

RM文獻閱讀分享

我沒想過的問題

黃美睿 聽力師

中國附醫 全方位聽覺健康中心 暨 北分院耳鼻喉科
高雄師範大學特教博班溝通障礙組





HOLISTIC HEARING HEALTHCARE
全方位聽覺健康中心

Individual Differences Offer Insight Into Clinical Recommendations for Directional and Remote Microphone Technology Use in Children

Gustafson, S. J., Ricketts, T. A., Picou, E. M. (2021).
Journal of Speech, Language, and Hearing Research,
64, 635-650.

DM VS RM

- Advantage
- Disadvantage

DM VS RM

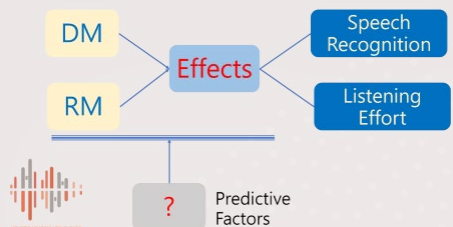
	Directional Microphones DM	Remote Microphones RM
目的	減少因為訊噪比差造成的挑戰	
優點	降低助聽器對某些角度聲音的敏感度，改善SNR	麥克風靠近單一音源，改善SNR
缺點	使用者不是面對音源的時候	太強的SNR，使用者無法聽清不是音源的聲音
	只限於某些特定情境會有幫助	

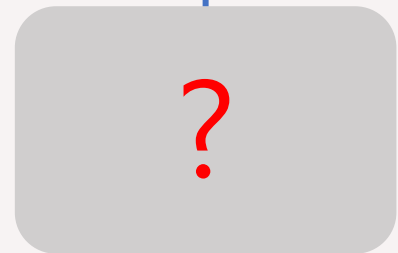
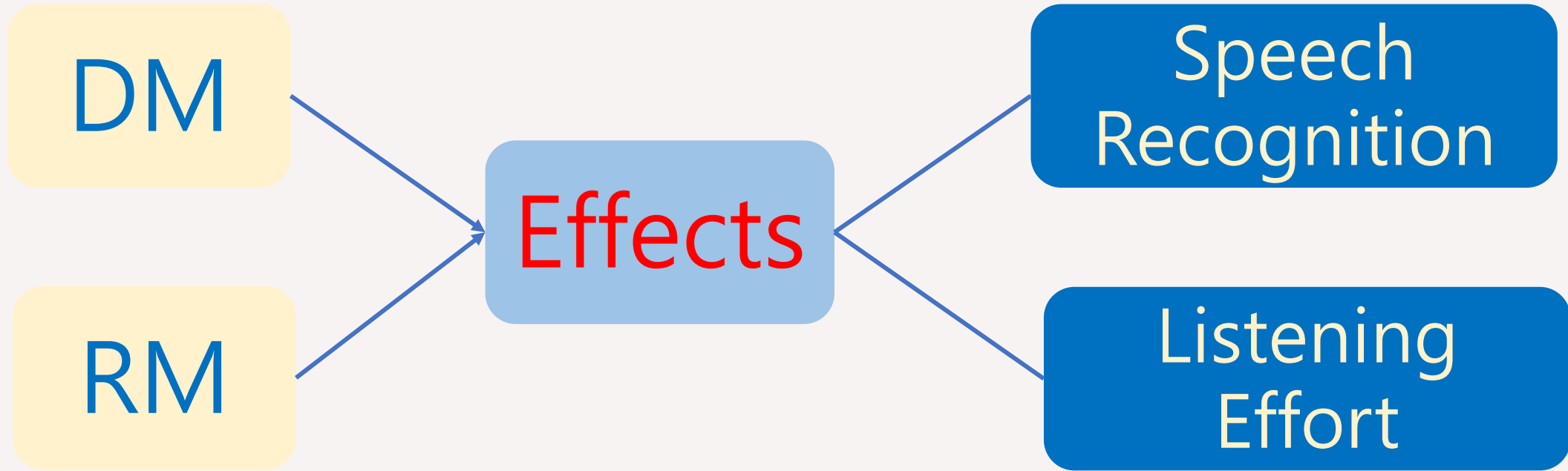


Concern

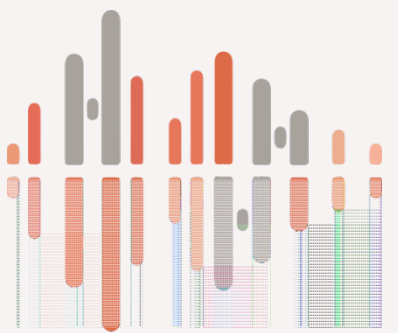


- Speech Recognition
- Listening effort







Predictive Factors



測試輔具及情境



	Conference 	
Orientation	Horizontal 	
Noise level	Quiet (<70dB)	Noise (>70dB)
Pickup distance	Up to 10 feet all around	Up to 3 feet frontal
Signal processing	Omni	Fixed Beamformer



