

Cochlear Implantation for Single-Sided Deafness: The Relationship Between Aural Rehabilitation, Processor Wear-Time and Patient Outcomes

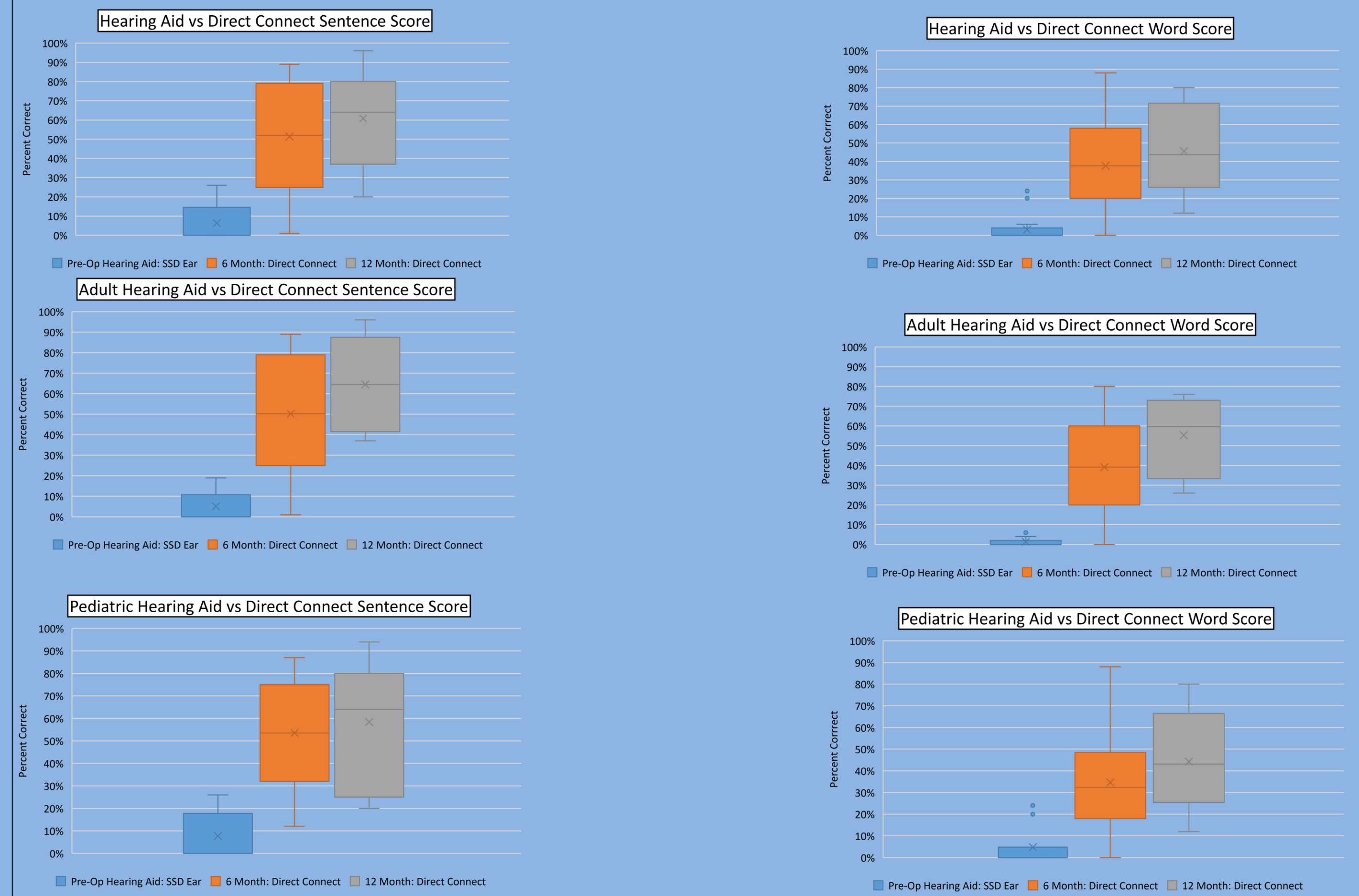
Introduction: Individuals with single-sided deafness (SSD) are a unique subpopulation of cochlear implant users. While all cochlear implant users require aural rehabilitation and adequate wear-time (i.e., 10 hours of daily use), this may be even more important for patients with SSD, who often struggle with the binaural integration between their normal hearing ear and implanted ear. Patients with SSD need to isolate their implanted ears to optimize aural rehabilitation. This can be performed by directly connecting their processors to the auditory material via remote microphone technology. The increased use of teletherapy that resulted from the COVID-19 pandemic has led to improved auditory training options for the SSD subpopulation of cochlear implant users. A poster presented at CI2021 entitled: Aural Rehabilitation for Single-Sided Deafness: The Benefits of Teletherapy, discussed the clinic protocol for teletherapy and initial findings for our SSD patients. This presentation looks to expand on those data. Specifically, we will look at the relationship between teletherapy, processor wear-time and patient outcomes. **Methods and Results:** We will review the data from the SSD patient population at our Center, totaling approximately 30 patients. Specifically, we will look at pre- and post-operative test scores, aural rehabilitation attendance, wear-time and patient satisfaction surveys. We will assess the trends and relationships among these aspects. **Conclusions:** Patients with SSD are a unique subgroup of the general cochlear implant population. They require more intensive aural rehabilitation to integrate the new signal with their normal hearing ear. Processor use is also an important factor in cochlear implant benefit, particularly for this population. It is expected that there will be a significant correlation between aural rehabilitation and wear-time on patient outcomes with their cochlear implant.

