

Sky: Enhanced Pediatric Hearing with Superior Sound Quality, and Usability

Global Survey of Audiological Professionals and Pediatric CI Users

THE ADVANCED BIONICS HEARING SYSTEM

The first dedicated pediatric hearing system

In 2020, Advanced Bionics (AB) launched its most advanced hearing system yet, including the Sky product family, the first ever dedicated pediatric solution. The AB Hearing System offers cochlear implant (CI) sound processors and dedicated Phonak Link hearing aids (HA) for bimodal listeners. In 2023, the Phonak CROS for unilateral CI users completed the portfolio of two-ear hearing solutions for all pediatric recipients.

The current generation, the Sky CI M sound processor¹ and Sky Link M hearing aid, and CROS P-13, features the first dedicated pediatric operating system AutoSense Sky OS 3.0², which provides enhanced speech intelligibility in challenging listening environments³, enhanced sound quality for music⁴, and universal Bluetooth® connectivity, allowing AB CI users to seamlessly connect with the people, places, and things in their world without limitations. Customized pediatric settings were developed specifically for the listening environments children experience. A wide range of accessories and customization abilities enables the creation of a truly individualized hearing solution.

The accompanying fitting software, Target CI, allows CI processors and Hearing Aids to be fitted within the same software for the first time. The ability to perform fittings wirelessly, provided through Noahlink, is an ideal solution for fitting active pediatric recipients.



GLOBAL SURVEY

Gathering feedback from around the world

An online survey was launched globally in 2020 to gather feedback about the current generation of the AB Hearing System from users and healthcare professionals. Responses were collected between November 2021 and August 2023.

GENERAL

[1] Please indicate your hearing system configuration. (select one box only)

Unilateral (one CI sound processor, no hearing device on the other side)

Bilateral (two CI sound processors)

Bimodal (one CI sound processor, one hearing aid)

Other (one CI sound processor, one other hearing device)

[2] Please indicate your age group. (select one box only)

<input type="checkbox"/> up to 3 years	<input type="checkbox"/> 13 to 18 years	<input type="checkbox"/> 66 to 80 years
<input type="checkbox"/> 3 to 6 years	<input type="checkbox"/> 19 to 30 years	<input type="checkbox"/> more than 80 years
<input type="checkbox"/> 7 to 12 years	<input type="checkbox"/> 31 to 65 years	

[3] Is the Marvel sound processor the first processor? (select one box only)

Marvel is my first sound processor

I used another sound processor before

[4] Please indicate how long you are using the Marvel system. (select one box only)

<input type="checkbox"/> 3 to 6 months	<input type="checkbox"/> 10 to 12 months
<input type="checkbox"/> 7 to 9 months	<input type="checkbox"/> more than 12 months

[5] How would you rate the Bluetooth streaming capabilities with the new Marvel system? (select one box per row corresponding to your rating)

	very poor	0	1	2	3	4	5	6	7	8	9	10	very good	I don't know
PHONE CALLS														
Speech understanding	<input type="checkbox"/>													
Sound quality	<input type="checkbox"/>													
Ease of use	<input type="checkbox"/>													
Sound quality for listener at the other end	<input type="checkbox"/>													

The professional survey was created for healthcare professionals who fit any part of the AB Hearing System (CI, HA, CROS, or combination thereof). There were no restrictions on what part of the AB Hearing System professionals had experience with. The CI user surveys were created for users of the AB Hearing System after at least three months of use (experienced users) or four to eight weeks after being upgraded from any previous system (upgrade users). There were no restrictions on what part of the AB Hearing System (CI, HA, CROS, or combination thereof) was used by the respondents, nor were there restrictions on the system used prior to using the current generation of the AB Hearing System.

SURVEY RESULTS

A dedicated pediatric solution impressing professionals and recipients

For professionals, demographics data on respondents' location, and fitting experience were collected. For experienced and upgrade CI users, demographics data on respondents' location, age, and device use were collected. Ratings were performed on an absolute scale from zero (very poor/difficult) to ten (very good/easy) and on a comparative scale including the options much worse, worse, similar, better, and much better, respectively. For both types of scales, respondents had the option of indicating "I don't know" for items they were unable to rate. The number of respondents making use of this option for each item is indicated in the figures. Additional questions asked respondents to indicate their top three items as responses.

