- Supplementary Digital Content - Pinna-Imitating Microphone Directivity Improves Sound Localization and Discrimination in Bilateral Cochlear Implant Users

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Abstract

The following material refers to the publication "Pinna-Imitating Microphone Directivity Improves Sound Localization and Discrimination in Bilateral Cochlear Implant Users". It shows alternative and partly more detailed forms of presentation of the data.

1 Static sound source localization

Table 1: Influence of front-back confusions (FBCs) on the root mean square error ($\mathrm{RMSE_{LOC}}$) in the static sound source localization test for each subject. Shown is the data for the omnidirectional microphone setting (OMNI) in degree angle.

Subject	$\mathrm{RMSE_{LOC}}$	$\mathrm{RMSE_{LOC}}$ (with FBCs)
CI01	34.0	80.5
CI02	21.5	60.7
CI03	20.7	66.7
CI04	30.4	76.6
CI05	33.2	62.9
CI06	32.2	64.3
CI07	41.2	60.3
CI08	38.0	59.6
CI09	39.0	55.2
CI10	30.1	68.5
CI11	30.6	57.9
CI12	20.8	65.3
Mean	31.0	64.9
SD	7.0	7.4
Median	31.4	63.6

Table 2: Influence of front-back confusions (FBCs) on the root mean square error ($\mathrm{RMSE_{LOC}}$) in the static sound source localization test for each azimuth. Shown is the data for the omnidirectional microphone setting (OMNI) in degree angle.

	FBCS excluded			**FBCS included**			**Δ (included-excluded)**		
Azimuth	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
0°	27.8	26.5	19.0	63.4	55.3	54.6	35.6	28.8	35.6
30°	37.3	21.7	43.0	62.5	32.5	71.0	25.2	10.8	28.0
60°	31.0	20.3	27.5	48.2	16.9	49.2	17.2	-3.4	21.7
90°	21.2	13.8	17.8	21.2	13.8	17.8	0.0	0.0	0.0
120°	16.8	9.0	17.7	26.2	15.4	21.6	9.4	6.4	3.9
150°	41.6	18.0	43.8	60.6	22.5	56.9	19.0	4.5	13.1
180°	40.6	27.1	49.4	120.9	43.2	132.9	80.3	16.1	83.5
210°	43.9	26.7	47.1	77.3	31.7	79.7	33.4	5.0	32.6
240°	14.7	8.8	15.8	30.2	14.3	23.1	15.5	5.5	7.3
270°	25.0	9.9	24.1	25.0	9.9	24.1	0.0	0.0	0.0
300°	20.1	12.5	22.2	43.1	13.8	42.1	23.0	1.3	19.9
330°	29.5	18.1	28.9	54.0	36.0	45.3	24.5	17.9	16.4

Table 3: Influence of front-back confusions (FBCs) on the root mean square error ($\mathrm{RMSE}_{\mathrm{LOC}}$) in the static sound source localization test for each subject. Shown is the data for the pinna-imitating microphone setting (PI) in degree angle.

Subject	$\mathrm{RMSE}_{\mathrm{LOC}}$	$\mathrm{RMSE}_{\mathrm{LOC}}$ (with FBCs)
CI01	20.4	31.6
CI02	20.1	50.6
CI03	28.0	60.3
CI04	37.7	68.8
CI05	32.1	57.7
CI06	20.9	36.7
CI07	29.3	56.0
CI08	38.4	58.4
CI09	30.7	44.1
CI10	24.4	62.7
CI11	32.9	64.8
CI12	23.7	34.2
Mean	36.9	52.2
SD	13.4	12.6
Median	39.6	56.9

Table 4: Influence of front-back confusions (FBCs) on the root mean square error ($\mathrm{RMSE}_{\mathrm{LOC}}$) in the static sound source localization test for each azimuth. Shown is the data for the pinna-imitating microphone setting (PI) in degree angle.

	FBCS excluded			**FBCS included**			**Δ (included-excluded)**		
Azimuth	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
0°	23.5	24.1	12.1	44.5	48.6	26.6	21.0	24.5	14.5
30°	39.0	15.2	38.9	47.4	19.9	41.0	8.4	4.7	2.1
60°	15.1	8.8	15.8	34.5	16.9	35.9	19.4	8.1	20.1
90°	22.4	8.6	22.0	22.4	8.6	22.0	0.0	0.0	0.0
120°	12.4	7.6	12.7	22.3	9.5	23.8	9.9	1.9	11.1
150°	30.8	17.5	28.6	55.2	27.6	53.5	24.4	10.1	24.9
180°	31.8	23.4	31.4	84.4	57.2	86.0	52.6	33.8	54.6
210°	36.2	18.2	29.7	58.7	29.2	58.3	22.5	11.0	28.6
240°	12.9	9.1	12.1	33.5	16.5	30.7	20.6	7.4	18.6
270°	20.6	12.8	21.6	20.6	12.8	21.6	0.0	0.0	0.0
300°	17.8	8.3	19.3	35.2	16.1	36.7	17.4	7.8	17.4
330°	34.3	12.4	36.8	53.0	28.0	57.7	18.7	15.6	20.9

Table 5: A separate analysis of front-back and back-front confusions in the static sound source localization test. Shown is the data for the omnidirectional microphone setting (OMNI).