Subject Information

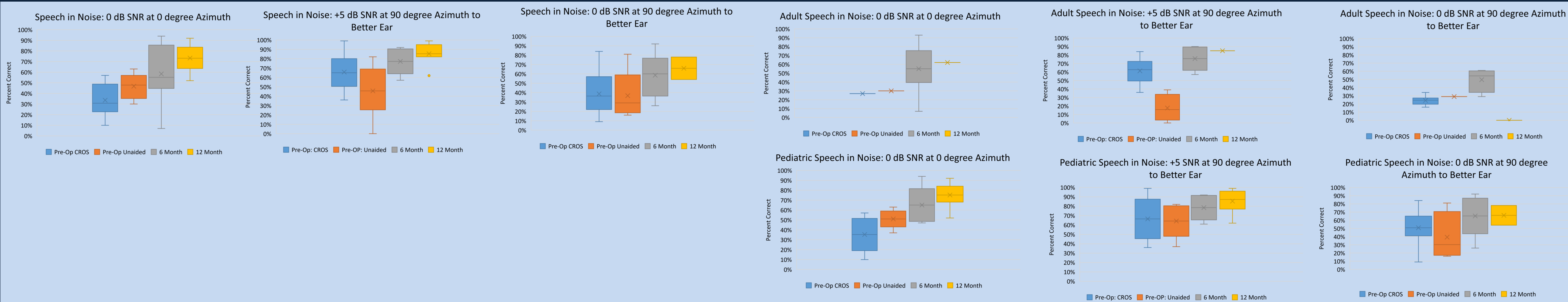
DOB	Sex	Etiology	SSD/AHL	SSD Ear	Age at Implantation	Duration of HL: in years
09/04/71	Female	Sudden	SSD	Left	49 years, 8 months, 21 days	3
04/13/20	Male	EVA	SSD	Right	1 years, 3 months, 21 days	1
04/14/07	Male	Congenital	SSD	Left	13 years, 2 months, 12 days	13
01/22/01	Female	Trauma	SSD	Right	19 years, 8 months, 15 days	10
04/05/59	Female	Sudden	SSD	Left	62 years, 0 months, 1 day	6
05/24/83	Female	Congenital	AHL	Right	38 years, 0 months, 8 days	37
02/11/05	Male	Progressive	SSD	Left	16 years, 6 months, 12 days	13
2/25/2002	Male	Sudden	SSD	Right	18 years, 9 months, 27 days	2
9/4/2004	Male	Sudden	SSD	Left	15 years, 5 months, 7 days	7
07/16/04	Male	Congenital	SSD	Left	16 years, 0 months, 19 days	17
06/16/02	Male	Sudden	SSD	Right	18 years, 0 months, 21 days	6
05/24/95	Male	Trauma	SSD	Left	24 years, 5 months, 14 days	0.2
08/08/97	Male	Trauma	SSD	Right	18 years, 10 months, 28 days	0.1
07/24/73	Male	Sudden	SSD	Left	43 years, 8 months, 3 days	20
07/08/78	Female	Sudden	AHL	Right	42 years, 0 months, 20 days	10
05/06/57	Male	Meniere's	AHL	Right	63 years, 5 months, 0 days	7
12/05/64	Male	Sudden	SSD	Left	50 years, 11 months, 6 days	0.8
10/17/46	Male	Sudden	AHL	Left	72 years, 1 months, 18 days	0.9
02/11/83	Male	Trauma	SSD	Left	37 years, 6 months, 30 days	0.1
04/25/10	Female	Congenital	SSD	Right	10 years, 3 months, 3 days	10
12/24/50	Male	Meniere's	AHL	Right	66 years, 8 months, 26 days	7
09/11/15	Male	EVA	AHL	Right	4 years, 4 months, 3 days	2
05/24/50	Male	Sudden	SSD	Right	70 years, 11 months, 10 days	3
01/03/07	Male	Congenital	SSD	Left	9 years, 4 months, 21 days	8
02/03/12	Female	Congenital	SSD	Right	6 years, 4 months, 17 days	5
11/14/11	Female	Congenital	SSD	Left	6 years, 8 months, 24 days	6
04/18/66	Female	Meniere's	AHL	Left	54 years, 7 months, 0 days	5

