

SUPPLEMENTAL INFORMATION

Title: Psychoacoustic and archeoacoustic nature of ancient Aztec skull whistles

Authors: S Frühholz, P Rodriguez, M Bonard, F Steiner, M Bobin

SUPPLEMENTAL FIGURES

Figure S1 | Representation similarity analysis on SW sounds. (a) Representational similarity analysis (RSA) on the acoustic patterns. **(b)** RSA on the perceptual rating patterns.

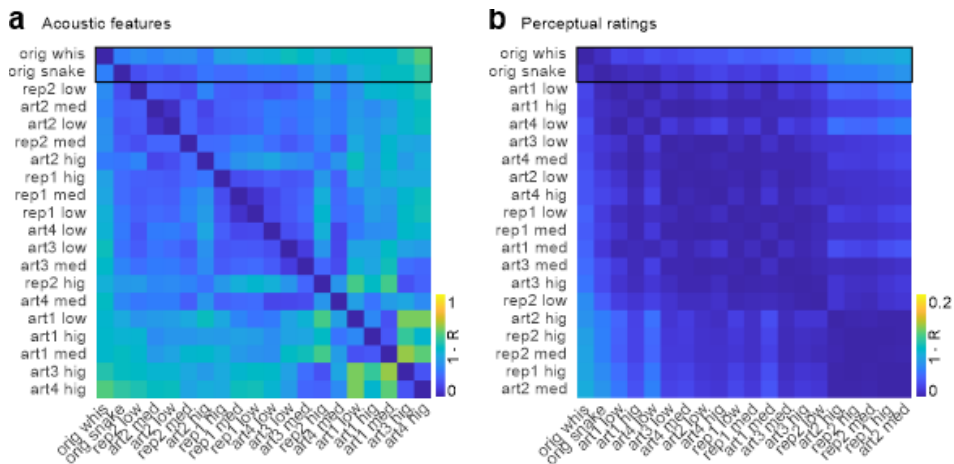
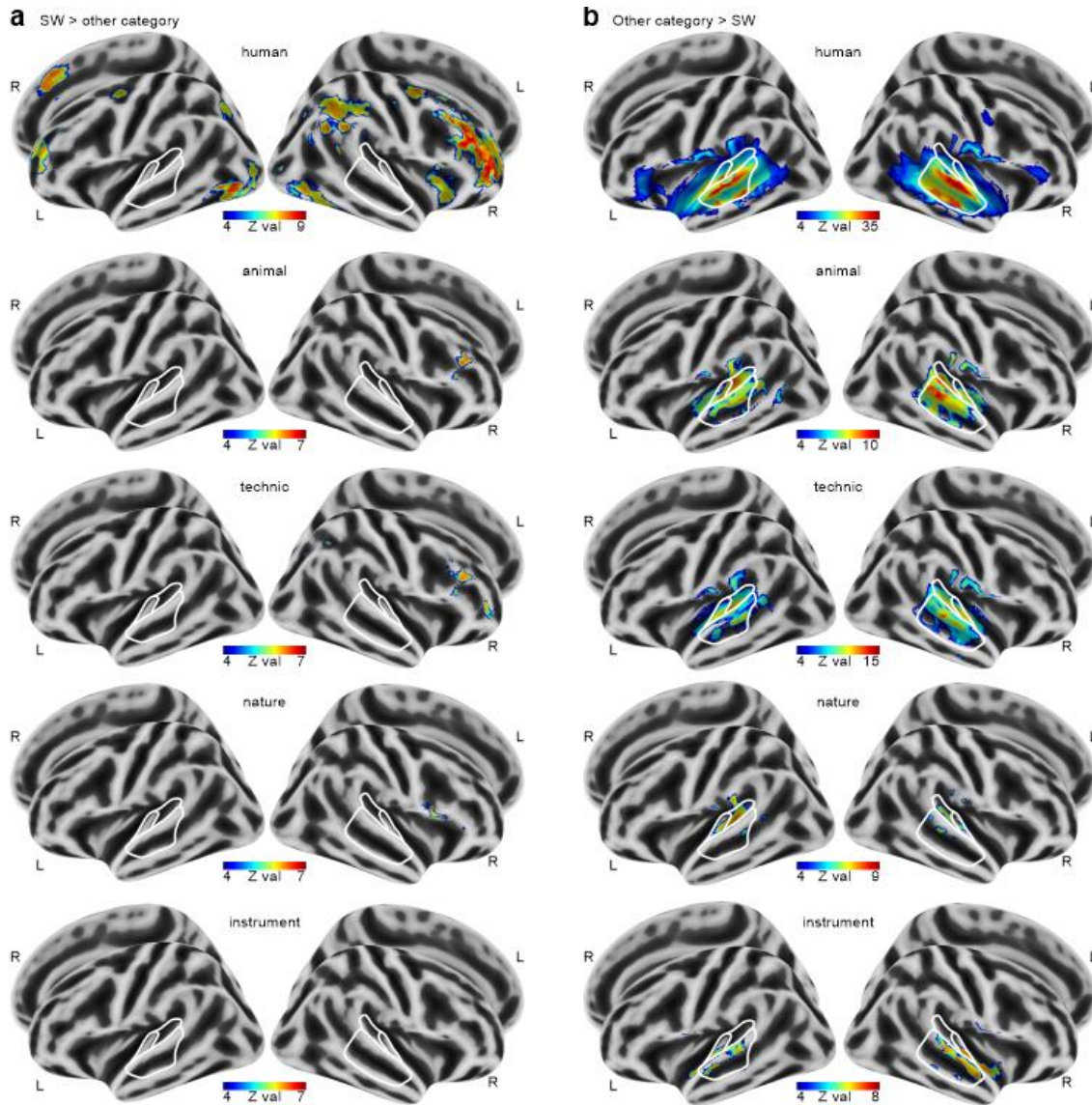


Figure S2 | Brain responses to SW sounds. (a) Functional brain activity in human listeners (n=32) when comparing activity for SW with activity for all other 5 general sound categories separately. (b) Same as in (a) but reversed contrasts in terms of higher brain activity for other sounds compared with SW sounds. All brain activity includes a voxel threshold $p < 0.05$ (FWE corrected), cluster threshold $k = 10$.