	Back-Front		**Front-Back**	
Subject	Occurences	Rate (%)	Occurences	Rate (%)
CI01	12	40	6	20.0
CI02	7	23.3	7	23.3
CI03	12	40	4	13.3
CI04	0	0	15	50.0
CI05	5	16.7	9	30.0
CI06	6	20	7	23.3
CI07	3	10	9	30.0
CI08	8	26.7	6	20.0
CI09	3	10	7	23.3
CI10	7	23.3	8	26.7
CI11	9	30	3	10.0
CI12	14	46.7	1	3.3
Mean	7	23.9	7	22.8
SD	4	13.8	4	11.7
Median	7	23.3	7	23.3

Table 6: A separate analysis of front-back and back-front confusions in the static sound source localization test. Shown is the data for the pinna-imitating microphone setting (PI).

	Back-Front		**Front-Back**	
Subject	Occurences	Rate (%)	Occurences	Rate (%)
CI01	3	10.0	0	0.0
CI02	4	13.3	3	10.0
CI03	8	26.7	2	6.7
CI04	0	0.0	14	46.7
CI05	10	33.3	3	10.0
CI06	3	10.0	4	13.3
CI07	8	26.7	4	13.3
CI08	5	16.7	10	33.3
CI09	1	3.3	6	20.0
CI10	10	33.3	5	16.7
CI11	12	40.0	4	13.3
CI12	6	20.0	2	6.7
Mean	6	19.4	5	15.8
SD	4	12.7	4	12.7
Median	6	18.4	4	13.3

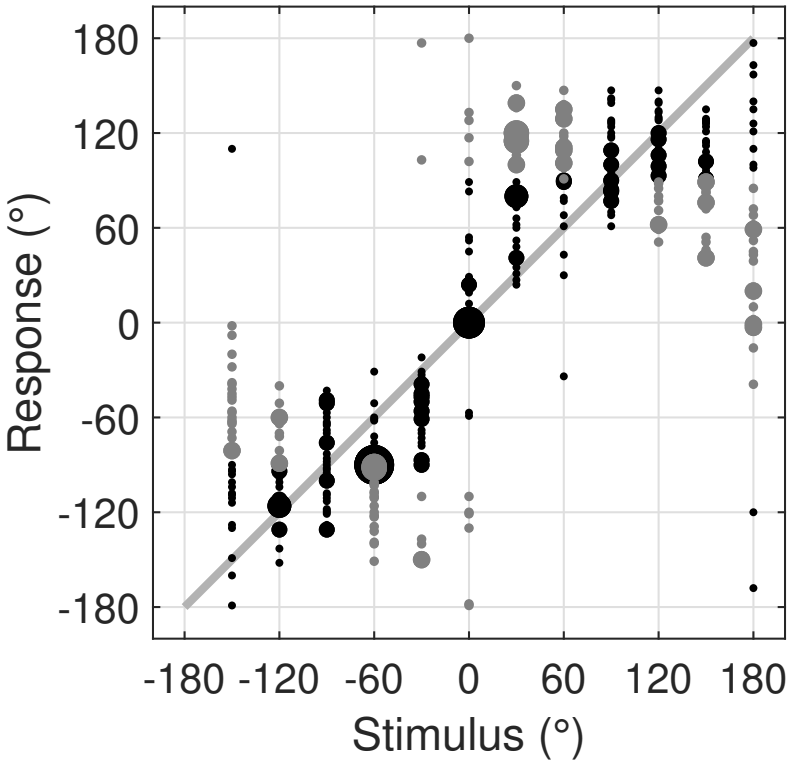

Figure 1: The plot shows the distribution of indicated response positions for given stimuli positions with the omni directional microphone setting (OMNI). The responses on the diagonal indicate a perfect localization result. Regular localization errors are represented by black dots and front-back confusion (FBC) errors by grey dots.

