Supplemental Figure 1.

Consistent relationships were observed between TEOAE-CNF, TEOAE-SNR, and the nearest frequency pure-tone thresholds in the 1-4 kHz frequency-bands (rows). Lower TEOAE-CNF (left column) and lower TEOAE-SNR (middle column) were associated with higher pure-tone thresholds. A nonlinear association between TEOAE-SNR and TEOAE-CNF was also observed for each frequency-band (right column). As noted in the text, this relationship reflects that more variable TEOAE waveforms have both lower SNR and lower correlations across measurements. The sigmoid function (right column) reflects a mapping between the dB scale for TEOAE-SNR and the bounded [0, 1] scale for TEOAE-CNF. Floor values for TEOAE-SNR and TEOAE-CNF predominated at higher frequency-bands (especially 4 kHz), where the widest range of pure-tone thresholds is seen. Because pure-tone thresholds at 1.5 kHz were interpolated, they are not spaced apart in 5 dB HL intervals. Colors indicate the phenotype classification for each ear: gray-Older-Normal, green-Metabolic, red-Sensory, blue-Metabolic + Sensory.

Supplementary Table 1A. Band-frequency measures of TEOAE-SNR

TEOAE-SNR, Base-class: Older-Normal		MET	SEN	MET+SEN	Num (O-N, M, S, MS)
SNR1K	Compliance, Pressure	-4.92***	-	-10.07***	[179, 99, 363, 204]
SNR15K	Sex (M), Age, Compliance	-5.74***	-	-11.55***	[229, 129, 463, 279]
SNR2K	Sex (M), Age, Canal Volume, Compliance	-6.41***	-3.48**	-12.23***	[232, 129, 458, 263]
SNR3K	Sex (M), Age, Canal Volume	-10.07***	-7.88***	-13.41***	[231, 126, 434, 262]
SNR4K	Sex (M), Age, Canal Volume, Compliance	-10.38***	-9.93***	-13.99***	[230, 111, 402, 247]

TEOAE-SNR, Base-class: Sensory		ON	MET	MET+SEN	Num (S, O-N, M, MS)
SNR1K	Compliance, Pressure	-	-4.07***	-10.03***	[363, 179, 99, 204]
SNR15K	Sex (M), Age, Compliance	-	-5.64***	-13.72***	[463, 229, 129, 279]
SNR2K	Sex (M), Age, Canal Volume, Compliance	3.48**	-4.30***	-11.77***	[458, 232, 129, 263]
SNR3K	Sex (M), Age, Canal Volume	7.88***	-4.67***	-8.32***	[434, 231, 126, 262]
SNR4K	Sex (M), Age, Canal Volume, Compliance	9.93***	-3.43**	-6.66***	[402, 230, 111, 247]

TEOAE-SNR, Base-class: Metabolic		ON	SEN	MET+SEN	Num (M, O-N, S, MS)
SNR1K	Compliance, Pressure	4.92***	4.07***	-3.40**	[99, 179, 363, 204]
SNR15K	Sex (M), Age, Compliance	5.74***	5.64***	-4.68***	[129, 229, 463, 279]
SNR2K	Sex (M), Age, Canal Volume, Compliance	6.41***	4.30***	-4.65***	[129, 232, 458, 263]
SNR3K	Sex (M), Age, Canal Volume	10.07***	4.67***	-	[126, 231, 434, 262]
SNR4K	Sex (M), Age, Canal Volume, Compliance	10.38***	3.43**	-	[111, 230, 402, 247]

Supplementary Table 1B. Band-frequency measures of TEOAE-CNF

TEOAE-CNF, Base-class: Older-Normal		MET	SEN	MET+SEN	Num (O-N, M, S, MS)
CNF1K	Compliance	-4.50***	-	-11.86***	[224, 119, 461, 251]
CNF15K	Sex (M), Age, Compliance	-4.89***	-	-11.02***	[228, 124, 462, 266]
CNF2K	Sex (M), Age, Compliance	-5.40***	-2.96*	-12.18***	[231, 123, 452, 247]
CNF3K	Sex (M), Age, Canal Volume	-9.06***	-6.81***	-12.69***	[230, 114, 411, 239]
CNF4K	Sex (M), Age, Canal Volume, Compliance	-9.84***	-9.34***	-13.46***	[228, 103, 373, 224]