SUPPLEMENTAL TABLES

Table S1 | Description of sound files. The study used a general collection of n=2567 sounds from 86 different sound categories. The table lists the abbreviations, file name, and the number of sounds per sound category.

Abbreviation	Full name	Number of sounds
SW orig	SKULL WHISTLE original	35
SW high	SKULL WHISTLE replica high	90
SW med	SKULL WHISTLE replica medium	90
SW low	SKULL WHISTLE replica low	90
AZT flu	AZTEC ancient flute	15
AZT inc	AZTEC ancient incense	4
AZT tru	AZTEC ancient trumpet	11
MEX eag	MEXICAN flute eagle	12
MEX jag	MEXICAN flute jaguar	11
MEX llo	MEXICAN flute llorona	11
MEX owl	MEXICAN flute owl	12
MEX sca	MEXICAN flute scary / monkey	17
MEX tur	MEXICAN flute turtle	11
MEX eag mod	MEXICAN flute eagle (modulated)	10
MEX jag mod	MEXICAN flute jaguar (modulated)	13
MEX llo mod	MEXICAN flute llorona (modulated)	10
MEX owl mod	MEXICAN flute owl (modulated)	11
MEX sca mod	MEXICAN flute scary (modulated)	8
MEX tur mod	MEXICAN flute turtle (modulated)	13
ANI bird (pas)	ANIMAL bird passeriformes	21
ANI bird (psi)	ANIMAL bird psittaciformes	22
ANI bird (str)	ANIMAL bird strigiformes	24
ANI insect (buzz)	ANIMAL insect buzzing	25
ANI insect (str)	ANIMAL insect stridulations (criquet)	23
ANI mamm (bov)	ANIMAL mammal bovidae	29
ANI mamm (can)	ANIMAL mammal canidae	40
ANI mamm (fel)	ANIMAL mammal felidae	37
ANI mamm (mon)	ANIMAL mammal monkey	21
ANI mamm (sui)	ANIMAL mammal suidae	21
ANI rept (cro)	ANIMAL reptile crocodylia	20
ANI rept (squ)	ANIMAL reptile squamata	29
ANI amph (anu)	ANIMAL amphibian anura	22
ANI bird (acc)	ANIMAL bird accipitriformes	22
ANI bird (gal)	ANIMAL bird galliformes	35
HUM speech	HUMAN speech	22
HUM whisper	HUMAN whisper	30
HUM mouth	HUMAN mouth	15
HUM anger	HUMAN voice anger	5
HUM fear	HUMAN voice fear	10
HUM pain	HUMAN voice pain	5
HUM sadness	HUMAN voice sadness	5

HUM neutral	HUMAN voice neutral	20
HUM joy	HUMAN voice joy	15
HUM laugh	HUMAN voice laugh	28
HUM pleasure	HUMAN voice pleasure	5
HUM ulu	HUMAN voice ululation	25
HUM baby	HUMAN baby cry	62
HUM body (move)	HUMAN body movement	53
HUM body (bre)	HUMAN body breath	27
HUM body (che)	HUMAN body chewing	27
HUM body (har)	HUMAN body solid parts	21
HUM body (ill)	HUMAN body illness	76
HUM body (nai)	HUMAN body nails	20
HUM body (sno)	HUMAN body snoring	38
HUM body (swa)	HUMAN body swallowing	20
NAT crack	NATURE cracking sounds	22
NAT fire	NATURE fire	34
NAT thu	NATURE thunder	42
NAT water (dro)	NATURE water dropping	30
NAT water (rai)	NATURE water rain	32
NAT water (flo)	NATURE water flowing	41
NAT wind	NATURE wind	35
EXT horn	EXTERIOR alarm horn	26
EXT siren	EXTERIOR alarm siren	31
EXT aerial	EXTERIOR aerial	64
EXT tool (cha)	EXTERIOR tool chainsaw	30
EXT tool (saw)	EXTERIOR tool handsaw	29
EXT engine	EXTERIOR engine	36
EXT firearm	EXTERIOR firearm	21
EXT fireworks	EXTERIOR fireworks	29
EXT bell	EXTERIOR bell	20
INT alarm (clo)	INTERIOR alarm clock	27
INT alarm (whi)	INTERIOR alarm whistle	21
INT door	INTERIOR door	41
INT clean	INTERIOR cleaning machines	63
INT glass	INTERIOR glass	31
INT neutral	INTERIOR neutral	76
INT water (pou)	INTERIOR water pouring	36
INT water (toi)	INTERIOR water toilet	36
INS brass	INSTRUMENT brass	30
INS guitar	INSTRUMENT guitar	30
INS perc	INSTRUMENT percussion	30
INS string	INSTRUMENT string instruments	53
INS wood	INSTRUMENT woodwind instruments	30
MUS elec	MUSIC electronic	80
SYN sound	SYNTHETIC sounds	30

Table S2 | Posthoc pairwise comparisons. The table reports results from posthoc pairwise comparisons for the valence ratings (perceptual assessment and ratings of sounds). Abbreviations: *ani* animal, *env* environment, *ext* exterior, *int* interior, *hum* human, *mus* music, *ins* instrument, *mex* mexican, *syn* synthetic.