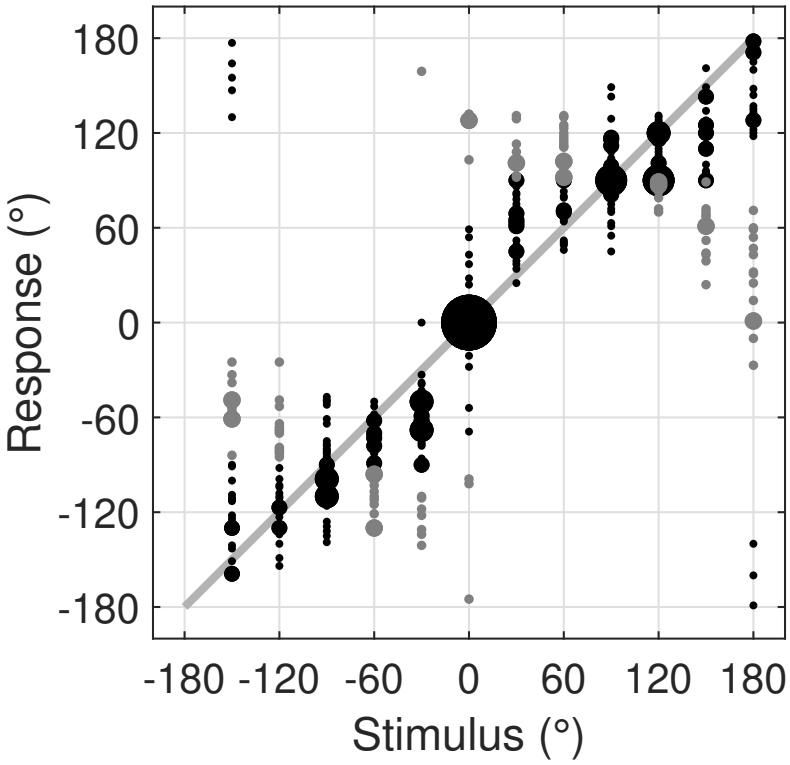

Figure 2: The plot shows the distribution of indicated response positions for given stimuli positions with the pinna-imitating microphone setting (PI). The responses on the diagonal indicate a perfect localization result. Regular localization errors are represented by black dots and front-back confusion (FBC) errors by grey dots.

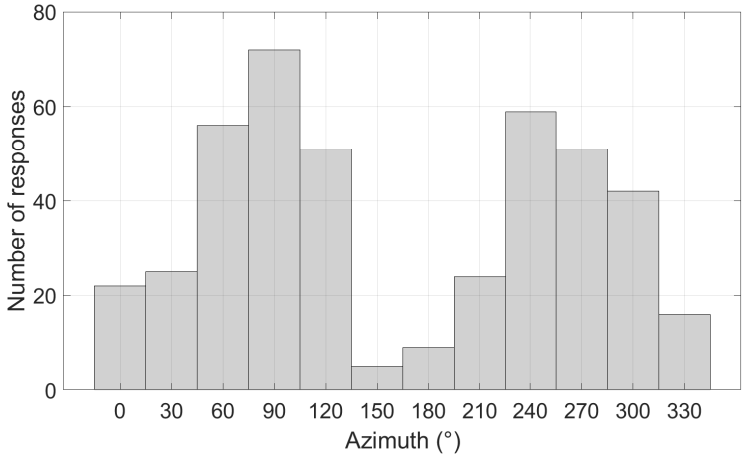

Figure 3: Histogram for the distribution of all responses (including those classified as FBCs) with the omni directional microphone setting (OMNI) for the static sound source localization tests. The responses are binned to the azimuths of the 12 possible stimuli directions.

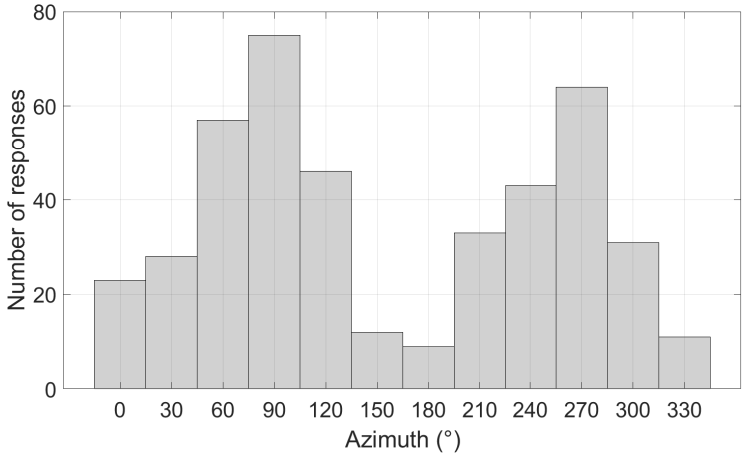

Figure 4: Histogram for the distribution of the responses (including those classified as FBCs) with the pinna-imitating microphone setting (PI) for the static sound source localization tests. The responses are binned to the azimuths of the 12 possible stimuli directions.

2 Minimum audible angle

Table 7: Minimum audible angle (MAA) performance averaged across all subjects with respect to the tested azimuth. The data compares the performance of the pinna-imitating microphone setting (PI) with the omnidirectional microphone setting (OMNI).

