

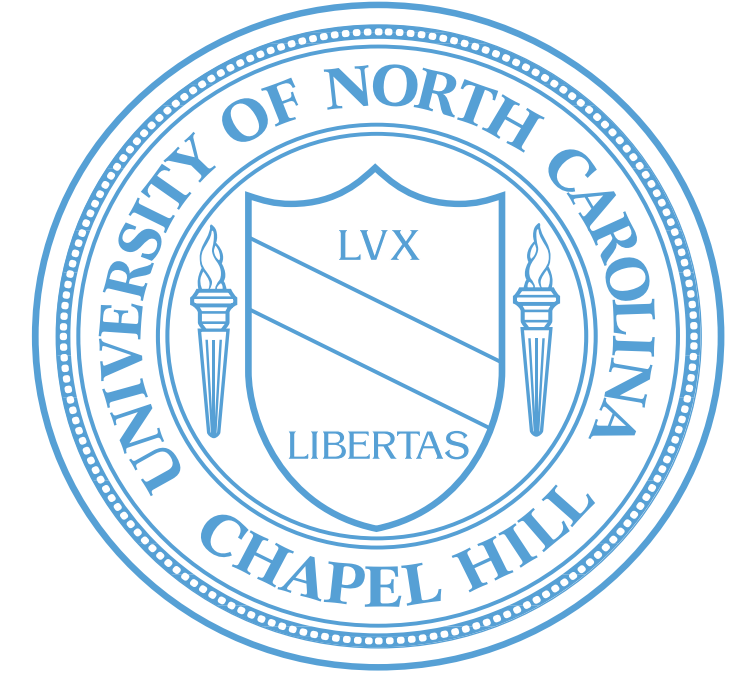
Review of Daily Cochlear Implant Use on Initial Speech Perception



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Background

Cochlear implant (CI) recipients are counseled that consistent device use during waking hours is needed to acclimate to the sound quality of the cochlear implant and improve speech perception. While research demonstrates improvements in speech perception with device use over time¹, there is limited evidence as to whether the number of hours of daily device use influences early speech perception performance.

CI recipients typically are seen more frequently within the initial months following device activation due to larger changes in speech perception and associated mapping adjustments. Routine follow-up intervals within the first year of device use typically occur at one, three, six, nine, and twelve months post-activation. Speech perception assessment, mapping procedures, and counseling are conducted at each interval. Historically, CI recipients were asked how long they listened to the device each day. More recently, the clinical CI programming software provides the hours of daily device use between programming sessions, called datalogging. Clinical audiologists may use datalogging information as a counseling tool when treating CI recipients. It is relatively unknown to what extent daily device use is positively associated with initial speech perception growth post-activation. A previous study on a pediatric CI population demonstrated a positive correlation between daily device use and early receptive/expressive language²; however, limited studies have evaluated device use specifically in the adult population, with the exception of one investigating use across the lifespan³.

A variable of consideration in this analysis is the role of auditory environment on device use and speech perception performance. A previous large-scale retrospective review reported on the variability of environment type across the lifespan; however, associated performance was not examined⁴. Potentially, CI recipients who are in more dynamic listening environments may experience a faster rate of speech perception improvement than those recipients in quiet environments. In the present report, subjects completed a subjective questionnaire assessing their daily listening environments to determine how these variables may interact.

The following report is a preliminary review from a prospective study investigating the association between hours of daily device use and early speech perception performance. Understanding the relationship of daily device use and/or listening environments on early speech perception performance will contribute to clinicians' counseling on realistic expectations and the variables that influence patient performance with CIs.

Aim

Preliminary review of the influence of daily device use on initial speech perception in CI recipients.