Category 1	Category 2	F value	p value	eta2	CI95% lower	CI95% upper
SW low	hum	1119.323	1.09E-238	0.136951	0.121867	0.15307
SW low	ani	1044.8	1.27E-223	0.156204	0.13837	0.175149
SW low	env	212.6834	1.67E-47	0.076053	0.058479	0.09588
SW low	ext	364.7535	4.86E-80	0.077402	0.061661	0.093363
SW low	int	24.72738	1.09E-06	0.007798	0.003398	0.013898
SW low	mus	74.26949	1.52E-17	0.017184	0.010749	0.025192
SW low	ins	34.14636	9.31E-09	0.011675	0.004834	0.020934
SW low	mex	4.772415	0.037193	0.001127	3.73E-06	0.006828
SW low	syn	7.488601	0.008284	0.001368	4.66E-06	0.007203
SW med	hum	1060.158	1.18E-226	0.129239	0.113313	0.146034
SW med	ani	989.264	3.10E-212	0.147495	0.129405	0.166844
SW med	env	198.0645	2.25E-44	0.06775	0.050841	0.086543
SW med	ext	333.4328	2.28E-73	0.069945	0.054897	0.086385
SW med	int	17.05152	5.47E-05	0.005593	0.002056	0.011133
SW med	mus	60.22986	1.75E-14	0.013997	0.008015	0.021314
SW med	ins	25.60176	7.24E-07	0.008328	0.002859	0.016559
SW med	mex	2.966708	0.098717	0.002207	1.70E-05	0.008836
SW med	syn	4.308536	0.047087	0.000371	9.38E-07	0.004495
SW high	hum	1003.155	4.81E-215	0.122615	0.107351	0.138376
SW high	ani	935.7472	4.21E-201	0.140305	0.122503	0.158716
SW high	env	184.1359	2.03E-41	0.061062	0.045087	0.07887
SW high	ext	303.8363	4.72E-67	0.06365	0.049182	0.079392
SW high	int	10.8686	0.00141	0.003707	0.000933	0.00835
SW high	mus	47.80517	9.13E-12	0.011128	0.006053	0.01783
SW high	ins	18.37087	2.86E-05	0.00559	0.001226	0.0128
SW high	mex	1.603268	0.22413	0.004031	0.000226	0.012264
SW high	syn	2.025953	0.173975	6.54E-07	7.05E-07	0.002876
SW orig	hum	245.0976	1.97E-54	0.08444	0.073379	0.096217
SW orig	ani	232.531	9.28E-52	0.100885	0.087749	0.115266
SW orig	env	191.6912	5.01E-43	0.06722	0.051334	0.084874
SW orig	ext	76.76913	4.59E-18	0.059515	0.047311	0.072553
SW orig	int	1.221047	0.284999	0.010612	0.005867	0.01651
SW orig	mus	8.910373	0.00393	0.016646	0.010791	0.023152
SW orig	ins	3.223824	0.087103	0.019215	0.01003	0.030479
SW orig	mex	0.228533	0.650692	0.00151	5.15E-06	0.014249
SW orig	syn	0.090607	0.763409	0.011316	0.002549	0.025886
SW low	SW med	0.470964	1.27E-223	0.000265	6.30E-07	0.003892
SW low	SW high	1.859309	1.67E-47	0.001177	3.95E-06	0.006417
SW low	SW orig	2.126339	4.86E-80	0.004094	0.000176	0.012933
SW med	SW high	0.458815	2.25E-44	0.000309	9.10E-07	0.004022
SW med	SW orig	1.068671	2.28E-73	0.005902	0.000712	0.01599
SW high	SW orig	0.378007	4.72E-67	0.008826	0.00184	0.020225

Table S3 | Posthoc pairwise comparisons. The table reports results from posthoc pairwise comparisons for the urgency ratings (perceptual assessment and ratings of sounds).

Category 1	Category 2	F value	p value	eta2	CI95% lower	CI95% upper
SW low	hum	1119.323	1.09E-238	0.136951	0.121867	0.15307
SW low	ani	1044.8	1.27E-223	0.156204	0.13837	0.175149
SW low	env	212.6834	1.67E-47	0.076053	0.058479	0.09588
SW low	ext	364.7535	4.86E-80	0.077402	0.061661	0.093363
SW low	int	24.72738	1.09E-06	0.007798	0.003398	0.013898
SW low	mus	74.26949	1.52E-17	0.017184	0.010749	0.025192
SW low	ins	34.14636	9.31E-09	0.011675	0.004834	0.020934
SW low	mex	4.772415	0.037193	0.001127	3.73E-06	0.006828
SW low	syn	7.488601	0.008284	0.001368	4.66E-06	0.007203
SW med	hum	1060.158	1.18E-226	0.129239	0.113313	0.146034
SW med	ani	989.264	3.10E-212	0.147495	0.129405	0.166844
SW med	env	198.0645	2.25E-44	0.06775	0.050841	0.086543
SW med	ext	333.4328	2.28E-73	0.069945	0.054897	0.086385
SW med	int	17.05152	5.47E-05	0.005593	0.002056	0.011133
SW med	mus	60.22986	1.75E-14	0.013997	0.008015	0.021314
SW med	ins	25.60176	7.24E-07	0.008328	0.002859	0.016559
SW med	mex	2.966708	0.098717	0.002207	1.70E-05	0.008836
SW med	syn	4.308536	0.047087	0.000371	9.38E-07	0.004495
SW high	hum	1003.155	4.81E-215	0.122615	0.107351	0.138376
SW high	ani	935.7472	4.21E-201	0.140305	0.122503	0.158716
SW high	env	184.1359	2.03E-41	0.061062	0.045087	0.07887
SW high	ext	303.8363	4.72E-67	0.06365	0.049182	0.079392
SW high	int	10.8686	0.00141	0.003707	0.000933	0.00835
SW high	mus	47.80517	9.13E-12	0.011128	0.006053	0.01783
SW high	ins	18.37087	2.86E-05	0.00559	0.001226	0.0128
SW high	mex	1.603268	0.22413	0.004031	0.000226	0.012264
SW high	syn	2.025953	0.173975	6.54E-07	7.05E-07	0.002876
SW orig	hum	245.0976	1.97E-54	0.08444	0.073379	0.096217
SW orig	ani	232.531	9.28E-52	0.100885	0.087749	0.115266
SW orig	env	191.6912	5.01E-43	0.06722	0.051334	0.084874
SW orig	ext	76.76913	4.59E-18	0.059515	0.047311	0.072553
SW orig	int	1.221047	0.284999	0.010612	0.005867	0.01651
SW orig	mus	8.910373	0.00393	0.016646	0.010791	0.023152
SW orig	ins	3.223824	0.087103	0.019215	0.01003	0.030479
SW orig	mex	0.228533	0.650692	0.00151	5.15E-06	0.014249
SW orig	syn	0.090607	0.763409	0.011316	0.002549	0.025886
SW low	SW med	0.470964	1.27E-223	0.000265	6.30E-07	0.003892
SW low	SW high	1.859309	1.67E-47	0.001177	3.95E-06	0.006417
SW low	SW orig	2.126339	4.86E-80	0.004094	0.000176	0.012933
SW med	SW high	0.458815	2.25E-44	0.000309	9.10E-07	0.004022
SW med	SW orig	1.068671	2.28E-73	0.005902	0.000712	0.01599
SW high	SW orig	0.378007	4.72E-67	0.008826	0.00184	0.020225

Table S4 | Posthoc pairwise comparisons. The table reports results from posthoc pairwise comparisons for the arousal ratings (perceptual assessment and ratings of sounds).