	OMNI			**PI**			**Δ (OMNI-PI)**		
Azimuth	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
0°	4.3	2.7	3.4	4.1	2.6	3.6	0.2	0.1	-0.2
45°	13.6	10.0	13.8	16.8	11.2	11.5	-3.3	-1.2	2.3
90°	71.9	27.0	85.9	34.7	21.2	30.5	37.2	5.9	55.4
135°	28.4	18.8	21.3	30.4	10.8	32.6	-2.0	8.0	-11.3
180°	7.0	5.0	5.9	8.4	9.6	6.3	-1.4	-4.6	-0.5
225°	26.2	12.3	25.3	18.3	14.4	11.5	7.9	-2.1	13.8
270°	79.0	18.6	87.3	40.7	22.0	37.3	38.4	-3.3	50.0
315°	12.2	6.0	8.6	12.9	13.1	10.2	-0.6	-7.0	-1.6
Overall	30.3	12.6	31.4	20.8	13.1	17.9	9.5	-0.5	13.5

Table 8: Minimum audible angle (MAA) performance for each subject. The data compares the performance of the pinna-imitating microphone setting (PI) with the omnidirectional microphone setting (OMNI).

	OMNI			**PI**			**Δ (OMNI-PI)**		
Subject	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
CI01	29.7	29.4	14.9	10.2	10.3	5.7	19.5	19.1	9.3
CI02	11.8	11.0	7.9	9.9	8.5	6.3	1.8	2.4	1.6
CI03	32.0	36.5	19.2	22.9	26.6	13.3	9.1	10.0	5.9
CI04	34.0	36.0	16.5	27.2	19.2	29.4	6.8	16.8	-12.9
CI05	30.4	33.5	17.4	36.1	31.0	33.7	-5.7	2.5	-16.3
CI06	36.9	38.3	22.6	17.0	15.0	10.2	20.0	23.3	12.4
CI07	36.0	34.2	22.4	22.8	13.4	19.0	13.2	20.8	3.4
CI08	27.4	24.2	24.4	22.2	17.3	21.9	5.2	6.9	2.5
CI09	35.2	35.1	25.8	23.1	16.5	24.0	12.1	18.6	1.8
CI10	26.7	36.9	9.5	22.2	20.9	14.7	4.6	16.0	-5.2
CI11	34.5	30.5	24.6	21.0	11.6	25.6	13.5	18.9	-0.9
CI12	29.3	29.8	14.0	14.8	15.0	8.1	14.5	14.7	5.9
Overall	30.3	7.6	18.3	20.8	6.6	16.8	9.5	1.0	1.5

2.1 Sound source tracking with touch pad

2.1.1 Steady trajectory

Table 9: Results on subject level for the sound source tracking with touch pad test and the steady trajectory. The data shows the performance with the omnidirectional microphone setting (OMNI). The columns of the table describe the following metrics: Position tracking error (RMSE_ϑ), front-back confusion (FBC) rate, percentage of correctly perceived movement direction, velocity tracking error (RMSE_ω), number of re-localizations of sound sources (ROS), duration of ROSs (Δt_{ros}), improvement after a ROS ($\Delta\mathrm{RMSE}_{\vartheta,\mathrm{ros}}$) and reaction time after a change in direcion (CID) of the stimulus (Δt_{cid}).

Subject	RMSE_ϑ (degree angle)	FBC rate (%)	Correct direction (%)	RMSE_ω (°/s)	N_{ros}	Δt_{ros} (ms)	$\Delta\mathrm{RMSE}_{\vartheta,\mathrm{ros}}$ (degree angle)	Δt_{cid} (ms)
CI01	50.1	21.7	86.3	2.9	11	810	34.2	6441
CI02	47.3	26.8	80.7	1.5	5	446	12.1	7160
CI03	57.4	32.9	60.2	2.9	16	511	20.6	2334
CI04	81.2	30.0	41.8	2.3	0	NaN	NaN	No CID perceived
CI05	86.5	54.2	57.0	2.4	7	663	16.6	No CID perceived
CI06	63.0	43.8	53.9	4.8	10	1302	49.9	No CID perceived
CI07	66.9	37.9	64.2	3.5	8	766	49.4	No CID perceived
CI08	51.6	37.6	65.9	4.4	15	730	36.1	3043
CI09	65.3	42.2	57.6	4.2	15	768	23.3	5566
CI10	59.9	32.5	62.4	2.2	6	279	16.0	5562
CI11	70.9	41.9	52.3	3.0	12	943	33.9	Wrong mov. dir.
CI12	48.1	20.1	81.6	4.6	6	713	43.5	8800
Mean	62.3	35.1	63.6	3.2	9	721	30.5	5558
SD	12.7	9.8	13.2	1.1	5	268	13.6	2257
Median	61.4	35.3	61.3	2.9	9	730	33.9	5566

Table 10: Results on subject level for the sound source tracking with touch pad test and the steady trajectory. The data shows the performance with the pinna-imitating microphone setting (PI). The columns of the table describe the following metrics: Position tracking error (RMSE_ϑ), front-back confusion (FBC) rate, percentage of correctly perceived movement direction, velocity tracking error (RMSE_ω), number of re-localizations of sound sources (ROS), duration of ROSs (Δt_{ros}), improvement after a ROS ($\Delta\mathrm{RMSE}_{\vartheta,\mathrm{ros}}$) and reaction time after a change in direcion (CID) of the stimulus (Δt_{cid}).