- 18 Male/9 Female
- 20 SSD/7 AHL
- 14 Left/13 Right
- 14 Pediatric/13 Adults
- Average age at implantation: 31.6 years, range: 1.3-72.1 years
- Average Duration of HL: 7.4 years, range: 0.1-37 years
- A total of 8 subjects had data at all intervals.

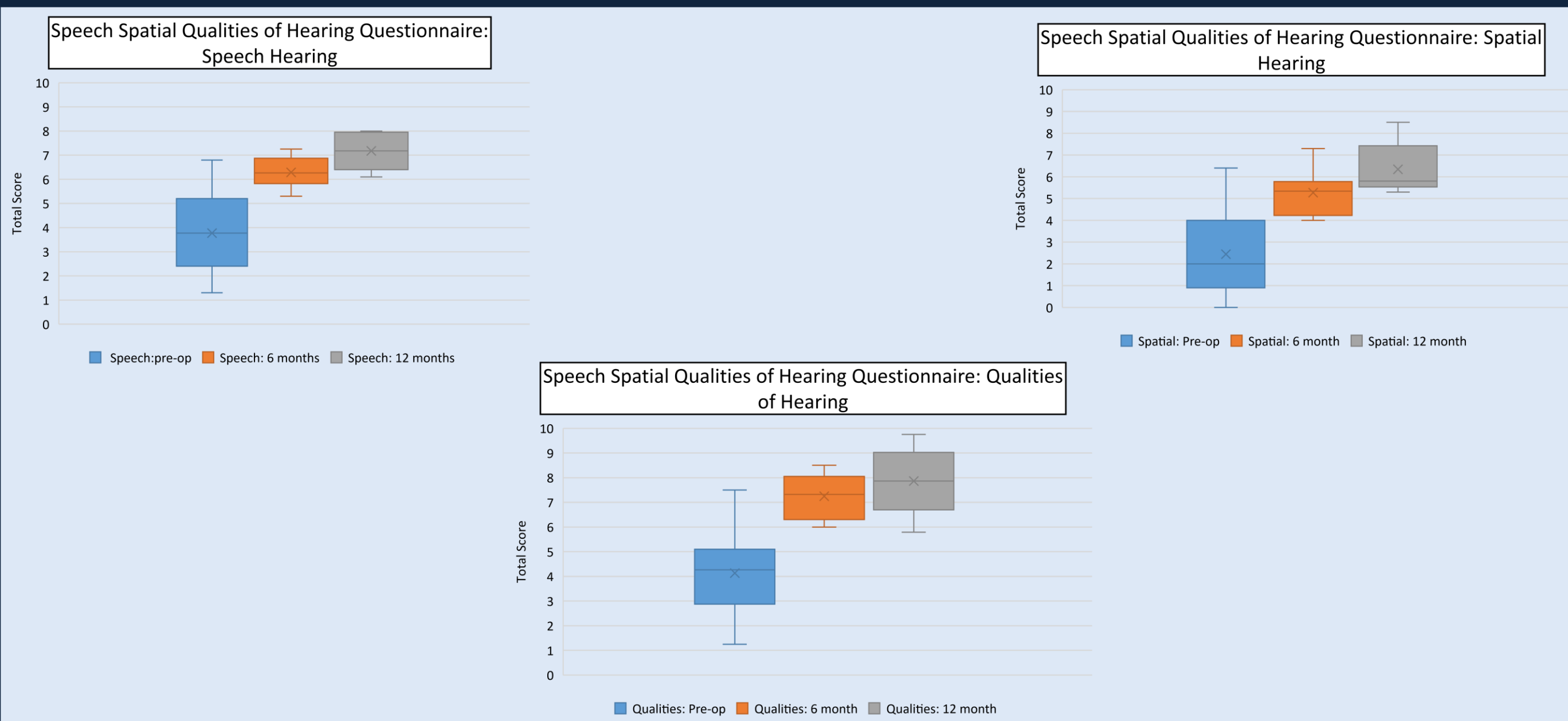
Sentence and Word: Direct Connect



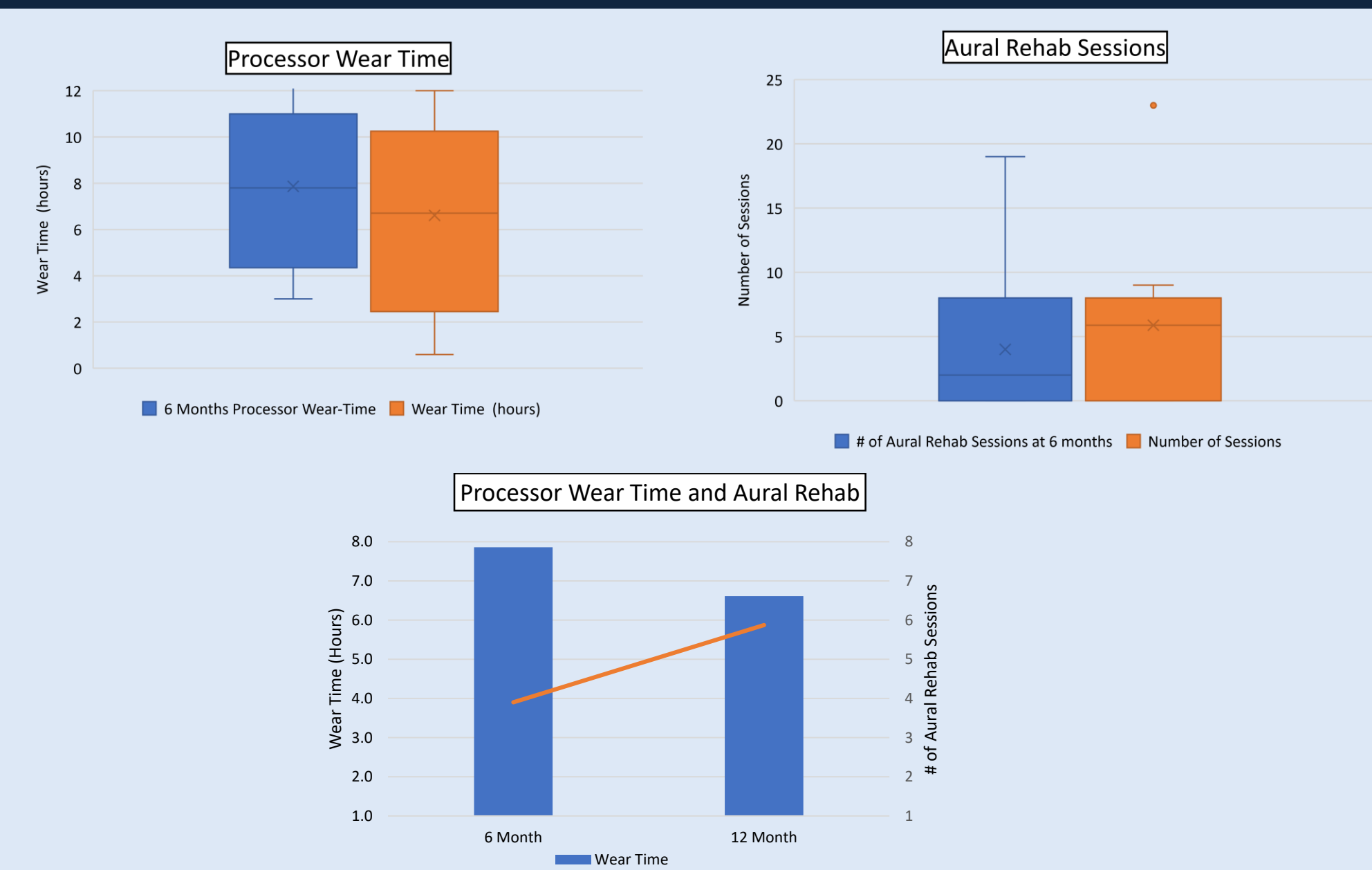
Speech Understanding in Noise



Subjective Questionnaires



Processor Wear Time and Aural Rehab



- Many patients used processors that did not data log (i.e., Rondo, Rondo 2)
- Only 3 patients, subject 1003, 1010, 1020 had complete data sets of 6- & 12-month processor wear-time and aural rehabilitation

Impressions and Thoughts for the Future

- Like many studies, our data indicates that speech understanding via direct-connect demonstrated limited improvement, with a plateau noted between 6 and 12 months.