Methods

INCLUSION CRITERIA

- Adult (≥ 18 years of age)
- Unilateral CI recipient
- Traditional CI candidate (as deemed by implant center)
- Cochlear implantation completed at study site
- Willing to participate in routine clinical follow-up intervals and study procedures

TEST BATTERY

Speech Perception (60 dB SPL)

- CNC words in quiet
- AzBio sentences in quiet

Questionnaires

- Hearing Participation Scale⁵
- Listening environment checklist^{6,7}

EXCLUSION CRITERIA

- History of cochlear implantation in the contralateral ear
- History of revision surgery
- Non-native English speaker (materials presented in English)
- Physical or geographic limitations that may influence ability to participate in clinic follow-up and/or clinical procedures
- Pre-lingual or peri-lingual hearing loss

INTERVALS

- Preoperative evaluation
- 1-month post-activation

DATALOGGING

- Daily device use data obtained from the subject's audio processor

Results

Nine subjects completed the 1-month post-activation interval at the time of the preliminary review. Subject demographics are listed in **Table 1**. The duration of severe-to-profound sensorineural hearing loss ranged from 1 to 57 years (mean: 18 years). The mean age at implantation was 68 years (SD: 7 years). All subjects were implanted with the MED-EL SYNCHRONY FLEX28 electrode array. Seven (7) subjects listened with the SONNET audio processor and two (2) subjects with the SONNET EAS. The acoustic component of the SONNET EAS is activated at the 1-month interval, per clinic protocol.

At the 1-month post-activation interval, datalogging revealed a mean of 12 hours of daily device listening experience, with a range of 10 to 15 hours. There was an error in the datalogging reading for one subject (S7), therefore, the initial results from 8 subjects are plotted here. AzBio sentences and CNC words in quiet were completed for all subjects at the preoperative interval. The difference between the speech perception performance at the preoperative and 1-month post-activation intervals are plotted by the duration of daily device use. **Figure 1.A** plots the results on the CNC words test and **Figure 1.B** plots the results on the AzBio sentences test.

Figure 1.A: Difference in the percent correct score on CNC words between the preoperative and 1-month intervals by hours of listening experience per day.