Subject	RMSE_ϑ (degree angle)	FBC rate (%)	Correct direction (%)	RMSE_ω (°/s)	N_{ros}	Δt_{ros} (ms)	$\Delta\mathrm{RMSE}_{\vartheta,\mathrm{ros}}$ (degree angle)	Δt_{cid} (ms)
CI01	62.8	24.8	78.6	3.7	5	892	41.8	12740
CI02	48.5	29.8	73.1	3.2	9	1012	54.5	No CID perceived
CI03	72.4	45.2	63.4	2.7	12	743	27.6	No CID perceived
CI04	83.9	31.6	43.1	2.5	6	403	12.5	No CID perceived
CI05	69.8	44.3	56.3	2.6	7	744	23.2	No CID perceived
CI06	53.5	29.0	66.5	2.7	8	1069	43.1	18311
CI07	24.8	7.5	87.2	1.6	5	780	26.5	2692
CI08	82.7	44.4	59.5	5.6	11	608	67.8	No CID perceived
CI09	39.7	15.1	84.3	2.0	13	572	21.9	5387
CI10	54.6	32.5	88.0	1.9	6	666	16.6	2693
CI11	56.5	25.2	93.9	1.3	3	992	26.0	4130
CI12	17.5	4.1	96.8	1.0	2	186	3.1	3234
Mean	55.6	27.8	74.2	2.6	7	722	30.4	7027
SD	20.9	13.6	16.7	1.2	3	259	18.3	6097
Median	55.5	29.4	75.8	2.5	7	743	26.3	4130

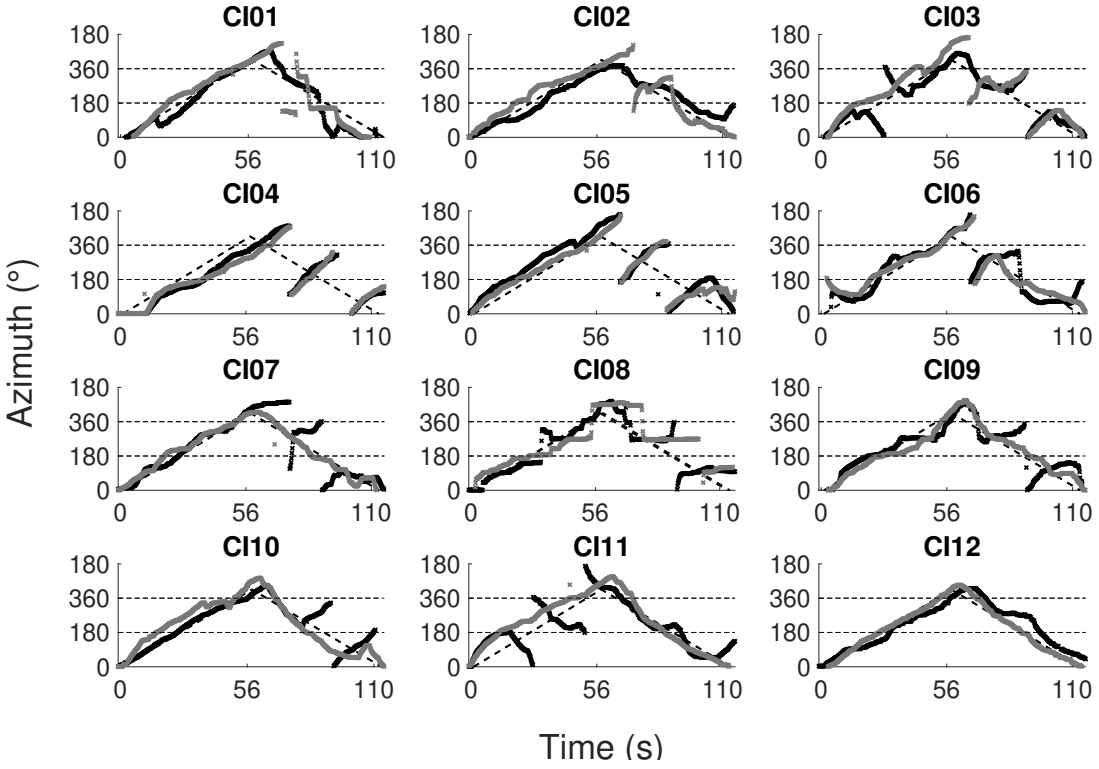

Figure 5: User and stimulus trajectories for the sound source tracking with touch pad test in the steady trajectory. The black line indicates the perceived trajectories with the omnidirectional microphone setting (OMNI). The performance with the pinna-imitating microphone setting (PI) is shown by the grey line. The underlying dotted line shows the trajectory of the stimulus. User inputs which result in errors bigger than 180° were set to the corresponding position closer to the stimulus.