Category 1	Category 2	F value	p value	eta2	CI95% lower	CI95% upper
SW low	hum	19.85941	1.21E-05	0.001884	0.000342	0.004675
SW low	ani	2.384787	0.137851	3.19E-05	3.76E-07	0.001387
SW low	env	0.01132	0.915271	0.045704	0.030856	0.064081
SW low	ext	297.2033	1.27E-65	0.066931	0.05011	0.086
SW low	int	158.7395	7.57E-36	0.0334	0.022364	0.046636
SW low	mus	297.5557	1.20E-65	0.063217	0.047851	0.081094
SW low	ins	67.5712	4.03E-16	0.01614	0.007571	0.028136
SW low	mex	7.349885	0.007794	0.000697	1.36E-06	0.006185
SW low	syn	18.66802	2.16E-05	0.002926	8.83E-05	0.010091
SW med	hum	10.94356	0.001192	0.001003	4.79E-05	0.003281
SW med	ani	0.183791	0.687228	6.06E-05	3.98E-07	0.001399
SW med	env	0.564548	0.493571	0.052064	0.036078	0.071659
SW med	ext	335.3945	1.73E-73	0.073872	0.055951	0.093704
SW med	int	187.1069	6.28E-42	0.038371	0.026281	0.052279
SW med	mus	336.6251	1.25E-73	0.069756	0.053356	0.088717
SW med	ins	85.07072	6.55E-20	0.020209	0.010478	0.032364
SW med	mex	10.90544	0.001192	0.000132	8.11E-07	0.004113
SW med	syn	26.69295	3.60E-07	0.00492	0.000613	0.013422
SW high	hum	0.297786	0.619706	4.58E-05	2.21E-07	0.001046
SW high	ani	10.98774	0.001192	0.002679	0.000455	0.006759
SW high	env	8.501249	0.004263	0.076776	0.057126	0.098395
SW high	ext	480.2873	3.10E-104	0.100166	0.078883	0.123266
SW high	int	299.2929	5.78E-66	0.057539	0.042726	0.074956
SW high	mus	485.2382	5.42E-105	0.094354	0.075676	0.115979
SW high	ins	158.4904	7.96E-36	0.037002	0.022918	0.053397
SW high	mex	27.94581	1.97E-07	0.001236	3.45E-06	0.007342
SW high	syn	64.07404	2.25E-15	0.014995	0.00571	0.028361
SW orig	hum	42.03787	1.49E-10	0.000119	3.38E-07	0.001379
SW orig	ani	60.66761	1.20E-14	0.002006	0.000202	0.005747
SW orig	env	113.0169	5.46E-26	0.062902	0.041125	0.087678
SW orig	ext	317.9859	7.66E-70	0.070426	0.050764	0.092804
SW orig	int	229.934	3.72E-51	0.037283	0.024496	0.053082
SW orig	mus	308.0388	8.82E-68	0.06119	0.044626	0.081043
SW orig	ins	172.0687	1.05E-38	0.02991	0.016182	0.047107
SW orig	mex	84.90015	6.74E-20	0.003425	1.63E-05	0.017539
SW orig	syn	118.2857	4.14E-27	0.017915	0.005671	0.036924
SW low	SW med	0.771608	0.137851	0.000261	8.56E-07	0.004025
SW low	SW high	14.63806	0.915271	0.004649	0.000426	0.012918
SW low	SW orig	64.84289	1.27E-65	0.005652	0.000482	0.016807
SW med	SW high	8.689057	0.493571	0.002689	6.42E-05	0.009405
SW med	SW orig	56.44443	1.73E-73	0.003531	4.89E-05	0.013342
SW high	SW orig	32.51393	3.10E-104	0.00012	6.65E-07	0.004275

Table S5 | Posthoc pairwise comparisons. The table reports results from posthoc pairwise comparisons for the naturalness ratings (perceptual assessment and ratings of sounds).

