Supplemental Information

Male African elephants discriminate and prefer vocalizations of unfamiliar females

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1) **Additional Information on playback equipment**
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1) Playback equipment: additional specifications

The playback equipment was custom built. Technical specifications:
Nominal impedance: 4 Ohm
Frequency range: 10 Hz to 200 Hz
200 Hz to ca. 3000 Hz with reduced accuracy and increased beaming on axis
Maximum sound pressure level: 110 db SPL from 10 Hz to 200 Hz at the recommended maximum input power of 400 W
Recommended maximum power: 400 W (40 V)
Absolute maximum power, not recommended for operation: 2000 W (89 V)
Outer dimensions – 1180 mm width x 1730 mm length x 980 mm height
Weight approximately 300 kg

Supplemental Figure S1. Photographs of our subwoofer on the vehicle at the Addo Elephant National Park. In order to minimize noises due to low-frequency vibrations during playback, we use isolating, sound-proofing material (such as anti-vibration rubber mats).

2) Propagation experiments

In order to verify the quality of the playback stimuli, we conducted propagation experiments outside the range of hearing of the elephants. We played back 4 familiar and 6 unfamiliar stimuli (N_{calls} = 10) at distances of 25, 50 and 100 m to control fidelity of sound reproduction.

Environmental conditions during propagation experiments:

At 25 m distance:

Temp °C	18.0
Humidity %	55
Speed m/s	< 1.2

At 50 m distance:

Temp °C	20.4
Humidity %	55.5
Speed m/s	< 0.1

At 100 m distance

Temp °C	24.5
Humidity %	41.9
Speed m/s	< 0.4

3) Supplementary Table S1. Total number of stimuli (a stimulus = one rumble) used throughout the study (indicating the number of individuals and rumbles per individuals available). Each male was exposed to two consecutive playback trials. Per trail we played back a rumble of a familiar, or an unfamiliar female, counterbalancing the order across individuals. For example, we started with a rumble from Mussina (a unfamiliar female), followed by a rumble from a familiar individual of the B1 family. Stimuli were used only once, except for 9 familiar stimuli that had to be used twice with a minimum of 16 days in between.

Stimuli pool for playback trials	
Familiar (AENP) *N*=18	**Unfamiliar (*N* =27)**
B1 family ($N_{ind=calls}$=3)	Chickwenya, age 29 (N_{calls} = 5) Pilanesberg
B2 family ($N_{ind=calls}$=3)	Mussina, 12 (N_{calls} = 4) Bela Bela
H family ($N_{ind=calls}$=3)	Nuanedi, age 13 (N_{calls} = 3) Bela Bela
L family ($N_{ind=calls}$=2)	Shan, age 16, (N_{calls} = 4) Bela Bela
M family ($N_{ind=calls}$=2)	Andile, age 14, (N_{calls} = 4) Hazyview
P family ($N_{ind=calls}$=3)	Tonga, 31 (N_{calls} = 3) Vienna Zoo (originally from South Africa)
R family ($N_{ind=calls}$=2)	Drumbo, 41 (N_{calls} = 4) Vienna Zoo (originally from Zimbabwe)

4) Supplemental Table S2 gives the file name (the ID of the stimulus) and it's duration for each trial. As mentioned in the main paper, the stimulus represents either a rumble of a familiar (1), or a rumble of an unfamiliar (X) female. 1X means that a rumble of a familiar female was played in the first trial, followed by a rumble of an unfamiliar female in the second trial (X1 thus means unfamiliar rumble first, familiar rumble second).

Explanation for familiar stimuli: Stimulus ID: B1, B2, L, H, P, M and R represent rumbles recorded of individuals belonging to the corresponding family units of the Addo Elephant National Park. E.g. B1_1_a0584_mod.wav indicates a rumble from the individual 1 of the B1 group. The numbers with a letter in front e.g. - a0584- indicates the original ID code of the recording, and 'mod' means that the file has been modified for playback (as described in the main paper).

Explanation for unfamiliar stimuli: pi: recordings of the female (Chickwenya) located at Pilanesberg NP, ef: recordings of females at Bela Bela (based on the ID number we know the individual), ew: recordings of Andile at Hazyview, W: recordings of the females at the Vienna Zoo (T = Tonga, D = Drumbo).

