National Acoustic Laboratories
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THE HEARING CRC

A randomized controlled comparison of NAL and DSL prescriptions:

Fitting and developmental outcomes of children at five years of age

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Introduction

Aims to maximise predicted speech intelligibility while limiting total loudness to be no greater than that perceived by a normal-hearing listener.

Aims to normalise loudness at different frequencies to achieve desired sensation levels.

Do hearing aids fitting outcomes vary depending on which prescription was used for fitting?

Do developmental outcomes vary according to the hearing aids prescriptions?

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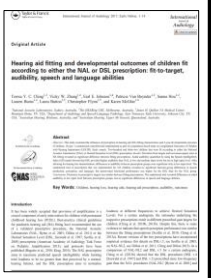
Objectives

To examine

The influence of prescription on hearing aid (HA) fitting characteristics and developmental outcomes of hearing-impaired children at five years of age.



Original Article

Hearing aid fitting and developmental outcomes of children fit according to either the NAL or DSL prescription: fit-to-target, audibility, speech and language abilities

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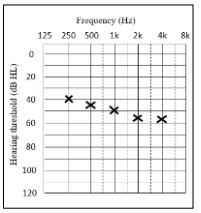
Methods

Design

- A randomised controlled trial of hearing aid prescription in LOCHI study
- N = 163 hearing-impaired children (NAL: n= 89; DSL: n=74)



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Methods

Characteristics	NAL group (n=89)	DSL group (n=74)
Gender (Male), No. (%)	57 (64.0%)	40 (54.1%)
Presence of additional disabilities (AD), No. (%)	30 (33.7%)	22 (29.7%)
Age at hearing aid fitting (months),		
Mean (SD)	11.2 (10.7)	10.0 (10.5)
Median	6.0	4.0
Interquartile range	3.0-17.0	2.0-18.8
Degree of Hearing Loss * (4FA HL in better ear)		
%: Mild (≤ 40 dB):	20.20% / 22.50%	20.30% / 31.10%
%: Moderate (41-60 dB)	57.30%	48.60%
%: Severe (61-80 dB)		
Cognitive ability (WNV) @		
N	76	63
Mean (SD)	100.9 (17.2)	104.1 (16.0)
Median	100.0	105.0
Interquartile range (IQR)	91.0-116.0	95.5-116.5

$p > 0.05$

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Methods

Fitting outcomes

Fit-to-target

- Deviations (dB) of measured couple gains from prescriptive targets at each frequency for each input level;
- Averaged root-mean-square (rms) error across four frequencies for each input level;

Aided Audibility Two versions of speech intelligibility index models

- ANSI SII (ANSI, 1997) $\mathrm{SII} = \sum I_i A_i$
- Desensitized SII (Ching et al., 2011) $k' = \left[\left(\frac{k}{30}\right)^p + m^p\right]^{1/p}$

Speech and language outcomes

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Methods

Speech and language outcomes

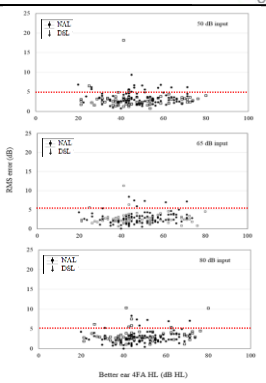
Measure	Purpose
PLS-4	Receptive (auditory comprehension, AC) and expressive (expressive communication, EC) language
PPVT-4	Receptive vocabulary
DEAP	Speech production
WNV	Nonverbal cognitive ability
BKB/NU-CHIPS	Speech perception in noise
PEACH	Auditory functional performance

Results_Fitting outcomes

Root-mean-square (rms) error

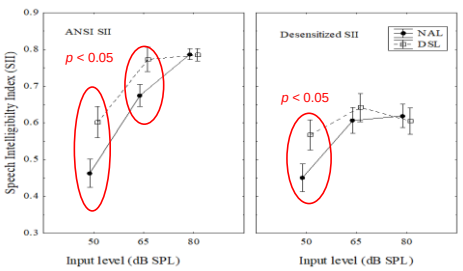
The rms error < 3.5dB for both NAL and DSL targets

No significant differences in rms errors between prescription groups at any of the three input levels.



Results_Aided audibility

- Audibility calculation: ANSI SII & Desensitized SII



Results_Developmental outcomes

No significant between-group differences in speech production, perception, and language, except for PEACH

	NAL		DSL		Difference
	n	Mean (SD)	n	Mean (SD)	p value
PLS-4_AC	77	85.6 (19.4)	71	88.2 (18.2)	0.39
PLS-4_EC	77	85.6 (18.6)	71	85.4 (18.35)	0.95
PPVT	74	91.0 (16.2)	67	90.9 (17.9)	0.98
DEAP_PCC	78	4.1 (2.1)	70	4.0 (1.6)	0.95
DEAP_PVC	78	5.0 (2.6)	70	5.1 (2.6)	0.81
PEACH-quiet	66	79.4 (15.3)	60	86.3 (11.5)	0.01
PEACH-noise	66	71.7 (18.5)	60	75.8 (13.8)	0.16
PEACH_Total	66	75.9 (15.5)	60	81.5 (11.0)	0.02
SNR_ S_0N_0	59	4.1 (3.2)	60	3.6 (3.3)	0.35
SNR_ S_0N_{90}	59	1.2 (3.3)	60	1.2 (3.8)	0.98
SRM	59	2.7 (3.3)	60	2.3 (3.0)	0.43

Conclusion

- Proximity to prescriptive targets were similar between fitting prescriptions;
- Significant difference in aided audibility between prescriptions at low but not at medium and high input levels, when desensitization was considered;
- Parent-rated functional performance scores were higher for the DSL than for the NAL group;
- The speech production, speech perception, receptive and expressive language were not significantly different between prescription groups at 5 years of age.

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