Category 1	Category 2	F value	p value	eta2	CI95% lower	CI95% upper
SW low	hum	19.85941	1.21E-05	0.001884	0.000342	0.004675
SW low	ani	2.384787	0.137851	3.19E-05	3.76E-07	0.001387
SW low	env	0.01132	0.915271	0.045704	0.030856	0.064081
SW low	ext	297.2033	1.27E-65	0.066931	0.05011	0.086
SW low	int	158.7395	7.57E-36	0.0334	0.022364	0.046636
SW low	mus	297.5557	1.20E-65	0.063217	0.047851	0.081094
SW low	ins	67.5712	4.03E-16	0.01614	0.007571	0.028136
SW low	mex	7.349885	0.007794	0.000697	1.36E-06	0.006185
SW low	syn	18.66802	2.16E-05	0.002926	8.83E-05	0.010091
SW med	hum	10.94356	0.001192	0.001003	4.79E-05	0.003281
SW med	ani	0.183791	0.687228	6.06E-05	3.98E-07	0.001399
SW med	env	0.564548	0.493571	0.052064	0.036078	0.071659
SW med	ext	335.3945	1.73E-73	0.073872	0.055951	0.093704
SW med	int	187.1069	6.28E-42	0.038371	0.026281	0.052279
SW med	mus	336.6251	1.25E-73	0.069756	0.053356	0.088717
SW med	ins	85.07072	6.55E-20	0.020209	0.010478	0.032364
SW med	mex	10.90544	0.001192	0.000132	8.11E-07	0.004113
SW med	syn	26.69295	3.60E-07	0.00492	0.000613	0.013422
SW high	hum	0.297786	0.619706	4.58E-05	2.21E-07	0.001046
SW high	ani	10.98774	0.001192	0.002679	0.000455	0.006759
SW high	env	8.501249	0.004263	0.076776	0.057126	0.098395
SW high	ext	480.2873	3.10E-104	0.100166	0.078883	0.123266
SW high	int	299.2929	5.78E-66	0.057539	0.042726	0.074956
SW high	mus	485.2382	5.42E-105	0.094354	0.075676	0.115979
SW high	ins	158.4904	7.96E-36	0.037002	0.022918	0.053397
SW high	mex	27.94581	1.97E-07	0.001236	3.45E-06	0.007342
SW high	syn	64.07404	2.25E-15	0.014995	0.00571	0.028361
SW orig	hum	42.03787	1.49E-10	0.000119	3.38E-07	0.001379
SW orig	ani	60.66761	1.20E-14	0.002006	0.000202	0.005747
SW orig	env	113.0169	5.46E-26	0.062902	0.041125	0.087678
SW orig	ext	317.9859	7.66E-70	0.070426	0.050764	0.092804
SW orig	int	229.934	3.72E-51	0.037283	0.024496	0.053082
SW orig	mus	308.0388	8.82E-68	0.06119	0.044626	0.081043
SW orig	ins	172.0687	1.05E-38	0.02991	0.016182	0.047107
SW orig	mex	84.90015	6.74E-20	0.003425	1.63E-05	0.017539
SW orig	syn	118.2857	4.14E-27	0.017915	0.005671	0.036924
SW low	SW med	0.771608	0.137851	0.000261	8.56E-07	0.004025
SW low	SW high	14.63806	0.915271	0.004649	0.000426	0.012918
SW low	SW orig	64.84289	1.27E-65	0.005652	0.000482	0.016807
SW med	SW high	8.689057	0.493571	0.002689	6.42E-05	0.009405
SW med	SW orig	56.44443	1.73E-73	0.003531	4.89E-05	0.013342
SW high	SW orig	32.51393	3.10E-104	0.00012	6.65E-07	0.004275

Table S6 | Full statistics for binomial test. The table reports full statistics for the binomial test for the frequency occurrence of nouns (free choice labeling experiment). FDR corrected p-values, relative risk (RR) as measure of effect size, confidence interval bounds.

	word	p FDR	prob success	RR relative risk	CI95% lower	CI95% upper
SW orig	scream	0	0.3085	16.3505	0.2410	0.3826
	train	7.74E-09	0.1085	5.7505	0.0666	0.1642
	whistle	3.28E-08	0.1085	5.7505	0.0666	0.1642
	flute	1.47E-07	0.1028	5.4484	0.0621	0.1576
	kettle	6.64E-07	0.1028	5.4484	0.0621	0.1576
	instrument	1.44E-05	0.0857	4.5421	0.0487	0.1374
	human	3.21E-02	0.0514	2.7242	0.0237	0.0953
	wind	0.074088	0.0400	2.1200	0.0162	0.0806
	machine	0.628828	0.0228	1.2084	0.0062	0.0574
	unkown	0.777269	0.0171	0.9063	0.0035	0.0492
	car	0.325332	0.0114	0.6042	0.0013	0.0406
	adult	0.325332	0.0114	0.6042	0.0013	0.0406
SW high	scream	0	0.7413	25.9455	0.6518	0.8182
	human	0.037422	0.0862	3.0170	0.0421	0.1528
	machine	0.469231	0.0431	1.5085	0.0141	0.0977
	kettle	0.999999	0.0258	0.9030	0.0053	0.0737
	wind	0.999999	0.0258	0.9030	0.0053	0.0737
	drilling	0.358295	0.0172	0.6020	0.0020	0.0608
	adult	0.358295	0.0172	0.6020	0.0020	0.0608
	animal	0.358295	0.0086	0.3010	0.0002	0.0470
	train	0.167933	0.0086	0.3010	0.0002	0.0470
	whistle	0.167933	0.0086	0.3010	0.0002	0.0470
	pet	0.167933	0.0086	0.3010	0.0002	0.0470
	unkown	0.167933	0.0000	0.0000	0.0000	0.0313
SW med	scream	0	0.5666	26.6302	0.4580	0.6708
	machine	3.91E-07	0.1444	6.7868	0.0792	0.2343
	kettle	0.002767	0.0888	4.1736	0.0391	0.1676
	car	0.130358	0.0666	3.1302	0.0248	0.1394
	tires	0.861106	0.0222	1.0434	0.0027	0.0779
	human	0.861106	0.0222	1.0434	0.0027	0.0779
	wind	0.861106	0.0222	1.0434	0.0027	0.0779
	drilling	0.405255	0.1110	5.2170	0.0002	0.0603
	unkown	0.405255	0.1110	5.2170	0.0002	0.0603
	adult	0.405255	0.1110	5.2170	0.0002	0.0603
	television	0.405255	0.1110	5.2170	0.0002	0.0603
	brakes	0.405255	0.1110	5.2170	0.0002	0.0603
SW high	scream	0	0.5617	25.8382	0.4525	0.6668
	car	0.000863	0.1011	4.6506	0.0472	0.1833
	human	0.052964	0.0674	3.1004	0.0251	0.1409

	machine	0.135146	0.0561	2.5806	0.0184	0.1262
	kettle	0.595836	0.0337	1.5502	0.0070	0.0953
	animal	0.595836	0.0337	1.5502	0.0070	0.0953
	pet	0.785816	0.0224	1.0304	0.0027	0.0788
	unkown	0.785816	0.0224	1.0304	0.0027	0.0788
	tires	0.463973	0.0112	0.5152	0.0002	0.0610
	drilling	0.463973	0.0112	0.5152	0.0002	0.0610
	child	0.463973	0.0112	0.5152	0.0002	0.0610
	wind	0.463973	0.0112	0.5152	0.0002	0.0610

Table S7 | Full statistics for binomial test. The table reports full statistics for the binomial test for the frequency occurrence of adjectives (free choice labeling experiment). FDR corrected p-values, relative risk (RR) as measure of effect size, and confidence interval bounds.