TEOAE-CNF, Base-class: Sensory		ON	MET	MET+SEN	Num (S, O-N, M, MS)
CNF1K	Compliance	-	-4.08***	-12.75***	[461, 224, 119, 251]
CNF15K	Sex (M), Age, Compliance	-	-4.87***	-13.28***	[462, 228, 124, 266]
CNF2K	Sex (M), Age, Compliance	2.96*	-3.61**	-12.32***	[452, 231, 123, 247]
CNF3K	Sex (M), Age, Canal Volume	6.81***	-4.47***	-8.71***	[411, 230, 114, 239]
CNF4K	Sex (M), Age, Canal Volume, Compliance	9.34***	-3.39**	-6.72***	[373, 228, 103, 224]

TEOAE-CNF, Base-class: Metabolic		ON	SEN	MET+SEN	Num (M, O-N, S, MS)
CNF1K	Compliance	4.50***	4.08***	-5.40***	[119, 224, 461, 251]
CNF15K	Sex (M), Age, Compliance	4.89***	4.87***	-5.20***	[124, 228, 462, 266]
CNF2K	Sex (M), Age, Compliance	5.40***	3.61**	-5.77***	[123, 231, 452, 247]
CNF3K	Sex (M), Age, Canal Volume	9.06***	4.47***	-	[114, 230, 411, 239]
CNF4K	Sex (M), Age, Canal Volume, Compliance	9.84***	3.39**	-	[103, 228, 373, 224]

Note 1: Each table provides the difference between in frequency-band TEOAE-SNR or TEOAE-CNF for a phenotype compared to the "base-class".

Note 2: Asterisks denote significant results (p < 0.05, ** p < 0.01, *** p < 0.001) after Bonferroni-correction for six phenotype comparisons within each frequency-band.*

Note 3: number of observations (Num) varied based on missing values.

Supplementary Table 2A. TEOAE-SNR Configuration Statistics

TEOAE-SNR, Base-class: Older-Normal

Factor	Estimate	Std. Error	Z	p	
Intercept	15.26	1.22	12.46	< 0.001	*
Slope	-4.56	0.59	-7.75	< 0.001	*
Metabolic Intercept	-6.12	0.53	-11.57	< 0.001	*
Sensory Intercept	-3.65	0.40	-9.12	< 0.001	*
Metabolic+Sensory Intercept	-7.59	0.46	-16.51	< 0.001	*
Sex (M)	-2.38	0.32	-7.42	< 0.001	*
Age	-0.10	0.02	-5.75	< 0.001	*
Canal Volume	-0.96	0.39	-2.46	0.014	
Compliance	-0.88	0.24	-3.74	< 0.001	*
Metabolic Slope	-2.80	1.00	-2.79	0.005	*
Sensory Slope	-5.69	0.73	-7.80	< 0.001	*
Metabolic+Sensory Slope	0.75	0.81	0.92	0.356	

TEOAE-SNR, Base-class: Sensory

Factor	Estimate	Std. Error	Z	p	
Intercept	11.61	1.34	8.67	< 0.001	*
Slope	-10.25	0.43	-23.84	< 0.001	*
Older-Normal Intercept	3.65	0.40	9.12	< 0.001	*
Metabolic Intercept	-2.47	0.47	-5.31	< 0.001	*
Metabolic+Sensory Intercept	-3.93	0.36	-10.85	< 0.001	*
Sex (M)	-2.38	0.32	-7.42	< 0.001	*
Age	-0.10	0.02	-5.75	< 0.001	*
Canal Volume	-0.96	0.39	-2.46	0.014	
Compliance	-0.88	0.24	-3.74	< 0.001	*
Older-Normal Slope	5.69	0.73	7.80	< 0.001	*
Metabolic Slope	2.89	0.92	3.14	0.002	*
Metabolic+Sensory Slope	6.43	0.70	9.18	< 0.001	*