STUDY POPULATION: PROFESSIONALS

AutoSense programs are the top choice for pediatric recipients

Eighty-six professionals from eleven countries provided feedback. More than 70% of respondents reported experience fitting pediatric recipients up to 18 years of age. The experience with fitting the dedicated pediatric solutions of the current generation of the AB Hearing System was 69.8% for the Sky CI sound processor and 38.5% for the Sky Link hearing aid. Compared to adults who were typically provided AutoSense programs as well as manual programs, pediatric recipients were more often provided with AutoSense programs only (see Fig. 1).

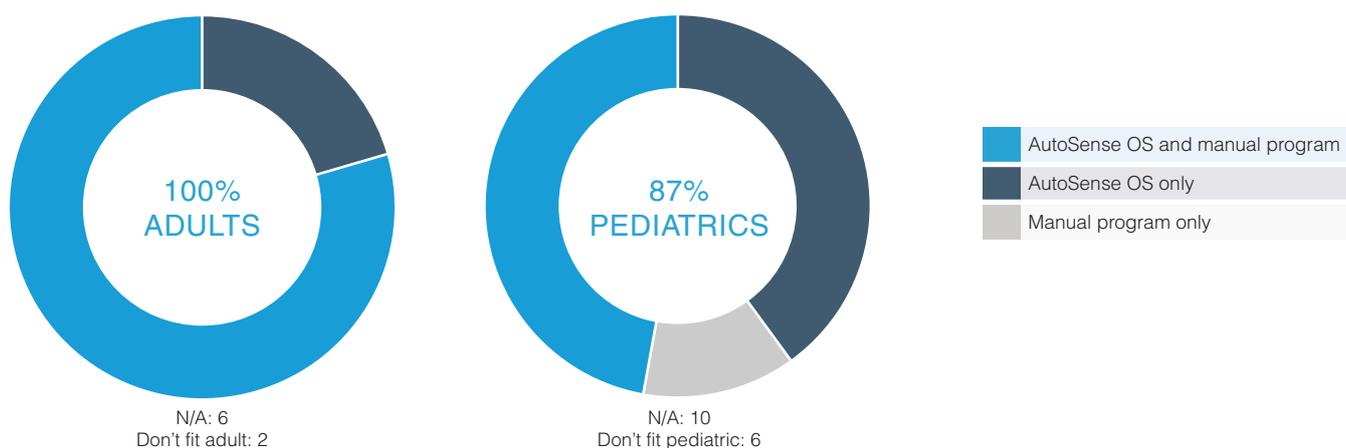


Fig. 1: Programs fitted for adult and pediatric recipients

STUDY POPULATION: CI USERS

Almost 40 experienced and 100 upgrade users provided feedback

Overall, there were 37 responses from upgrade users from four countries and 96 responses from experienced users from seven countries (see Fig. 1). More than two thirds of the respondents from both surveys were between seven and 18 years of age but all age groups from <3 years to 18 years were included.

Of the 37 upgrade respondents, 27 indicated being upgraded on one ear only (73%), and ten indicated having received bilateral upgrades (27%), resulting in a total of 47 upgraded ears. Most respondents reported having used the Naída Q or Harmony sound processors prior to the upgrade.