Omnidirectional



Adaptive directional



Remote microphone
+ Omnidirectional

Listening Effort Task



PRIMARY TASK
單音節字詞辨識



SECONDARY TASK
VISUAL SHAPE RECOGNITION TASK

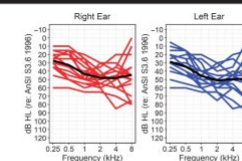
1

2

3

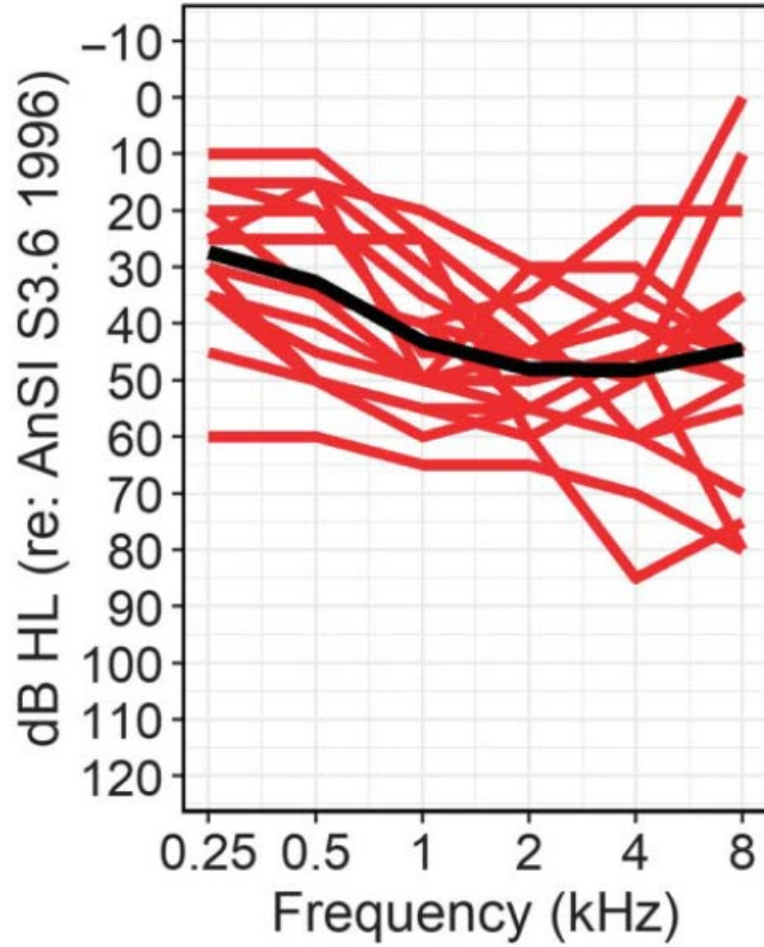
ID	Gender	Age (years)	Age at diagnosis (years)	Suspected etiology	History of chronic otitis media	Age at hearing aid fitting (years)	Reported hearing aid use at time of study	Other interventions in classrooms	WR (rau) in omnidirectional	RT (ms) in omnidirectional
1	M	12	5.5	Unknown	No	6.5	All the time	Personal RM	51.8	1722
2	F	12	9.5	Unknown	No	9.75	All the time	Soundfield RM	68.9	1346
3	M	17	4	Chemotherapy	No	4	All the time	Discontinued RM	96.4	792
4	M	14	8.5	Unknown	Yes	11.5	Sometimes	Personal RM	85.4	1290
5	F	16	3.25	Unknown	No	3.75	Sometimes	Discontinued RM	71.0	1196
6	F	16	2.5	Unknown	No	8.9	Never	Preferential seating	90.0	1227
7	M	17	8	Unknown	No	11	Sometimes	Personal RM	71.8	1197
8	M	16	6	Unknown	Yes	7	All the time	None	90.0	735
9	M	15	8.5	Unknown	No	8.5	Never	Soundfield RM	77.6	1439
10	F	11	5	Prenatal drug exposure	Yes	5	All the time	Discontinued RM	63.9	1475
11	F	11	10.5	Unknown	Yes	NA	Never	Discontinued RM	63.1	1562
12	F	10	6	Chemotherapy	No	7	Sometimes	Personal RM	52.1	1376
13	M	14	9	Familial	No	10.5	All the time	None	84.6	1402
14	F	16	Unknown	Familial	Yes	Unknown	All the time	None	81.9	1287
15	F	14	11.5	Unknown	Yes	11.5	All the time	Discontinued RM	89.6	968
16	F	16	8	EVA	No	NA	Never	Discontinued RM	103.3	1184
17	F	11	5	Unknown	Yes	5	All the time	Discontinued RM	69.1	1179

Note. ID = participant identification code; M = male; F = female; EVA = enlarged vestibular aqueduct; NA = not applicable; RM = remote microphone system; WR = word recognition; RT = response time.