Male subjects	**1. Trial**		**2. Trial**	
	Stimulus ID	**Duration**	**Stimulus ID**	**Duration**
Subject 1_1X	B1_1_a0584_mod.wav	6.1 s	ef109_mod.wav	5.9 s
Subject 2_X1	pi222_mod.wav	5.0 s	P_2_a0176_mod.wav	4.2 s
Subject 3_1X	L_1_a0699_mod.wav	3.6 s	ew120_mod.wav	3.9 s
Subject 4_X1	pi256_mod.wav	2.6 s	H_3_a0387_mod.wav	2.7 s
Subject5_1X	H_1_a0385_mod.wav	3.5 s	pi040_mod.wav	3.8 s
Subject 6_X1	W1_D_a0776_mod.wav	4.1 s	R_2_a0681_mod.wav	4.3 s
Subject 7_1X	P_1_a0186_mod.wav	4.1 s	ef015_mod.wav	3.6 s
Subject 8_1X	B1_2_a0582_mod.wav	6.8 s	W_D_w0765_mod.wav	6.4 s
Subject 9_X1	R_1_a0686_mod.wav	3.1 s	ef458_mod.wav	3.0 s
Subject10_1X	L_2_a0712_mod.wav	6.2 s	W_T_w0211_mod.wav	6.0 s
Subject 11_X1	ef133_mod.wav	4.5 s	H_2_a0411_mod.wav	4.8 s
Subject 12_1X	B2_1_a0014_mod.wav	4.3 s	ef134_mod.wav	3.6 s
Subject 13_X1	W_T_w0801_mod.wav	4.8 s	P_2_a0176_mod.wav	4.2 s
Subject 14_1X	H_3_a0387_mod.wav	2.7 s	pi254_mod.wav	3.3 s
Subject 15_1X	B2_2_a0018_mod.wav	4.3 s	ef135_mod.wav	4.0 s
Subject 16_X1	ef293_mod.wav	2.7 s	M_1_a0104_mod.wav	2.8 s
Subject 17_1X	B1_3_a0437_mod.wav	5.4 s	pi249_mod.wav	5.0 s
Subject 18_1X	P_3_a0211_mod.wav	3.2 s	W_T_w0340_mod.wav	3.7 s
Subject 19_X1	W_D_w0334_mod.wav	3.4 s	B2_3_a0543_mod.wav	3.5 s
Subject 20_1X	B1_1_a0584_mod.wav	6.1 s	ef243_mod.wav	5.9 s
Subject 21_X1	W_D_w0512_mod.wav	3.6 s	M_2_a0090_mod.wav	3.5 s
Subject 22_1X	P_1_a0186_mod.wav	4.4 s	ef108_mod.wav	3.8 s
Subject 23_X1	ew350_mod.wav	5.2 s	L_2_a0712_mod.wav	4.8 s
Subject 24_1X	H_2_a0411_mod.wav	4.8 s	ef218_mod.wav	4.9 s
Subject 25_X1	ew300_mod.wav	4.2 s	B2_1_a0014_mod.wav	4.3 s
Subject 26_1X	M_1_a0104_mod.wav	2.9 s	ew156_mod_.wav	3.3 s
Subject 27_X1	ef456_mod.wav	5.0 s	B1_3_a0437_1_mod.wav	5.4 s

5) Supplementary videos

Supplemental Video 1: Shows reactions in response to an unfamiliar stimulus (*ears lifted*, *head lifted*, *stop feeding*, *turn to speaker*, *trunk high*, and *face speaker*).

Supplemental Video 2: Shows reactions in response to another unfamiliar stimulus (*ears lifted*, *head lifted*, *stop feeding*, *turn to speaker*, *approach speaker*).

Supplemental Video 3: Gives examples for ear relaxation (end of *ears lifted*). Usually, following an initial reaction, the elephants first resumed feeding/drinking and lowered the head. *Ears lifted* was the behavior observed longest. When the ears relaxed (ears touching the shoulder), and remained relaxed for 5 seconds, we stopped measuring the behavior (=end of reaction).