	word	p FDR	prob success	RR relative risk	CI95% lower	CI95% upper
SW orig	aversive	0	0.3098	21.0664	0.2350	0.3928
	scary	0	0.1760	11.9680	0.1172	0.2488
	indifferent	1.33E-15	0.1619	11.0092	0.1055	0.2330
	unpleasant	6.72E-07	0.0985	6.6980	0.0549	0.1598
	frightend	1.27E-02	0.0563	3.8284	0.0246	0.1079
	calm	0.119147	0.0352	2.3936	0.0115	0.0802
	pleasant	0.119147	0.0352	2.3936	0.0115	0.0802
	alarming	0.704044	0.0281	1.9108	0.0077	0.0705
	excited	1	0.0140	0.9520	0.0017	0.0499
	irritating	1	0.0140	0.9520	0.0017	0.0499
	happy	0.794103	0.0070	0.4760	0.0001	0.0386
	stressed	0.794103	0.0070	0.4760	0.0001	0.0386
	SW high	scary	0	0.3928	17.2832	0.2280
aversive		3.56E-12	0.2142	9.4248	0.1322	0.3173
frightened		2.39E-07	0.1547	6.8068	0.0850	0.2500
unpleasant		0.009254	0.0952	4.1888	0.0420	0.1790
indifferent		0.955696	0.0238	1.0472	0.0028	0.0833
alarming		0.404502	0.0119	0.5236	0.0003	0.0645
irritating		0.404502	0.0119	0.5236	0.0003	0.0645
terrifying		0.404502	0.0119	0.5236	0.0003	0.0645
saddening		0.404502	0.0119	0.5236	0.0003	0.0645
nervous		0.404502	0.0119	0.5236	0.0003	0.0645
worrying		0.404502	0.0119	0.5236	0.0003	0.0645
stressed		0.404502	0.0119	0.5236	0.0003	0.0645
SW med		aversive	0	0.3695	17.3665	0.2712
	scary	6.94E-09	0.1739	8.1733	0.1028	0.2670
	unpleasant	2.58E-06	0.0141	0.6641	0.0774	0.2295
	frightened	8.39E-05	0.1195	5.6165	0.0612	0.2038
	indifferent	0.008591	0.0869	4.0843	0.0382	0.1641
	alarming	0.490843	0.4340	20.3980	0.0119	0.1075
	irritating	0.325862	0.0108	0.5076	0.0002	0.0590
	terrifying	0.325862	0.0108	0.5076	0.0002	0.0590
	attentive	0.325862	0.0108	0.5076	0.0002	0.0590
	excited	0.325862	0.0108	0.5076	0.0002	0.0590
	loud	0.325862	0.0108	0.5076	0.0002	0.0590
	saddening	0.325862	0.0108	0.5076	0.0002	0.0590
	SW low	aversive	0	0.3125	14.6875	0.2217
scary		0	0.2500	11.7500	0.1672	0.3487
frightend		7.25E-08	0.1562	7.3414	0.0901	0.2445

	indifferent	0.003174	0.0833	3.9151	0.0366	0.1576
	unpleasant	0.003174	0.0833	3.9151	0.0366	0.1576
	alarming	0.792649	0.0208	0.9776	0.0025	0.0732
	excited	0.792649	0.0208	0.9776	0.0025	0.0732
	pleasant	0.413387	0.0104	0.4888	0.0002	0.0566
	worrying	0.413387	0.0104	0.4888	0.0002	0.0566
	saddening	0.413387	0.0104	0.4888	0.0002	0.0566
	concerned	0.413387	0.0104	0.4888	0.0002	0.0566
	attentive	0.167933	0.0000	0.0000	0.0000	0.0376

Table S8 | Full statistics for binomial test. The table reports full statistics for the binomial test for the frequency occurrence of nouns (reabeled data) (free choice labeling experiment). FDR corrected p-values, relative risk (RR) as measure of effect size, and confidence interval bounds.

	word	p FDR	prob success	RR relative risk	CI95% lower	CI95% upper
SW orig	human	4.38E-18	0.3563	3.2067	0.2971	0.3981
	exterior	0.000105	0.1815	1.6335	0.1430	0.2254
	interior	0.001691	0.1675	1.5075	0.1303	0.2104
	instrument	0.010023	0.1592	1.4328	0.1228	0.2013
	nature	0.801035	0.1145	1.0305	0.0834	0.1521
	animal	1.21E-10	0.0195	0.1755	0.0078	0.0398
	unknown	2.80E-14	0.0083	0.0747	0.0017	0.0242
	synthetic	2.80E-14	0.0000	0.0000	0.0000	0.0102
	music	2.80E-14	0.0000	0.0000	0.0000	0.0102
SW high	human	0	0.7741	6.9669	0.7127	0.8280
	interior	0.745836	0.1013	0.9117	0.0646	0.1494
	exterior	0.147573	0.0783	0.7047	0.0462	0.1224
	nature	4.34E-05	0.0322	0.2898	0.0130	0.0653
	animal	1.02E-08	0.0092	0.0828	0.0011	0.0328
	unknown	2.40E-11	0.0000	0.0000	0.0000	0.0168
	instrument	2.40E-11	0.0000	0.0000	0.0000	0.0168
	synthetic	2.40E-11	0.0000	0.0000	0.0000	0.0168
	music	2.40E-11	0.0000	0.0000	0.0000	0.0168
SW med	human	0	0.4654	4.1886	0.3976	0.5341
	exterior	2.30E-12	0.2949	2.6541	0.2351	0.3604
	interior	6.97E-06	0.2165	1.9485	0.1636	0.1111
	nature	6.31E-08	0.0184	0.1656	0.0050	0.0465
	animal	4.88E-10	0.0046	0.0414	0.0001	0.0254
	unknown	4.88E-10	0.0046	0.0414	0.0001	0.0254
	synthetic	2.00E-11	0.0000	0.0000	0.0000	0.0168
	instrument	2.00E-11	0.0000	0.0000	0.0000	0.0168
	music	2.00E-11	0.0000	0.0000	0.0000	0.0168
SW low	human	0	0.5742	5.1678	0.5029	0.6433
	exterior	5.43E-07	0.1633	1.4697	0.1152	0.2217
	interior	0.50236	0.0990	0.8910	0.0615	0.1487
	animal	0.037044	0.0643	0.5787	0.0347	0.1075
	unknown	4.67E-08	0.0099	0.0891	0.0012	0.0353
	nature	4.67E-08	0.0099	0.0891	0.0012	0.0353
	synthetic	1.54E-10	0.0000	0.0000	0.0000	0.0180
	instrument	1.54E-10	0.0000	0.0000	0.0000	0.0180
	music	1.54E-10	0.0000	0.0000	0.0000	0.0180