TEOAE-SNR, Base-class: Metabolic

Factor	Estimate	Std. Error	Z	p	
Intercept	9.14	1.40	6.53	< 0.001	*
Slope	-7.36	0.81	-9.04	< 0.001	*
Older-Normal Intercept	6.12	0.53	11.57	< 0.001	*
Sensory Intercept	2.47	0.47	5.31	< 0.001	*
Metabolic+Sensory Intercept	-1.46	0.50	-2.95	0.003	*
Sex (M)	-2.38	0.32	-7.42	< 0.001	*
Age	-0.10	0.02	-5.75	< 0.001	*
Canal Volume	-0.96	0.39	-2.46	0.014	
Compliance	-0.88	0.24	-3.74	< 0.001	*
Older-Normal Slope	2.80	1.00	2.79	0.005	*
Sensory Slope	-2.89	0.92	-3.14	0.002	*
Metabolic+Sensory Slope	3.54	0.98	3.60	< 0.001	*

Supplementary Table 2B. TEOAE-CNF Configuration Statistics

TEOAE-CNF, Base-class: Older-Normal

Factor	Estimate	Std. Error	Z	p	
Intercept	2.69	0.22	12.04	< 0.001	*
Slope	-0.77	0.10	-7.37	< 0.001	*
Metabolic Intercept	-1.10	0.10	-11.26	< 0.001	*
Sensory Intercept	-0.66	0.07	-8.94	< 0.001	*
Metabolic+Sensory Intercept	-1.42	0.08	-16.74	< 0.001	*
Sex (M)	-0.42	0.06	-7.26	< 0.001	*
Age	-0.02	0.00	-5.51	< 0.001	*
Canal Volume	-0.16	0.07	-2.29	0.0222	
Compliance	-0.17	0.04	-4.04	< 0.001	*
Metabolic Slope	-0.68	0.18	-3.83	< 0.001	*
Sensory Slope	-1.08	0.13	-8.33	< 0.001	*
Metabolic+Sensory Slope	-0.05	0.14	-0.35	0.728	

TEOAE-CNF, Base-class: Sensory

Factor	Estimate	Std. Error	Z	p	
Intercept	2.04	0.24	8.36	< 0.001	*
Slope	-1.85	0.08	-24.02	< 0.001	*
Older-Normal Intercept	0.66	0.07	8.94	< 0.001	*
Metabolic Intercept	-0.44	0.09	-5.15	< 0.001	*
Metabolic+Sensory Intercept	-0.76	0.07	-11.30	< 0.001	*
Sex (M)	-0.42	0.06	-7.26	< 0.001	*
Age	-0.02	0.00	-5.51	< 0.001	*
Canal Volume	-0.16	0.07	-2.29	0.022	
Compliance	-0.17	0.04	-4.04	< 0.001	*
Older-Normal Slope	1.08	0.13	8.33	< 0.001	*
Metabolic Slope	0.40	0.16	2.45	0.014	
Metabolic+Sensory Slope	1.03	0.12	8.25	< 0.001	*

TEOAE-CNF, Base-class: Metabolic

Factor	Estimate	Std. Error	Z	p	
Intercept	1.59	0.25	6.26	< 0.001	*
Slope	-1.45	0.14	-10.08	< 0.001	*
Older-Normal Intercept	1.10	0.10	11.26	< 0.001	*
Sensory Intercept	0.44	0.09	5.15	< 0.001	*
Metabolic+Sensory Intercept	-0.32	0.09	-3.44	< 0.001	*
Sex (M)	-0.42	0.06	-7.26	< 0.001	*
Age	-0.02	0.00	-5.51	< 0.001	*
Canal Volume	-0.16	0.07	-2.29	0.0222	
Compliance	-0.17	0.04	-4.04	< 0.001	*
Older-Normal Slope	0.68	0.18	3.83	< 0.001	*
Sensory Slope	-0.40	0.16	-2.45	0.014	
Metabolic+Sensory Slope	0.63	0.17	3.61	< 0.001	*

Note 1: Each table provides the difference between the shape parameters for a phenotype compared to the "base-class".

Note 2: Asterisks indicate significant results after Bonferroni-correcting alpha for six phenotype comparisons (0.05/6 = 0.00833)

Note 3: The dependent variable for these analyses was each frequency-band OAE measurement, so there were approximately 5 obs per ear.

Phenotype	n obs
Older-Normal	1154
Metabolic	625
Sensory	2227
Metabolic+Sensory	1322

Phenotype	n obs
Older-Normal	1141
Metabolic	583
Sensory	2158
Metabolic+Sensory	1227