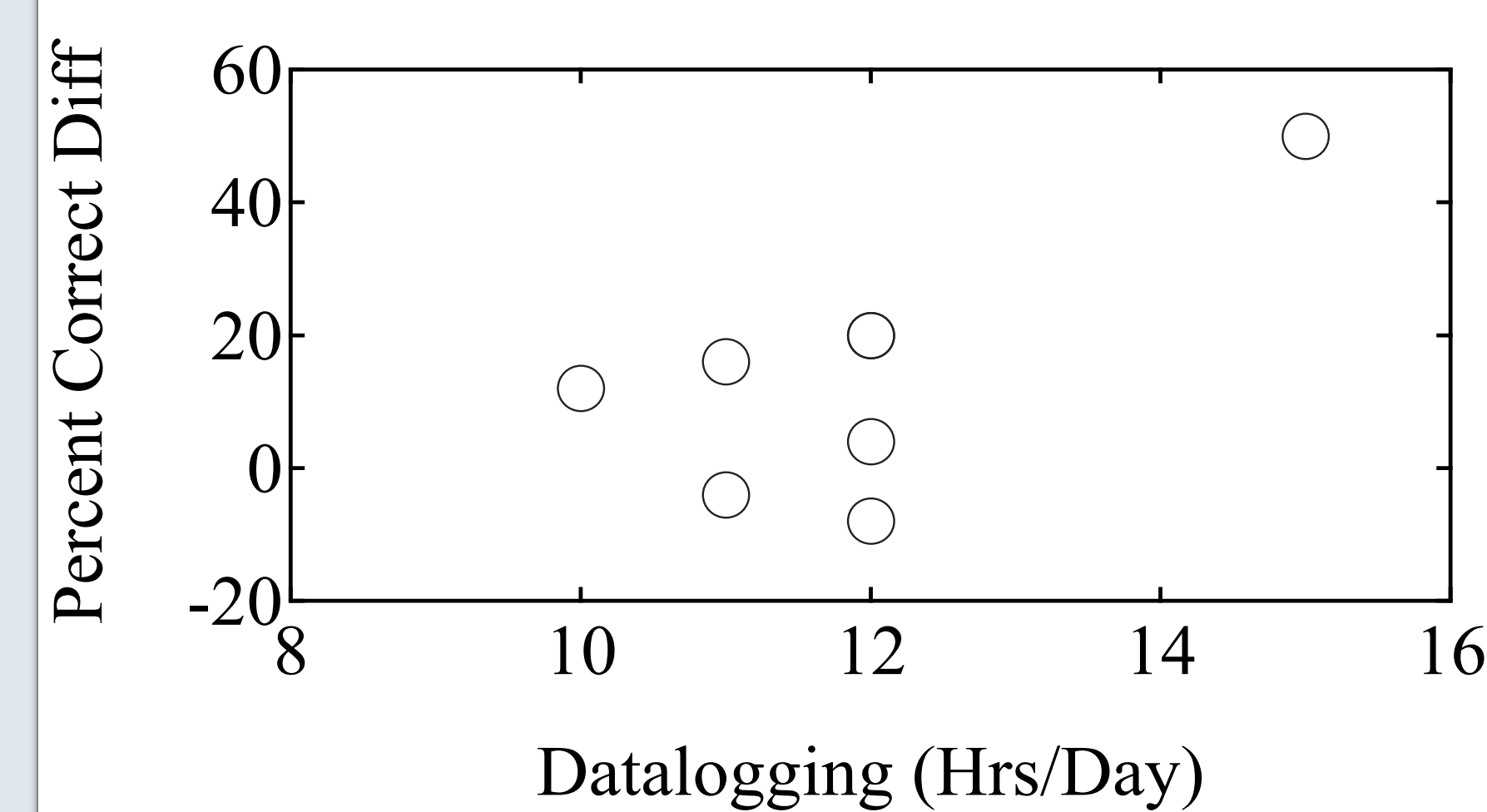


Figure 1.B: Difference in the percent correct score on AzBio sentences between the preoperative and 1-month intervals by hours of listening experience per day.