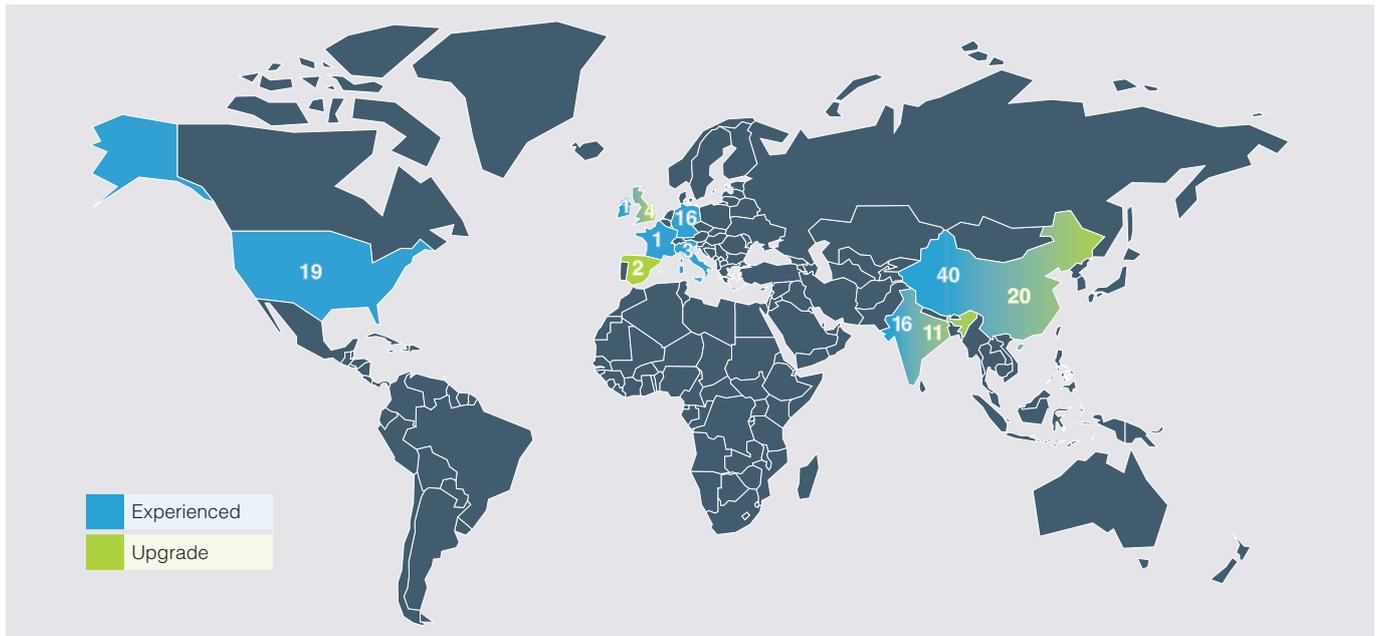


Fig. 2: Responses were collected from countries across the world.

Among the experienced respondents were 30 unilateral CI users (31%), 39 bilateral CI users (41%), and 22 bimodal CI users (23%). Five respondents (5%) indicated using other device configurations. Eighty respondents (83%) had used other sound processors before using the Sky CI M, while for 16 respondents (17%), Sky CI was the first sound processor used. The duration of experience with the Sky CI at the time of responding to the survey is shown in Fig. 3.

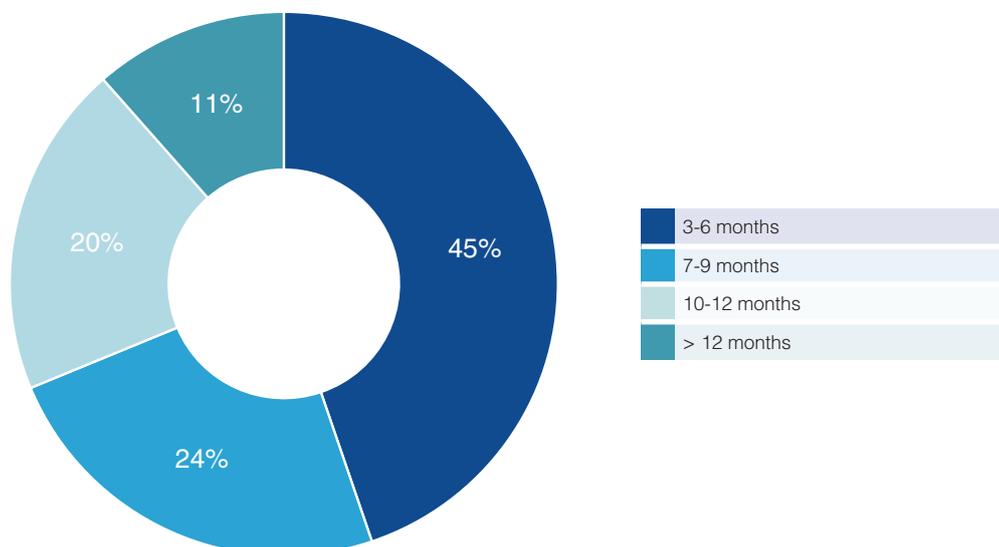


Fig. 3: Duration of experience with the Sky CI M sound processor at the time of completing the survey for the experienced respondents.