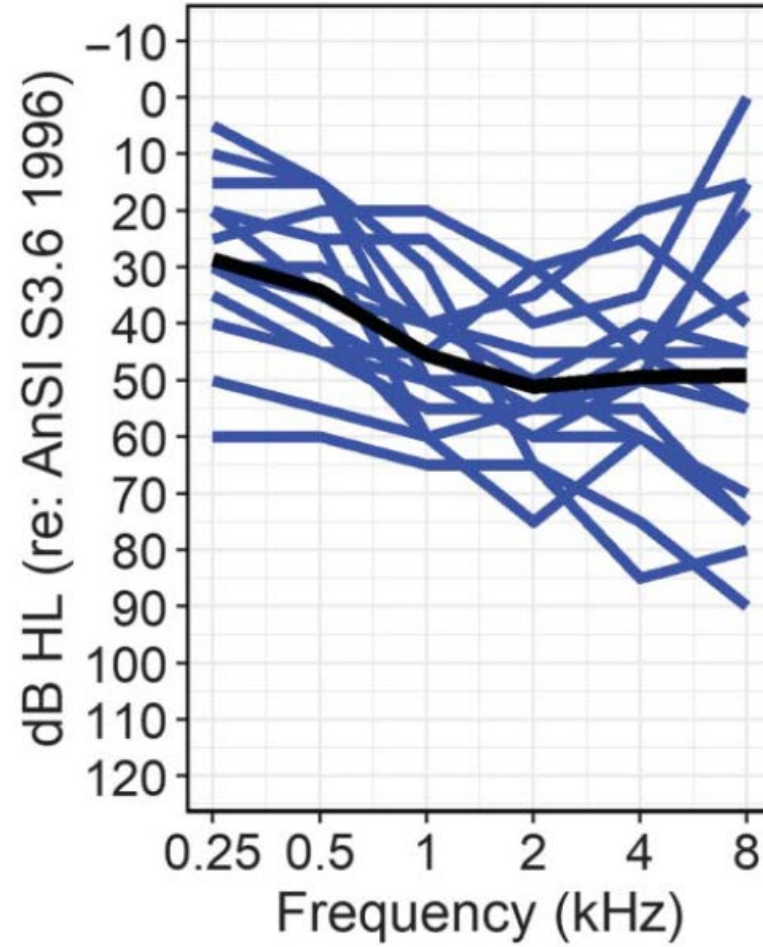


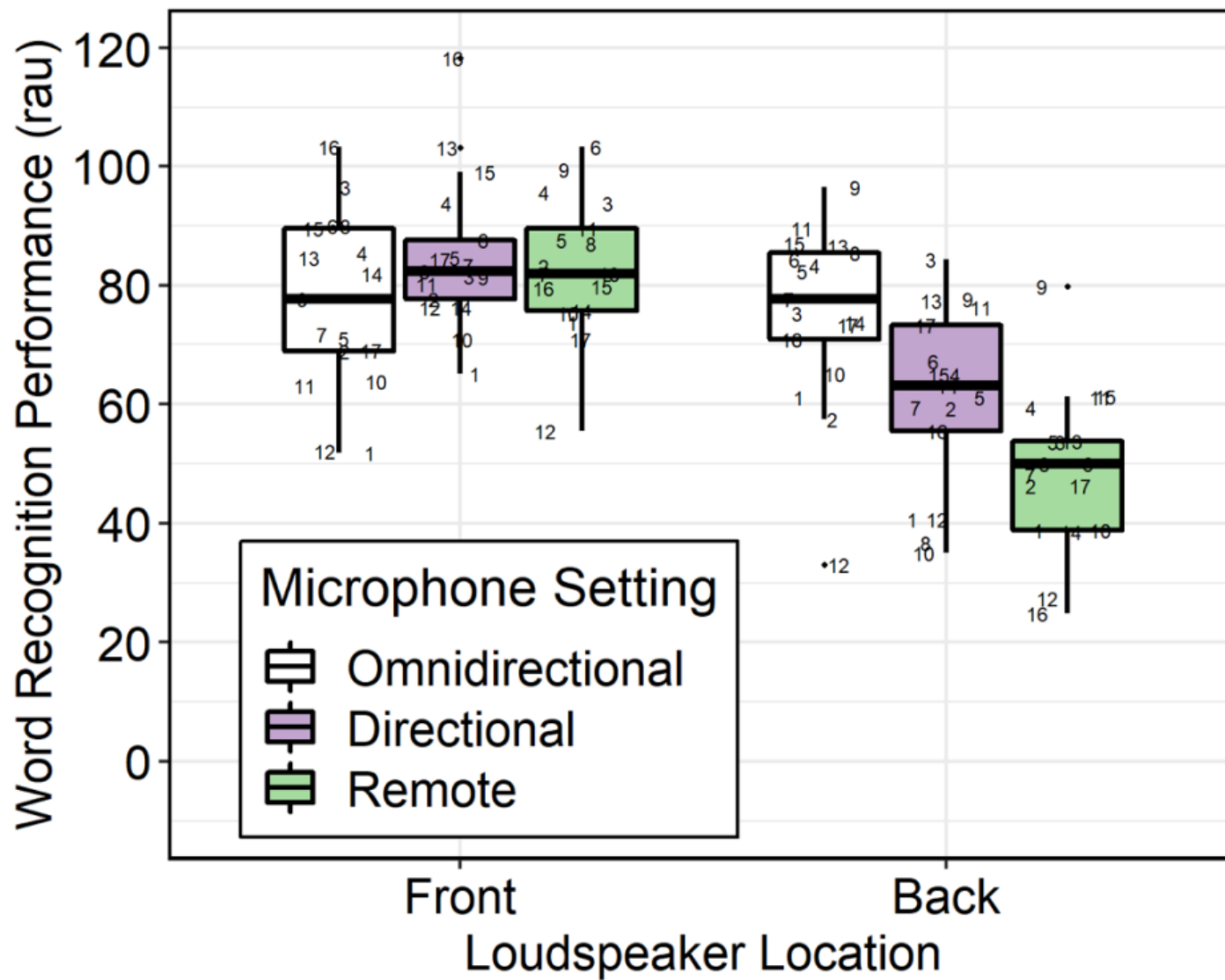
受試者資料

Right Ear



Left Ear





Loudspeaker	Contrast	Estimate	95% CI (lower)	95% CI (upper)	t ratio	p value
Front	Omnidirectional - Directional	-8.64	-14.5	-2.83	-2.83	.004
Front	Omnidirectional - Remote	-6.10	-11.9	-0.29	-2.07	.040
Front	Directional - Remote	2.54	-3.23	8.35	0.86	.39
Back	Omnidirectional - Directional	14.4	8.57	20.2	4.88	<.001
Back	Omnidirectional - Remote	27.4	21.6	33.2	9.30	<.001
Back	Directional - Remote	13.0	7.19	18.8	4.42	<.001