2.1.2 Alternating trajectory

Table 11: Results on subject level for the sound source tracking with touch pad test and the alternating trajectory. The data shows the performance with the omnidirectional microphone setting (OMNI). The columns of the table describe the following metrics: Position tracking error ($\mathrm{RMSE}_{\vartheta}$), percentage of correctly perceived movement direction, velocity tracking error (RMSE_{ω}), number of re-localizations of sound sources (ROS), duration of ROSs (Δt_{ros}), improvement after a ROS ($\Delta\mathrm{RMSE}_{\vartheta,\mathrm{ros}}$).

Subject	$\mathrm{RMSE}_{\vartheta}$ (degree angle)	FBC rate (%)	Correct direction (%)	RMSE_{ω} (°/s)	N_{ros}	Δt_{ros} (ms)	$\Delta\mathrm{RMSE}_{\vartheta,\mathrm{ros}}$ (degree angle)
CI01	83.9	45.3	46.6	4.7	64	934	38.1
CI02	25.1	9.5	54.9	1.6	6	408	7.9
CI03	65.5	50.7	46.0	3.0	35	820	20.4
CI04	78.9	60.4	47.1	2.5	13	956	37.4
CI05	74.2	57.1	56.4	3.3	34	1103	36.5
CI06	50.8	35.0	57.6	2.1	9	845	31.2
CI07	72.1	43.1	53.7	3.1	29	793	29.8
CI08	64.7	38.6	50.3	2.9	8	851	37.4
CI09	75.2	60.7	52.5	2.2	17	513	24.6
CI10	74.1	61.1	43.3	3.5	33	1014	34.9
CI11	74.0	42.0	47.7	3.7	38	1304	42.4
CI12	60.5	50.9	48.7	2.1	9	756	42.7
Mean	66.6	46.2	50.4	2.9	25	858	31.9
SD	15.8	14.6	4.6	0.8	17	241	10.1
Median	73.0	48.0	49.5	2.9	23	848	35.7

Table 12: Results on subject level for the sound source tracking with touch pad test and the alternating trajectory. The data shows the performance with the pinna-imitating microphone setting (PI). The columns of the table describe the following metrics: Position tracking error (RMSE_ϑ). percentage of correctly perceived movement direction, velocity tracking error (RMSE_ω), number of re-localizations of sound sources (ROS), duration of ROSs (Δt_{ros}), improvement after a ROS ($\Delta\mathrm{RMSE}_{\vartheta,\mathrm{ros}}$).

Subject	RMSE_ϑ (degree angle)	FBC rate (%)	Correct direction (%)	RMSE_ω (°/s)	N_{ros}	Δt_{ros} (ms)	$\Delta\mathrm{RMSE}_{\vartheta,\mathrm{ros}}$ (degree angle)
CI01	73.2	35.2	44.9	4.4	51	916	42.6
CI02	32.8	8.7	56.2	1.7	8	546	17.7
CI03	64.0	46.4	49.8	3.5	35	797	36.6
CI04	82.6	50.0	57.8	2.5	20	757	30.8
CI05	68.6	52.5	46.1	4.0	39	1093	34.8
CI06	48.0	23.3	53.9	1.7	3	821	33.3
CI07	63.5	28.4	52.5	3.3	31	886	40.4
CI08	87.8	53.7	48.6	3.7	20	876	50.0
CI09	32.3	13.8	50.4	1.8	6	598	22.5
CI10	60.9	30.0	49.2	3.2	40	1045	32.7
CI11	79.8	41.5	49.2	2.5	19	982	25.6
CI12	32.5	18.2	52.3	2.7	20	493	35.6
Mean	60.5	33.5	50.9	2.9	24	817	33.5
SD	19.9	15.5	3.8	0.9	15	192	8.9
Median	63.8	32.6	50.1	2.9	20	848	34.1