SOUND QUALITY AND SPEECH UNDERSTANDING

Outstanding sound quality and speech perception

Upgrade users rated several aspects of sound quality with the new AB Hearing System compared to their previously used system. All items were rated as statistically significantly better* with the new system (see Fig. 4).

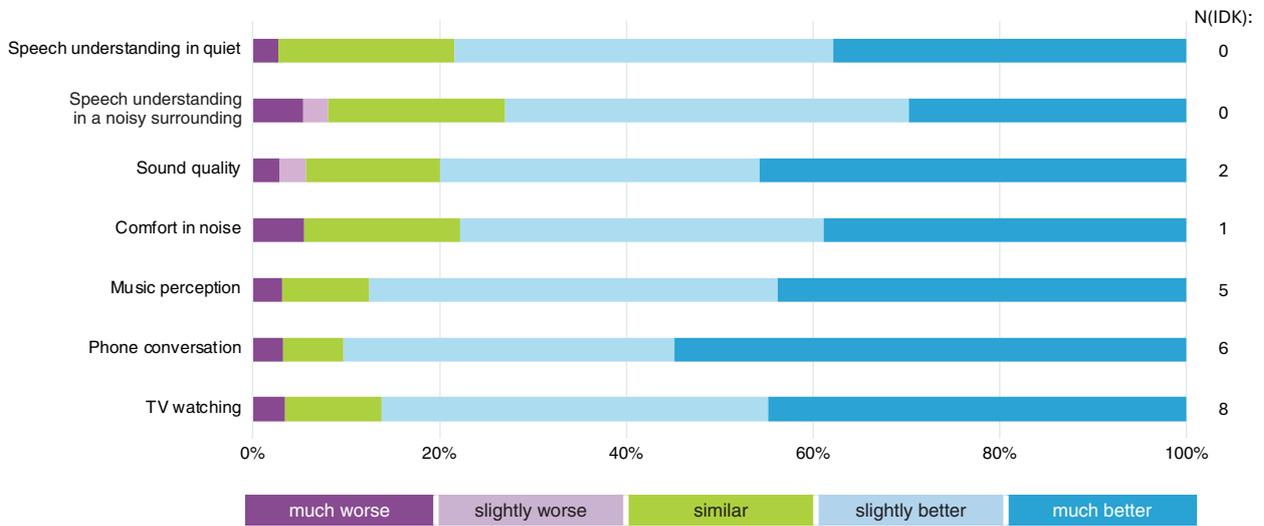


Fig. 4: Comparative ratings of sound quality and speech perception aspects. All items were rated as significantly better with the new Marvel CI Hearing System. N(IDK) indicates the number of respondents who chose the “I don’t know” option for each item.

While conversation in noise received the lowest ratings for speech intelligibility, the median rating of 7.5 out of 10 still falls in the good to very good range. Listening in a car and listening in noise (sound quality) and conversation in a car and conversation in a small group (speech intelligibility) were rated higher, with a median rating of 8 out of 10. Listening to music (sound quality), and conversation in a car and conversation in quiet (speech intelligibility) were rated as very good with median ratings of 9 out of 10, while the sound quality for listening in quiet was rated as 10 out of 10.