Note. For all comparisons, the standard error of the estimate is 2.95 and degrees of freedom are 181.2. Estimates are provided in rau. Significant comparisons are indicated by bold typeface. CI = confidence interval.

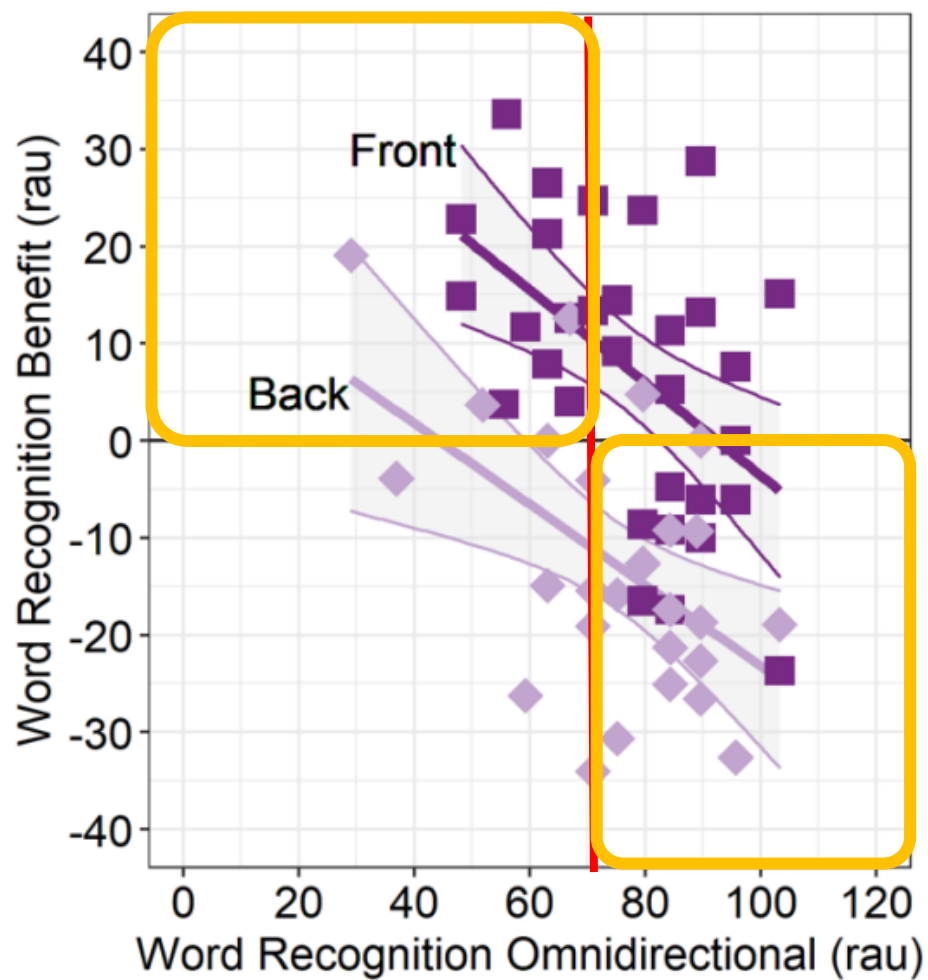
Loudspeaker	Contrast	Estimate	95% CI (lower)	95% CI (upper)	t ratio	p value
Front	Omnidirectional – Directional	-8.64	-14.5	-2.83	-2.93	.004
Front	Omnidirectional – Remote	-6.10	-11.9	-0.29	-2.07	.040
Front	Directional – Remote	2.54	-3.28	8.35	0.86	.39
Back	Omnidirectional – Directional	14.4	8.57	20.2	4.88	< .001
Back	Omnidirectional – Remote	27.4	21.6	33.2	9.30	< .001
Back	Directional – Remote	13.0	7.19	18.8	4.42	< .001