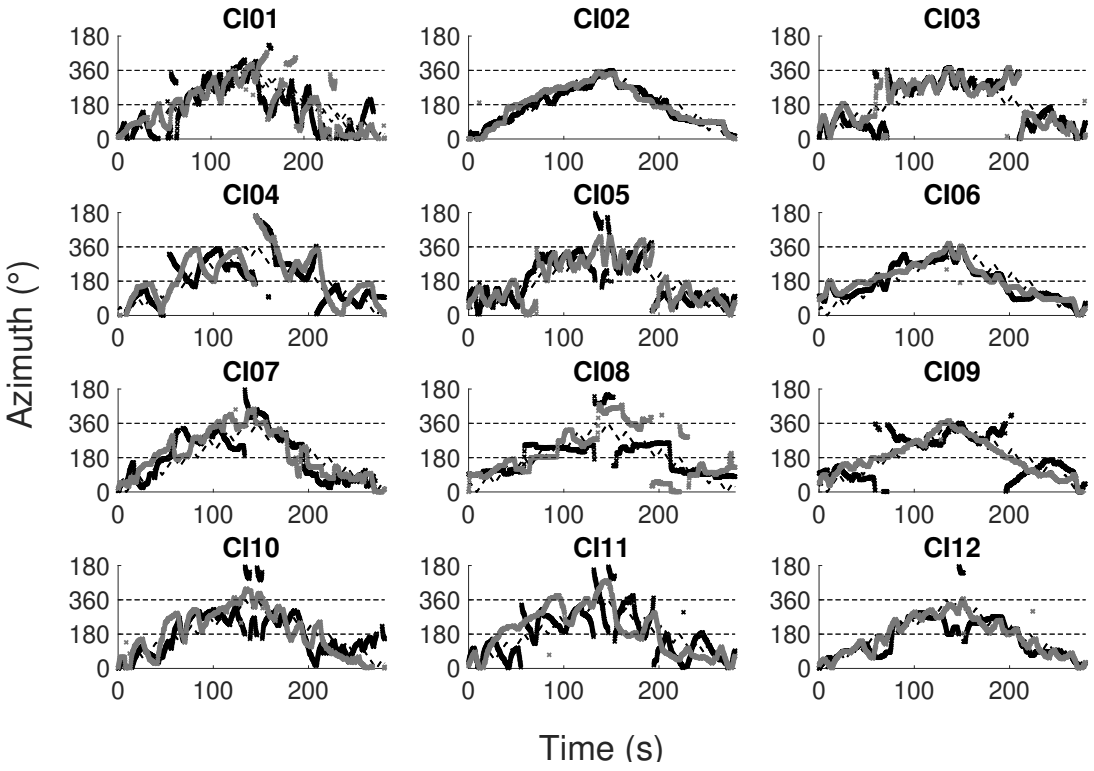

Figure 6: User and stimulus trajectories for the sound source tracking with touch pad test in the alternating trajectory. The black line indicates the perceived trajectories with the omnidirectional microphone setting (OMNI). The performance with the pinna-imitating microphone setting (PI) is shown by the grey line. The underlying dotted line shows the trajectory of the stimulus. For reasons of illustrativity, user inputs which result in errors bigger than 180°, were set to the corresponding position closer to the stimulus.

Table 13: Root mean square tracking errors (RMSE_ϑ) for specific movement directions (clockwise (CW) or counter-clockwise (CCW)) or hemifields (left, right, frontal, dorsal). The data refers to the omnidirectional microphone setting (OMNI) in the alternating trajectory and is given in degree angle. Hemifields have an angular span of 180-degree angle each.

Subject	CW	CCW	Left	Right	Dorsal	Frontal
CI01	85.5	82.1	68.7	96.6	88.8	77.6
CI02	24.6	25.3	22.7	27.4	25.8	24.3
CI03	65.4	65.7	64.9	67.4	83.7	32.9
CI04	76.8	80.9	86.4	70.5	72.4	85.7
CI05	73.0	75.1	87.9	58.6	77.7	69.1
CI06	54.0	47.1	53.1	48.8	51.1	50.1
CI07	72.5	71.6	69.8	74.7	81.4	58.9
CI08	60.3	68.8	76.6	50.8	42.7	82.8
CI09	75.6	74.5	76.3	75.2	91.1	50.1
CI10	66.8	80.3	80.3	67.7	63.9	83.5
CI11	66.1	81.1	77.7	70.8	78.2	68.2
CI12	54.3	65.9	72.6	46.3	49.3	70.6
Mean	64.6	68.2	69.8	62.9	67.2	62.8
SD	15.6	16.7	17.6	17.8	20.6	20.1
Median	66.5	73.1	74.5	67.5	75.0	68.7

Table 14: Root mean square tracking errors (RMSE_ϑ (degree angle)) for specific movement directions (clockwise (CW) or counter-clockwise (CCW)) or hemifields (left, right, frontal, dorsal). The data refers to the pinna-imitating microphone setting (PI) in the alternating trajectory. Hemifields have an angular span of 180-degree angle each.