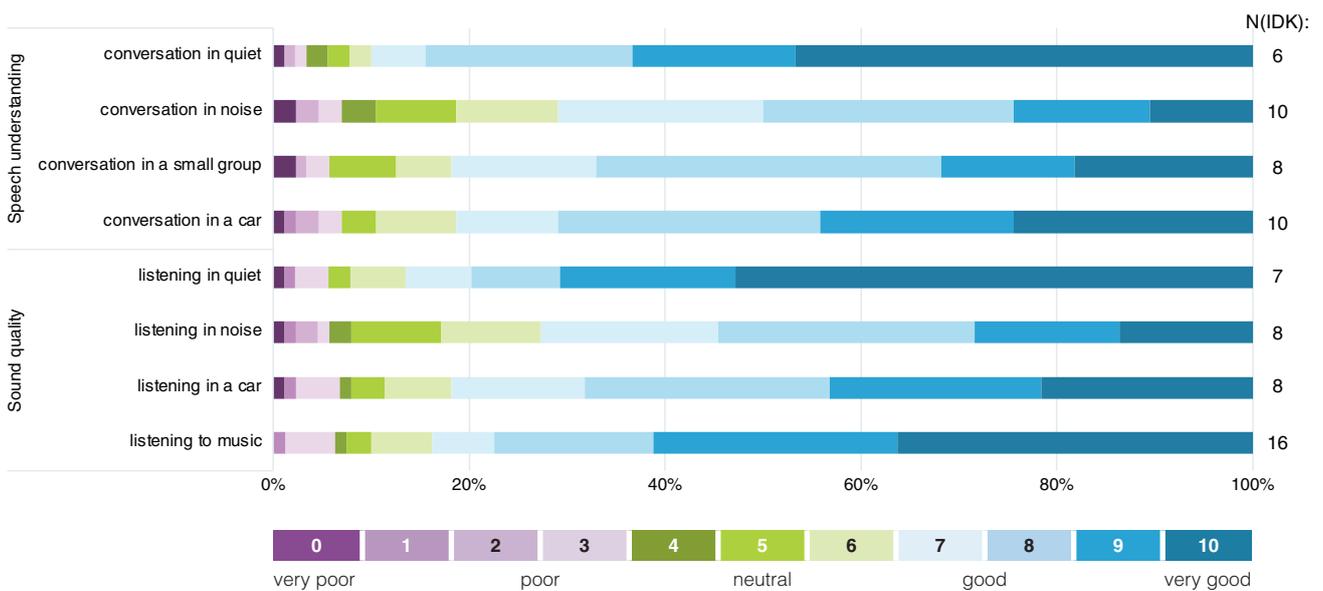


Fig. 5: Subjective rating of speech intelligibility (top) and sound quality perception (bottom) with the AB Hearing System. All items were rated as significantly higher than 6 out of 10. N(IDK) indicates the number of respondents who chose the “I don’t know” option for each item.

*One-sample Wilcoxon signed rank test.

DAILY DURATION OF USE

Increased daily use after upgrade

Upgrade users reported a significant increase* in use time after the upgrade to the current AB Hearing System, with most subjects using the device 11-16h/day.

BLUETOOTH STREAMING

A significant increase in media streaming time

Of the upgrade users, more than 75% reported not using any device for Phone, TV, and Media before upgrading to the current generation of Sky CI. Streaming frequencies for Phone, music, and TV and frequency of program change increased significantly* after upgrading to the current generation of the AB Hearing System with integrated Bluetooth® capabilities (see Fig. 6).