Table S9 | Full statistics for binomial test. The table reports full statistics for the binomial test for the frequency occurrence of adjectives (reabeled data) (free choice labeling experiment). FDR corrected p-values, relative risk (RR) as measure of effect size, and confidence interval bounds.

	word	p FDR	prob success	RR relative risk	CI95% lower	CI95% upper
SW orig	fear	3.74E-16	0.6267	6.2670	0.5744	0.6769
	joy	3.52E-15	0.2506	2.5060	0.2066	0.2988
	neutral	0.053097	0.0696	0.6960	0.0455	0.1010
	anger	1.80E-08	0.0222	0.2220	0.0096	0.0434
	anticipation	8.76E-12	0.0139	0.1390	0.0045	0.0322
	sadness	1.13E-12	0.0111	0.1110	0.0030	0.0282
	disgust	3.05E-14	0.0027	0.0270	0.0007	0.0154
	trust	3.05E-14	0.0027	0.0270	0.0007	0.0154
	unknown	1.15E-14	0.0000	0.0000	0.0000	0.0102
	surprise	1.15E-14	0.0000	0.0000	0.0000	0.0102
SW high	fear	0	0.8680	8.6800	0.8180	0.9085
	joy	0.828119	0.0936	0.9360	0.0596	0.1383
	neutral	7.03E-07	0.0170	0.1700	0.0046	0.0430
	anger	1.46E-08	0.0127	0.1270	0.0026	0.0368
	anticipation	6.14E-11	0.0042	0.0420	0.0001	0.0234
	sadness	6.14E-11	0.0042	0.0420	0.0001	0.0234
	disgust	6.14E-11	0.0042	0.0420	0.0001	0.0234
	unknown	6.14E-11	0.0000	0.0000	0.0000	0.0155
	surprise	6.14E-11	0.0000	0.0000	0.0000	0.0155
	trust	6.14E-11	0.0000	0.0000	0.0000	0.0155
SW med	fear	0	0.7892	7.8920	0.7402	0.8483
	joy	0.056738	0.1403	1.4030	0.0980	0.1923
	neutral	0.000156	0.3500	3.5000	0.0152	0.0679
	anger	3.20E-08	0.0131	0.1310	0.0027	0.0379
	anticipation	2.21E-09	0.0043	0.0430	0.0001	0.0241
	sadness	2.21E-09	0.0043	0.0430	0.0001	0.0241
	surprise	9.66E-11	0.0000	0.0000	0.0000	0.0160
	disgust	9.66E-11	0.0000	0.0000	0.0000	0.0160
	unknown	9.66E-11	0.0000	0.0000	0.0000	0.0160
	trust	9.66E-11	0.0000	0.0000	0.0000	0.0160
SW low	fear	0	0.8151	8.1510	0.7580	0.8623
	joy	0.278554	0.1218	1.2180	0.0831	0.1702
	neutral	0.001752	0.0420	0.4200	0.0203	0.0759
	anticipation	9.85E-09	0.0126	0.1260	0.0026	0.0363
	sadness	1.05E-09	0.0042	0.0420	0.0001	0.0231
	anger	1.05E-09	0.0042	0.0420	0.0001	0.0231
	unknown	4.55E-11	0.0000	0.0000	0.0000	0.0153
	disgust	4.55E-11	0.0000	0.0000	0.0000	0.0153
	surprise	4.55E-11	0.0000	0.0000	0.0000	0.0153

	trust	4.55E-11	0.0000	0.0000	0.0000	0.0153
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Table S10 | Full statistics for posthoc pairwise comparisons. The table reports full statistics for the posthoc pairwise comparison for the dichotic listening experiment (SW orig). Abbreviations: *ani* animal, *env* environment, *ext* exterior, *hum* human, *mus* music, *noi* noise, *sil* silence.

Category 1	Category 2	p value	eta2	CI95% lower	CI95% upper
SW orig	ani	1.0000	0.0000	-37.9248	32.1106
SW orig	env	0.9958	0.0002	-44.2954	27.8276
SW orig	ext	0.0052	0.0054	-82.3583	-9.4808
SW orig	hum	1.0000	0.0000	-34.9100	32.9508
SW orig	mus	0.4730	0.0011	-51.7596	11.3656
SW orig	noi	0.9845	0.0002	-39.9036	22.2625
SW orig	sil	0.0088	0.0047	-81.4812	-7.5112
ani	sil	0.0004	0.0012	-68.9802	-14.1980
env	sil	0.0100	0.0071	-91.7386	-7.9074
ext	sil	0.0000	0.0205	-124.4961	-50.5213
hum	sil	0.0129	0.0052	-79.2627	-5.8748
mus	sil	0.0001	0.0110	-97.9582	-25.6140
noi	sil	0.0019	0.0070	-87.4085	-13.4109

Table S11 | Full statistics for posthoc pairwise comparisons. The table reports full statistics for the posthoc pairwise comparison for the dichotic listening experiment (SW repl). Abbreviations: *ani* animal, *env* environment, *ext* exterior, *hum* human, *mus* music, *noi* noise, *sil* silence.