Subject	CW	CCW	Left	Right	Dorsal	Frontal
CI01	64.1	81.2	79.8	66.3	82.6	60.8
CI02	33.6	31.7	30.2	35.3	37.4	26.7
CI03	62.0	65.9	60.7	67.6	74.9	47.7
CI04	74.2	90.1	90.0	75.1	78.7	86.5
CI05	71.8	64.8	69.5	68.3	81.7	49.1
CI06	52.8	42.1	38.8	55.3	41.6	54.3
CI07	64.2	62.8	71.2	55.4	72.4	51.8
CI08	76.7	97.6	96.6	78.9	94.5	79.2
CI09	29.6	34.4	25.5	37.8	27.3	37.4
CI10	60.1	61.2	54.4	66.7	69.6	48.9
CI11	83.4	75.9	87.5	72.5	91.0	64.5
CI12	35.0	29.5	30.8	34.2	36.0	27.9
Mean	59.0	61.4	61.2	59.5	65.6	52.9
SD	17.8	22.9	25.2	15.9	23.5	18.2
Median	63.1	63.8	65.1	66.5	73.7	50.4

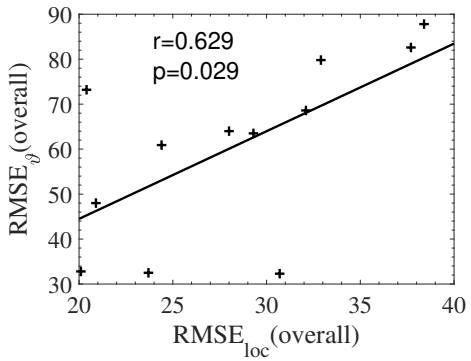

Figure 7: The data on the *x* axis represents the root mean square localization error ($\mathrm{RMSE}_{\mathrm{LOC}}$) of the static sound source localization test. On the *y* axis, the root mean square tracking error ($\mathrm{RMSE}_{\vartheta}$) of the sound source tracking with touchpad in the alternating trajectory is shown. The data refers to the pinna-imitating microphone setting (PI).

3 Discussion data

Table 15: Comparison of the averaged minimum audible angle (MAA) values from this study with the references mentioned in the discussion of this article. For the MAA values at the sides (90 degree angle and 270 degree angle), both references were limited to MAA measurements smaller than 90 degree angle and therefore were not suitable for a comparison with this study. The abbreviations for the microphone settings are listed below: pinna-imitating microphone setting (PI), omnidirectional microphone setting (OMNI), in-the-canal positioning of an omnidirectional microphone (ITC). n.a. = data not available. All numerical values were given in degree angle.

Reference	Microphone-setting	MAA (0°)	MAA (180°)	MAA (45° and 315°)	MAA (135° and 225°)
This study	PI	4.1	8.4	14.9	24.4
This study	OMNI	4.3	7.0	12.9	27.3
Senn et al. (2005)	OMNI	5.4	5.4	9.0	10.6
Mantokoudis et al. (2011)	OMNI	10.1	10.7	n.a.	n.a.
Mantokoudis et al. (2011)	ITC	8.4	10.1	n.a.	n.a.

Table 16: Comparison of the averaged root mean square error ($\mathrm{RMSE_{LOC}}$) and front-back confusion (FBC) results from the static sound source localization test of this study with the references mentioned in the discussion of this article. For the computation of the $\mathrm{RMSE_{LOC}}$, FBCs were not excluded from the error metric. Frontal azimuths described an angular range of $\pm$90 degree angle centered around the 0 degree angle position. The abbreviations for the microphone settings are listed below: pinna-imitating microphone setting (PI), omnidirectional microphone setting (OMNI), in-the-canal positioning of an omnidirectional microphone (ITC), behind-the-ear positioning of an omnidirectional microphone (BTE). n.a. = data not available. All numerical values of $\mathrm{RMSE_{LOC}}$ were given in degree angle. The FBC rate was given in percent.

Reference	Microphone setting	$\mathrm{RMSE_{LOC}}$	$\mathrm{RMSE_{LOC}}$ (frontal azimuths)	FBC rate
This study	PI	52	23	35
This study	OMNI	65	27	47
Frohne-Büchner et al. (2004)	ITC	ca. 48*	n.a.	n.a.
Frohne-Büchner et al. (2004)	BTE	ca. 87*	n.a.	n.a.
Dorman et al. (2018)	OMNI	n.a.	19	n.a.
Dorman et al. (2018)	PI	n.a.	20	n.a.
Jones et al. (2016)	ITC	n.a.	25	n.a.
Jones et al. (2016)	BTE	n.a.	29	n.a.
Pastore et al. (2018)	n.a.	n.a.	n.a.	42
Majdak et al. (2011)	Virtual cues	n.a.	n.a.	37

*No numerical data available. The values were extracted from figures.

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