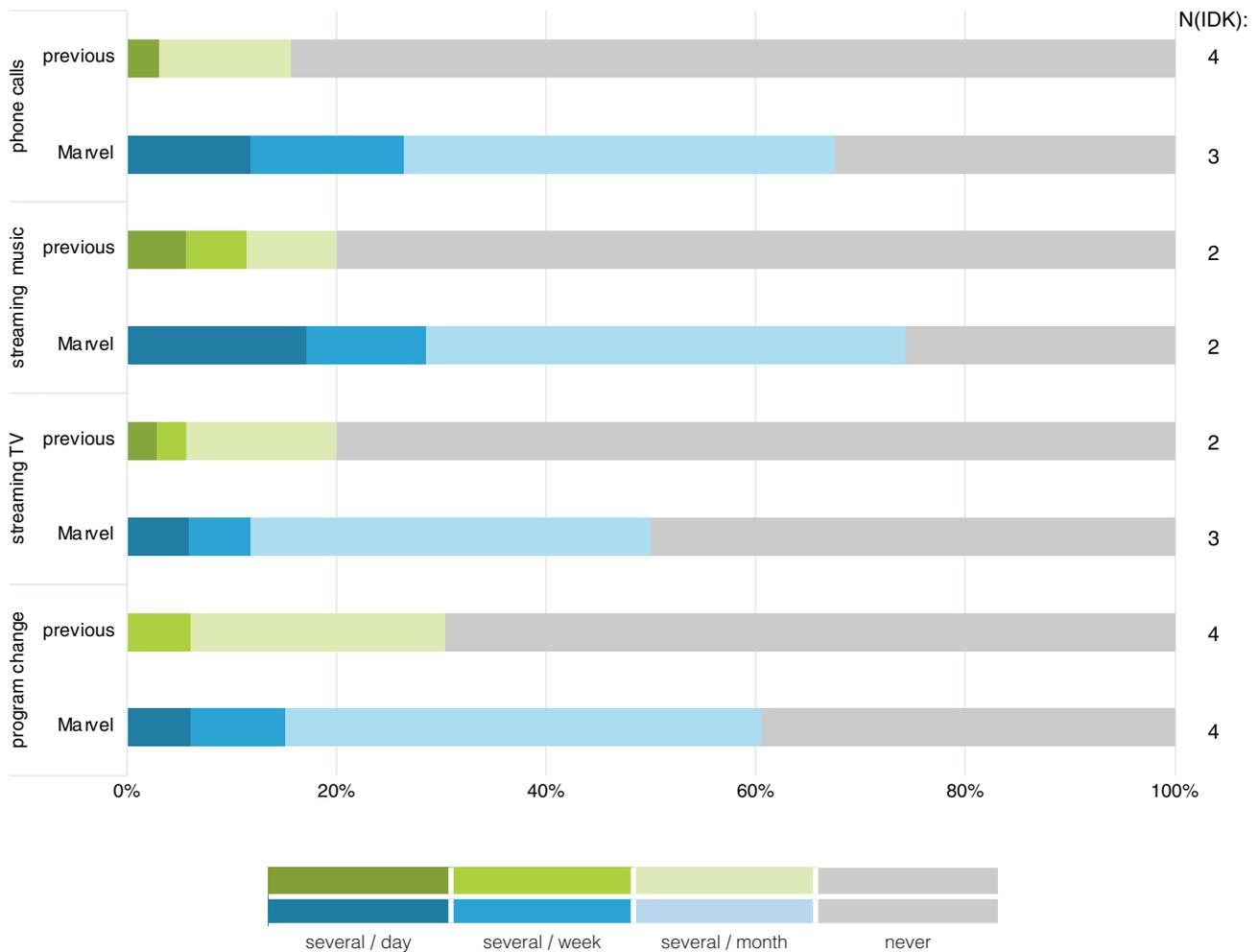


Fig. 6: Streaming frequency for phone calls, music, and TV, as well as program change frequency with the previous (top rows) and current (bottom rows) system. All items were significantly different between the previous system and the current AB Hearing System. N(IDK) indicates the number of respondents who chose the "I don't know" option for each item.

*Paired Wilcoxon Signed Rank Test.

The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by Sonova AG is under license.

Experienced CI users rated all items relating to speech understanding, sound quality, and ease of use while using Bluetooth® streaming as significantly* higher than 6 out of 10 with median ratings of 9 out of 10 (see Fig. 7) on a rating scale from 0 (very poor) to 10 (very good). However, the option “I don’t know” was indicated by at least 19% and up to 52% of respondents for each item.