- Speech understanding in noise improved for all scenarios, particularly those highlighted in this poster. Again, scores appear to plateau between the 6- and 12-month intervals.
- Speech understanding in noise improved for all patients, even those who had limited scores via direct-connect.
- Pediatric patients demonstrated greater improvements on the "0 dB SNR at 0 degree azimuth" scenario compared to their adult counterparts.
- All patients reported subjective improvement, even those who had limited wear-time.
- Week to week aural rehabilitation sessions seemed to improve accountability for wear time and practice. The speech language pathologist was able to encourage weekly practice and monitor progress. Patients also benefitted from reminders and practice using DAI which is necessary in order to truly target the cochlear implant.
- The difference in wear-time between 6 and 12 months is a little more than 1 hour, though the number of aural rehab sessions increased.
- These numbers should be interpreted with caution as the number of subjects with this data is small.
- Many patients reported using their processors only during work, school, or particularly difficult situations.
- An important question to ask is: "what is the goal for patients with SSD who receive a cochlear implant- comprehension or speech understanding in noise and localization?"
- If comprehension is a goal, then aural rehab should be beneficial, as has been demonstrated in other studies.
- Should aural rehabilitation be a long-term endeavor, or is 6-8 sessions sufficient?
- Future studies should look at these questions in more detail, including the differences between adult and pediatric populations.