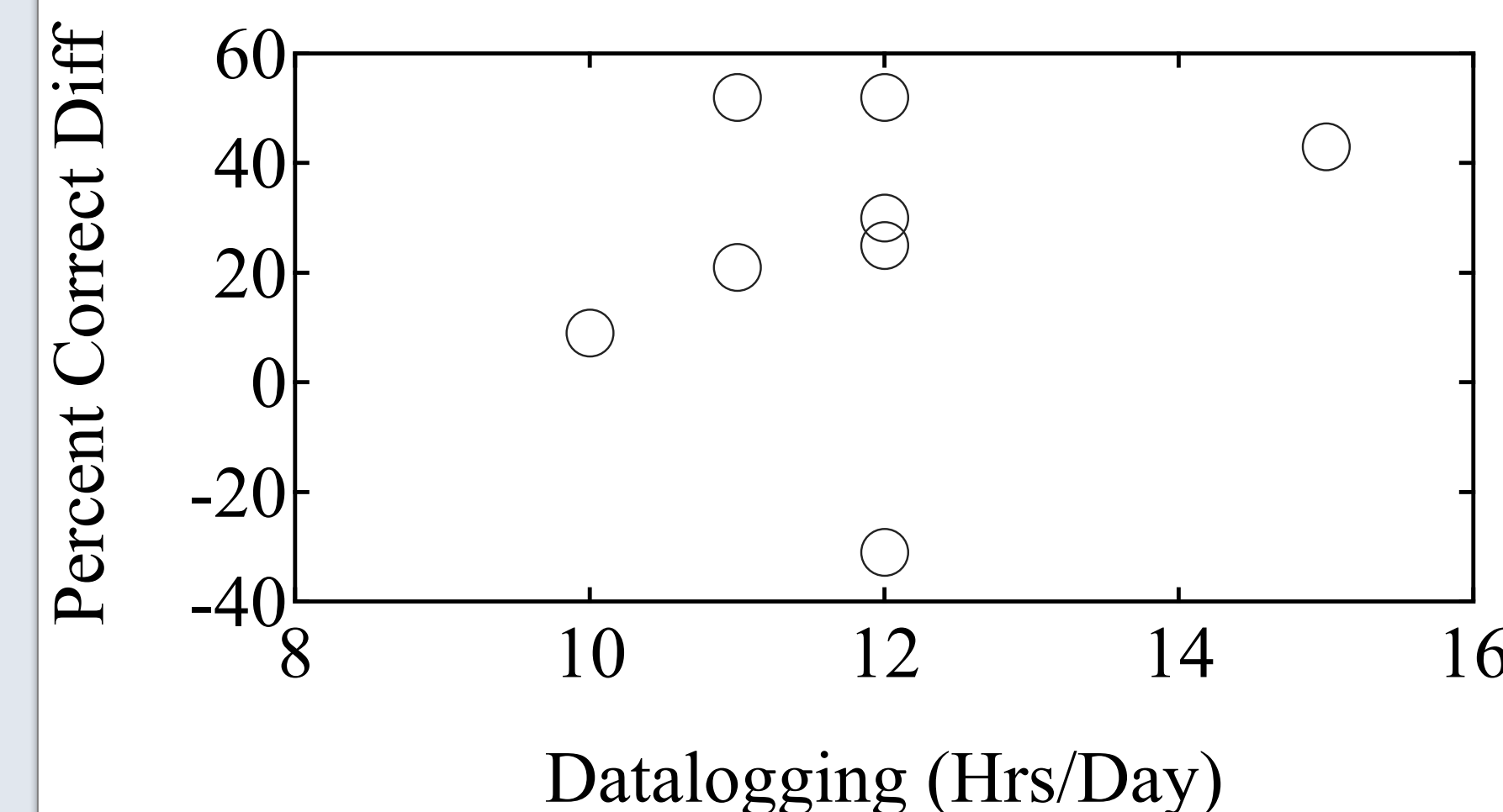


Table 1: Demographic information for initial study cohort.

Subject	Gender	Age at Implantation(yrs)	Ear Implanted	Etiology	Duration Severe-to-Profound SNHL (yrs)
1	M	57	R	Unknown	7
2	F	60	L	Unknown	29
3	F	61	L	Unknown	15
4	M	67	R	Meniere's	12
5	M	70	L	Unknown	4
6	F	72	L	Unknown	57
7	F	74	L	Unknown	16
8	M	75	R	Unknown	20
9	F	76	R	Unknown	1

On the Listening Environment Checklist, subjects reported that they were in similar auditory environments before and after cochlear implantation. Subjects reported listening with their CI on average 1 hour less per day during the week and on weekends as compared to preoperatively with their hearing aids.

Initial review of responses on the Hearing Participation Scale noted an improvement at the 1-month interval for the following items:

- Since you got your cochlear implant, does your hearing problem affect *the enjoyment you get out of things that you do?*
- Since you got your cochlear implant, does your hearing problem affect *the way you feel about yourself?*
- Since you got your cochlear implant, is *the way you get on with people* affected by your hearing problem?
- Since you got your cochlear implant, does your hearing problem affect *your confidence?*

Conclusions

Subjects presented with a mean of 12 hours of device use per day (minimum: 10 hours), which follows the clinical recommendations of at least 8-10 hours of device use per day. It is hypothesized that subjects with limited daily device use may experience different outcomes. Subject recruitment and data collection are ongoing.

The initial review demonstrated that some subjects experienced a decrement in performance at the 1-month interval. This is in line with previous reports that some CI recipients surpass their preoperative performance after at least 6 months of device use⁸. The Listening Environment Checklist revealed that some subjects report listening with their CI less in the early post-activation period than with their hearing aid preoperatively. Continued review of the relationship between daily device use and listening environments may reveal differences between subjects who use their CI as frequently as their hearing aids and those who do not in specific auditory environments.

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