Note. For all comparisons, the standard error of the estimate is 2.95 and degrees of freedom are 181.2. Estimates are provided in rau. Significant comparisons are indicated by bold typeface. CI = confidence interval.

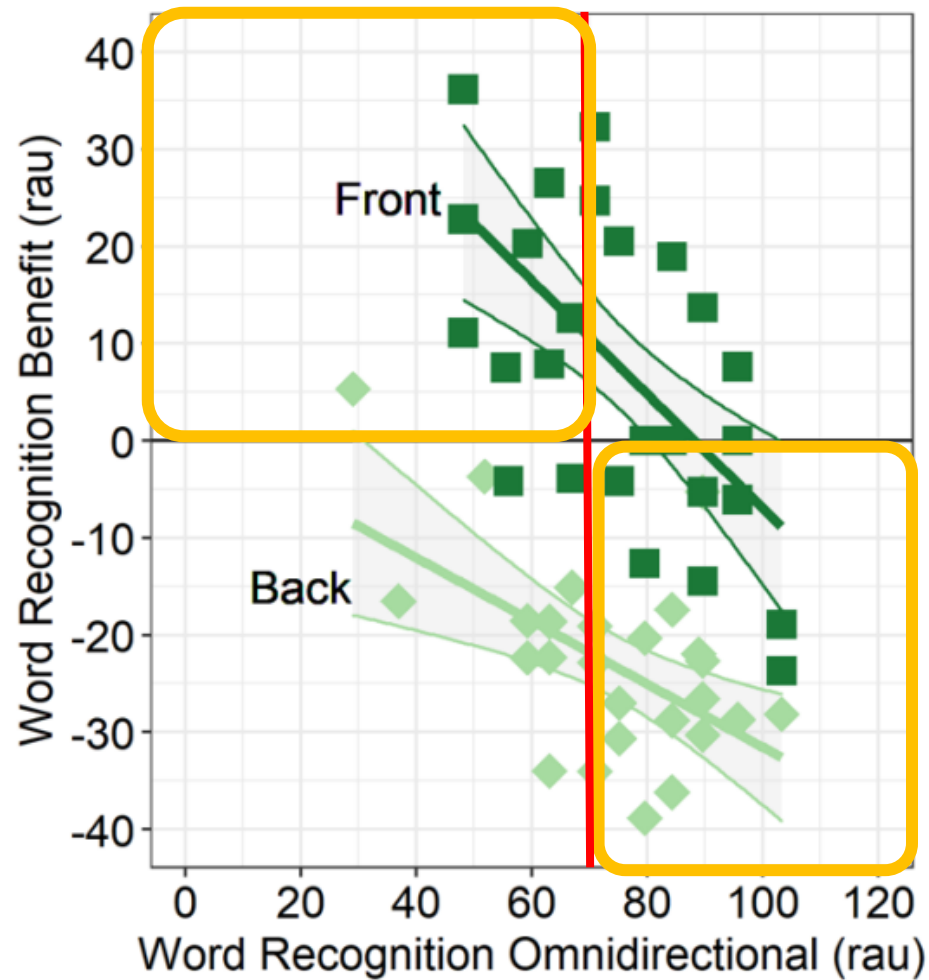
Word recognition directional benefit front						Word recognition remote benefit front					
	Est.	SE	t ratio	p	R ² Δ		Est.	SE	t ratio	p	R ² Δ
(Int.)	87.9	26.1	3.36	.002		(Int.)	23.3	21.2	1.10	.28	
Age	-2.08	1.20	-1.73	.094	0.24	Age	2.31	0.97	2.37	.025	0.022
PTA	-0.55	0.39	-1.43	.16	0.024	PTA	0.24	0.31	0.76	.46	0.026
WRS	-0.12	0.14	-0.89	.38	0.026	WRS	0.048	0.11	0.43	.67	< 0.001
Omni	-0.28	0.20	-1.42	.17	0.048	Omni	-0.80	0.16	-5.01	< .001	0.45
Word recognition directional benefit back						Word recognition remote benefit back					
	Est.	SE	t ratio	p	R ² Δ		Est.	SE	t ratio	p	R ² Δ
(Int.)	32.2	28.0	1.15	.26		(Int.)	11.0	20.8	0.53	.60	
Age	-0.30	1.20	-0.25	.81	0.070	Age	-0.40	0.90	-0.45	.66	0.046
PTA	-0.16	0.41	-0.40	.70	0.045	PTA	-0.33	0.31	-1.08	.29	-0.067
WRS	0.11	0.15	0.74	.46	0.007	WRS	-0.006	0.11	-0.059	.95	< 0.001
Omni	-0.55	0.18	-3.01	.005	0.22	Omni	-0.25	0.14	-1.82	.079	-0.094

