	1.7	3.5	4	86.6	1.5	5	2.5	5.2
Sensorypleasure	3	1.2	14.9	9.2	15.7	2	0.7	2	20.6	1.5	48.3	1	1.7	8
Surprised	12.4	0.2	14.4	2.2	0.7	9.5	6.7	20.6	0.5	1	0.7	39.6	1.7	5.7
Tenderness	0.7	1	3.2	11.9	4.7	1	0.7	0.8	0.7	5.5	0	0	46.5	0.2
Triumph	0.7	0.5	0.2	1.2	5.7	16.7	24.1	1.2	0.5	0.7	0.5	1.7	0.5	16.4

Spontaneous

	Admiration	Amusement	Awe	Being moved	Determination	Elation	Excitement	Interest	Lust	Relief	Sensorypleasure	Surprised	Tenderness	Triumph
Admiration	40.3	0	6.5	0.5	1	0.5	1	2.5	0.2	0.5	0.7	2.7	1.5	0
Amusement	5.5	83.1	3.7	23.1	1	6.7	10.2	1.5	1	0	0.7	2.5	3.7	2.2
Awe	17.4	0.5	18.2	2.2	4	0.7	1	0.5	0.2	1	2.7	16.7	6	3.2
Being moved	4.2	1.5	4.2	13.9	2.2	1.2	0.2	1.2	1.7	1.7	0.2	3.7	14.4	2.2
Determination	1.5	0.5	2.5	0.7	18.7	1	0.2	12.7	1.2	2.7	0.7	2	1.5	0.5
Elation	2	2.2	4.2	12.7	1.7	17.4	13.4	1.5	0.7	1.7	1	4.2	8.2	18.7
Excitement	2.7	3.2	8.7	15.2	1.7	39.6	61.7	1	0.2	0	0.5	6.7	10	41.8
Interest	5.7	4.7	1.2	2.2	0.2	1.2	0.2	69.7	0.7	0.2	0.5	1.7	2	0
Lust	0	0.2	2.5	6.5	32.3	0.5	0	3.7	48.3	20.4	37.8	2.5	10	0.5
Relief	1	0.7	0.5	3.5	6.7	0	0.2	1	27.4	58.7	18.9	3.5	3	0.2
Sensorypleasure	1.2	1	2	3.7	16.9	0	0.2	2.2	15.2	9.7	31.1	2.5	9	0.2
Surprised	17.2	6.5	40.5	9.5	1.7	8.2	2.2	1	1.2	0.2	1	47.5	3.7	6
Tenderness	0.5	0	1.7	4	3.2	1.2	0	1.2	1.5	1	0.7	1.2	24.1	0.5
Triumph	0.7	0	0	3.2	6.5	22.1	9.2	0.2	0.2	2	1.5	2.5	2.5	23.9

2. Based on PCA on 88 acoustic features, cues with highest loadings were retained:

Human listeners are accurate at recognizing many positive emotions from both posed and spontaneous nonverbal vocalisations.

Some emotions that are frequently confused by listeners have similar acoustic profiles.

Vocalisations of 14 positive emotions for posed expressions are available from https://emotionwaves.github.io/posed14/, and spontaneous expressions from https://emotionwaves.github.io/spontaneous14.