Category 1	Category 2	p value	eta2	CI95% lower	CI95% upper
SW repl	ani	0.9200	0.0006	-57.0748	25.2781
SW repl	env	0.9998	0.0001	-51.6010	39.0743
SW repl	ext	0.0457	0.0049	-89.4474	-0.5010
SW repl	hum	0.9384	0.0003	-43.1054	19.9991
SW repl	mus	0.9493	0.0006	-61.1334	29.2667
SW repl	noi	1.0000	0.0000	-36.5461	45.0705
SW repl	sil	0.0000	0.0166	-143.5963	-46.5271
ani	sil	0.0035	0.0249	-139.9673	-18.3594
env	sil	0.0000	0.0201	-134.8203	-36.0330
ext	sil	0.0000	0.0420	-179.5136	-68.7614
hum	sil	0.0004	0.0224	-150.5336	-30.8994
mus	sil	0.0000	0.0253	-138.9469	-51.2464
noi	sil	0.0033	0.0149	-132.2090	-17.5933

Table S12 | Peak location of brain activity. (a) Significant brain activity when comparing SW against all other sounds, (b) other sounds versus SW, (c) SW versus animated sounds, (d) animated versus SW, (e) SW versus artificial sounds, (f) and artificial sounds versus SW sounds. All brain activity includes a voxel threshold $p < 0.05$ (FWE corrected), cluster threshold $k=10$.

Region	Cluster size	Z value	MNI coordinates		
			x	y	z
(a) SW > other sounds					
L occipital gyrus	13	4.66	-28	-84	6
R middle frontal gyrus	165	6.32	46	34	24
R inferior frontal gyrus	297	5.88	40	50	4
		4.59	46	40	-8
R medial frontal cortex	243	5.46	6	34	42
		5.38	8	40	32
R inferior frontal gyrus	28	5.26	48	16	8
R insula	76	5.14	34	20	2
		4.80	32	24	-6
R intraparietal sulcus	54	5.00	30	-56	38
(b) Other sounds > SW					
L superior temporal gyrus	3101	Inf	-54	-20	4
L planum polare		4.63	-38	0	-20
R planum temporale	3537	Inf	54	-18	2
R superior temporal gyrus		Inf	64	-26	6
(c) SW > animated sounds					
L occipital gyrus	115	5.30	-28	-84	6
L inferior temporal gyrus	136	5.26	-42	-76	-4
L inferior frontal sulcus	61	5.00	-28	-8	42
R middle frontal gyrus	1334	7.36	46	34	24
		6.17	40	58	6
R inferior frontal sulcus		6.07	40	56	-2
R middle frontal gyrus	515	6.21	20	0	52
R medial frontal cortex		6.02	8	38	32
		5.65	6	30	40
R intraparietal sulcus	879	5.78	42	-52	46
		5.60	38	-48	40
		5.10	48	-38	42
R insula	88	5.36	32	20	2
R inferior temporal sulcus	21	4.89	40	-54	-14
(d) Animated sounds > SW					
L superior temporal gyrus	5941	Inf	-62	-18	0
L superior temporal sulcus		Inf	-42	-36	8
L planum polare		Inf	-38	0	-20
L inferior frontal gyrus	244	7.46	-42	28	-2
		4.79	-36	32	-14
R superior temporal gyrus	5726	Inf	62	-10	-4
		Inf	62	-28	4

R inferior frontal gyrus	27	5.03	56	32	2
(e) SW > artificial sounds					
R middle frontal gyrus	67	5.50	48	32	24
R inferior frontal sulcus	141	5.17	42	54	6
R medial frontal cortex	28	4.84	8	34	44
(f) Artificial sounds > SW					
L planum temporale	1315	Inf	-52	-20	4
L superior temporal gyrus		7.77	-56	-32	8
L superior temporal sulcus		5.51	-50	-2	-10
R planum temporale	1648	Inf	54	-16	2
R superior temporal gyrus		Inf	66	-22	6
R superior temporal sulcus		6.60	52	0	-10

Table S13 | Functional brain clusters resulting from connectivity analyses. (a) Significant functional connectivity with right fronto-parietal seeds, **(b)** left auditory cortex seeds, **(c)** right auditory cortex seeds. Voxel-level threshold of $p=0.005$ combined with an FWE-corrected cluster-level threshold of $p=0.05$.

Cluster	Cluster size	MNI coordinates		
		x	y	z
(a) Right fronto-parietal seeds				
L inferior frontal gyrus, insula	883	-34	24	-6
R medial frontal cortex, anterior cingulate cortex	617	6	22	50
R inferior frontal cortex, insula	328	44	18	0
(b) Left auditory cortex seeds				
L medial frontal cortex	1171	-6	42	46
L motor cortex	497	-26	-20	68
L angular gyrus, superior temporal sulcus	461	-24	-84	-38
L superior temporal gyrus	437	-58	-62	22
R angular gyrus, superior temporal sulcus	1598	36	-80	44
R inferior frontal gyrus, insula	383	46	12	4
(c) Right auditory cortex seeds				
L cuneus	415	-4	-92	34

Table S14 | Peak location of brain activity for the cross-correlation analysis. (a) Significant brain activity for the cross-correlation approach with the acoustic patterns and **(b)** with the perceptual rating patterns. All brain activity includes a voxel threshold $p < 0.05$ (FWE corrected), cluster threshold $k=10$.

Region	Cluster size	Z value	MNI coordinates		
			x	y	z
(a) Acoustic: cross-correlation					
L superior temporal gyrus	9548	Inf	-56	-10	-2
		Inf	-60	-30	2
L motor cortex		6.57	-58	6	16
L middle frontal gyrus	152	5.46	-48	-4	50
		5.06	-50	-16	44
L motor cortex		4.84	-40	-12	52
R superior temporal gyrus	8005	Inf	54	-8	-6
		Inf	60	-18	-4
R inferior frontal gyrus		5.48	52	28	6
R motor cortex	357	5.77	50	4	40
R inferior frontal sulcus		4.93	44	14	40
R medial frontal cortex	105	5.37	2	10	52
R medial frontal cortex	44	5.33	8	58	32
R angular gyrus	48	5.22	38	-68	42
R precuneus	24	5.16	2	-54	44
R motor cortex	21	5.08	44	-14	52
R middle frontal gyrus		4.67	44	-4	54
R inferior frontal gyrus	42	4.94	46	24	28
(b) Perceptual rating: cross-correlation					
L Heschl's gyrus	641	5.90	-42	-30	6
R planum temporale	1046	6.63	46	-22	2
R superior temporal gyrus		6.59	58	-26	10