Note. Int. = intercept; Est. = estimate; SE = standard error; R² Δ = R-squared change; PTA = pure tone average; WRS = unaided word recognition scores; Omni = experimental word recognition scores in the omnidirectional condition.

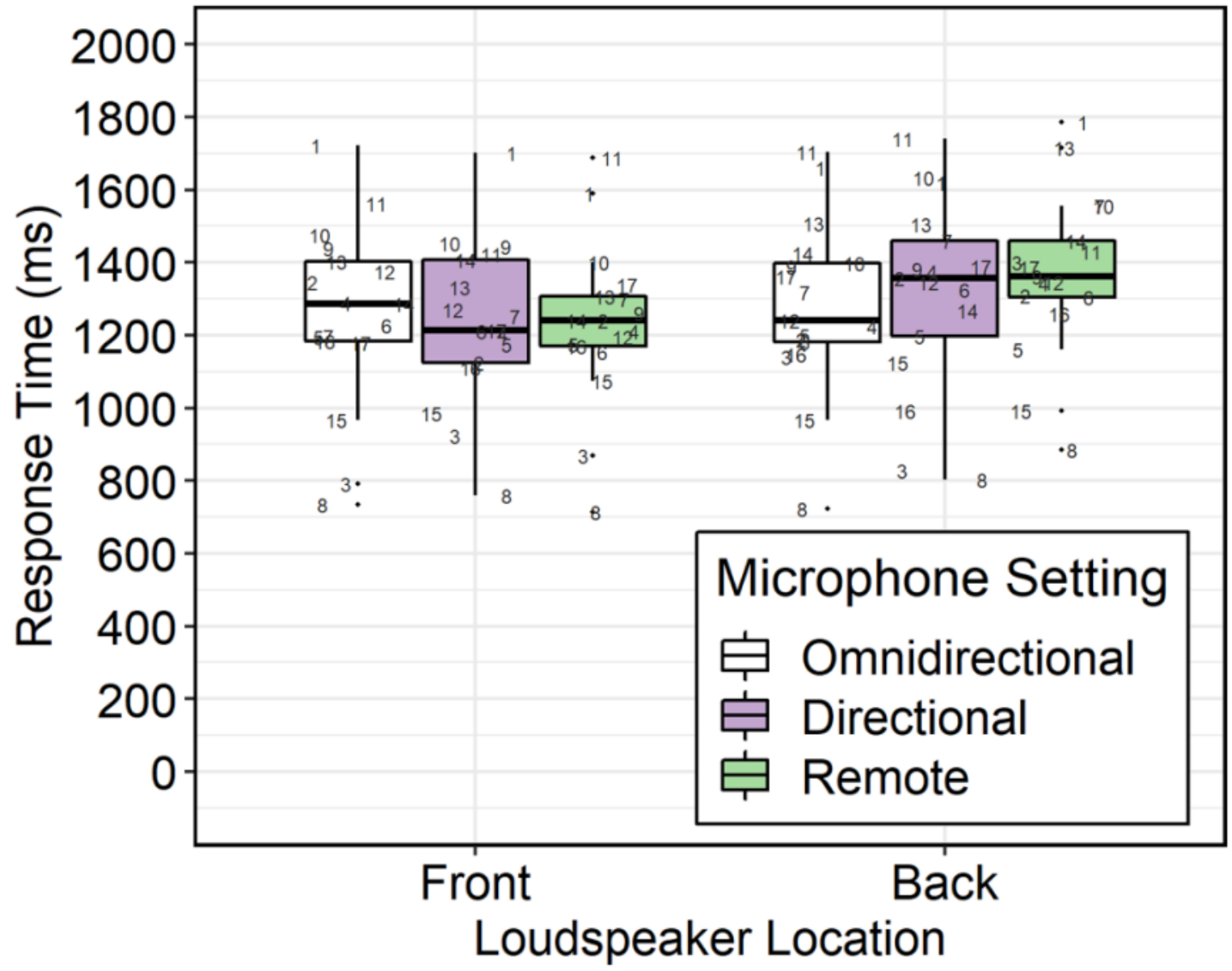
Directional Microphone Benefit

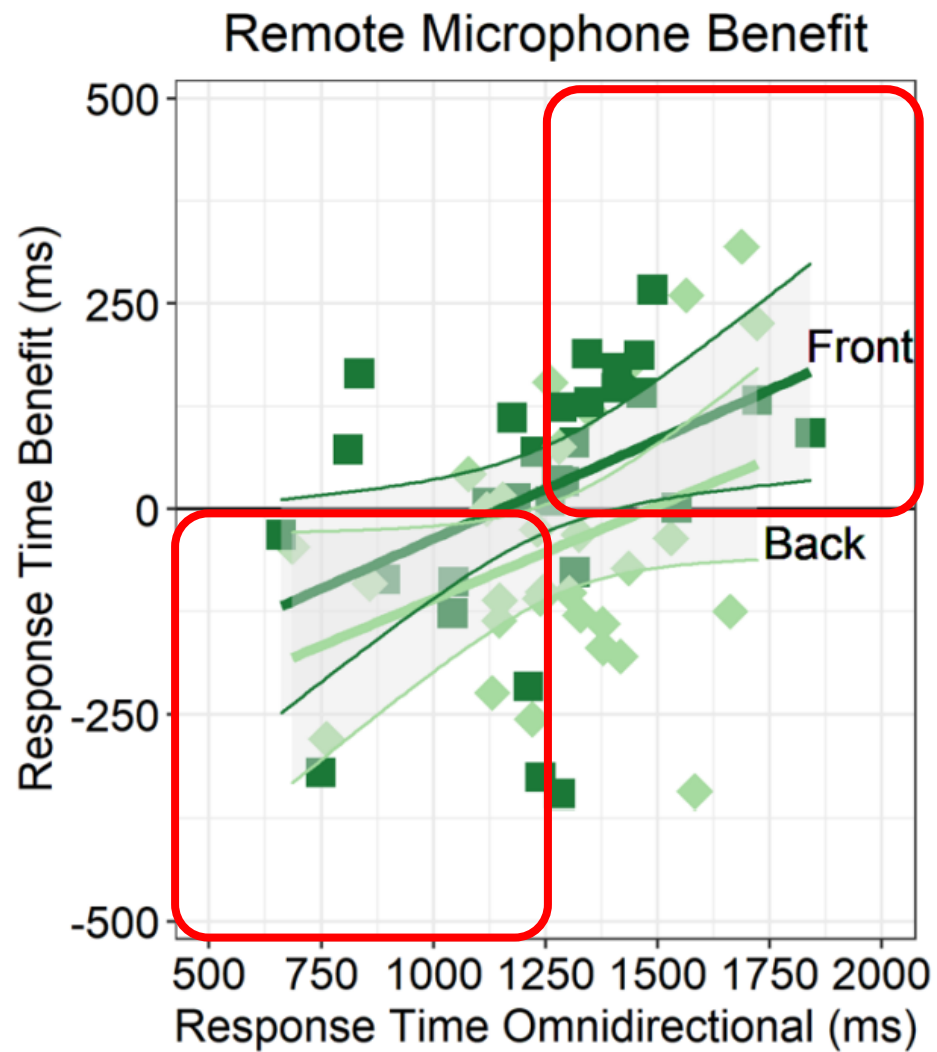
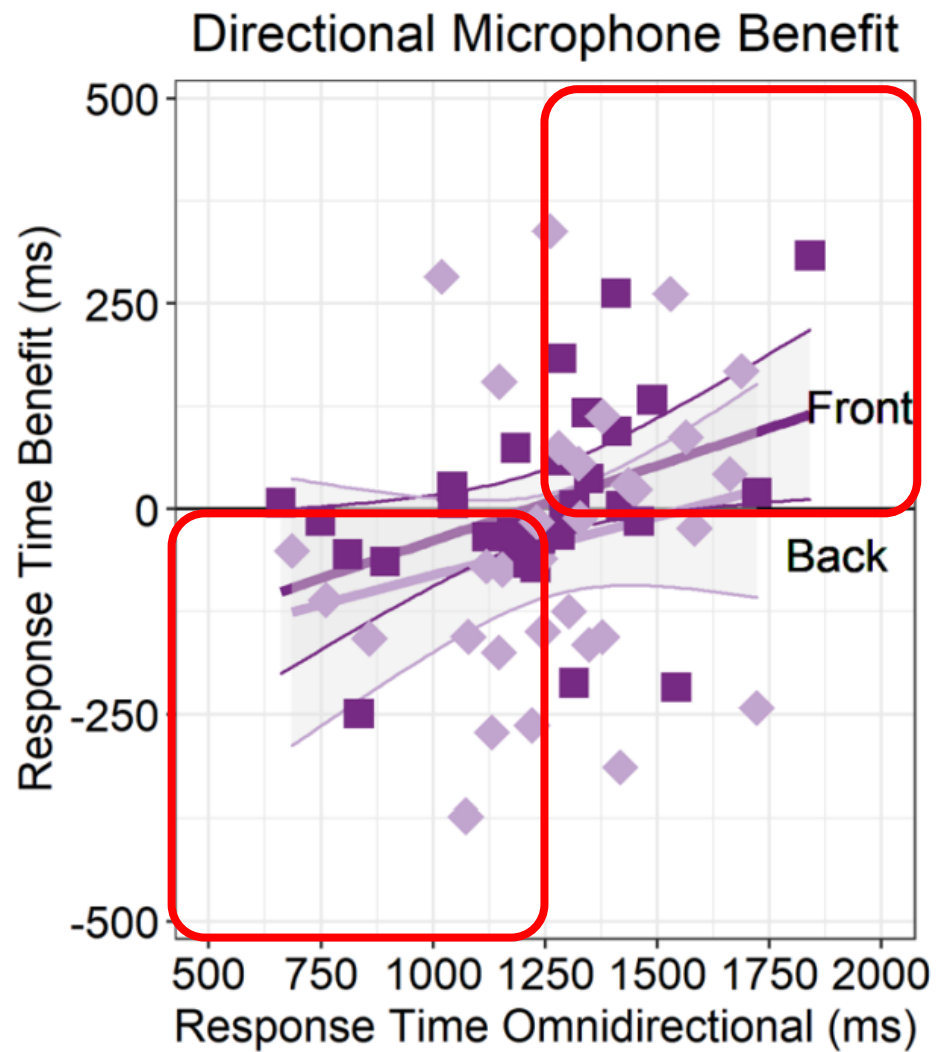


Remote Microphone Benefit



location ■ Front ◆ Back Loudspeaker Location ■ Front ■ Back





location ■ Front ◆ Back Loudspeaker Location ■ Front ■ Back

	Word Recognition		Listening Effort	
聲源	前	後	前	後
結果	DM≐RM>OM	OM>DM>RM	反應快	反應慢
預測	在全方位表現好的人，用RM較無法得到幫助 年紀小的個案比年紀大的個案更能從RM得到幫助 *天花板效應	在全方位表現好的人，用DM容易受影響	反應比較慢的人較有可能從DM或RM得到幫助	反應比較快的人較有可能在使用DM或RM的時候表現受到影響 用DM，年紀小的個案比年紀大的個案容易受影響 *cognitive capacity

Pick One

- DM
- RM





CI的RM

HOLISTIC HEARING HEALTHCARE
全方位聽覺健康中心



Mini Microphone 2 / 2+



TV Streamer



Phone Clip

Marvel brings wireless connectivity to Naída CI M



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AudioStream



AudioLink



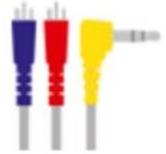
Neckloops



Telecoil



FM Systems



Direct Audio Input

	Audio Mixing Ratio	IDR	Sensitivity
AB	Mic Only 50:50 (Mic: Aux=-6:-6) 30:70 (Mic: Aux=-12:-3) Aux only Aux only (Atten.) (Aux: -20)	從RM來的聲音通常是高音強，容易被壓縮。	降低，會更強調RM
Cochlear	1:1 2:1 (Mic-6) 3:1 (Mic-10) 10:1 (Mic-20)		使用RM時，較低比較高好
Medel	1:1		如果要改變Mixing Ratio就直接調整Sensitivity



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Thanks