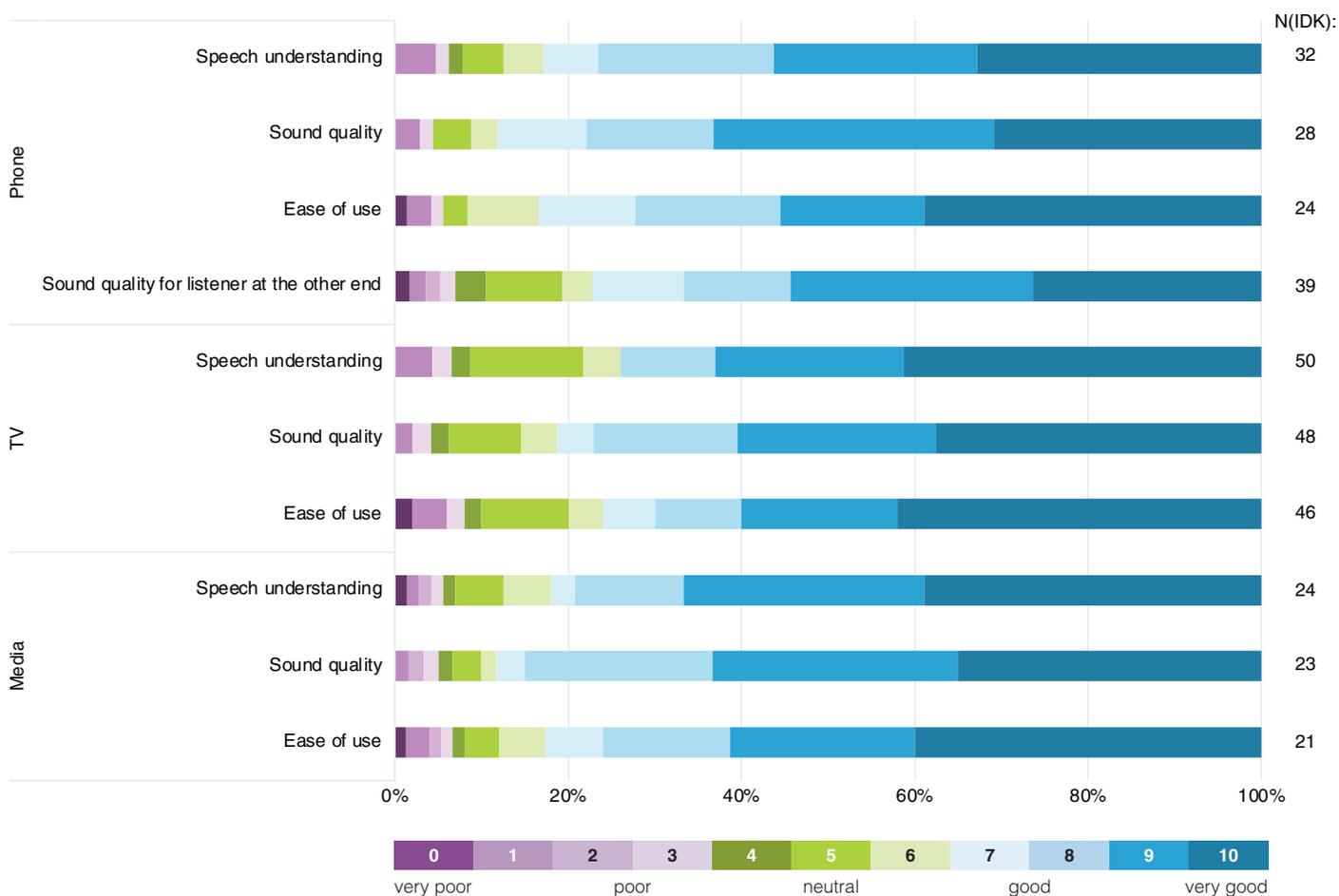


Fig. 7: Subjective rating of the current AB Hearing System’s Bluetooth capabilities. All items were rated as significantly higher than six out of ten. N(IDK) indicates the number of respondents who chose the “I don’t know” option for each item.

*One-sample Wilcoxon signed rank test.

HANDLING AND EASE OF USE

Easy to use for upgrade and experienced users

Upgrade users rated all aspects related to daily use of the current AB Hearing System as significantly better* than the previously used system (see Fig. 8). Experienced users rated all aspects as significantly* higher than 6 out of 10 with median ratings of 9 out of 10 or 10 out of 10, on a scale from 0 (very poor) to 10 (very good). The option “I don’t know” was indicated by between 1% and 22% of respondents (see Fig. 9).

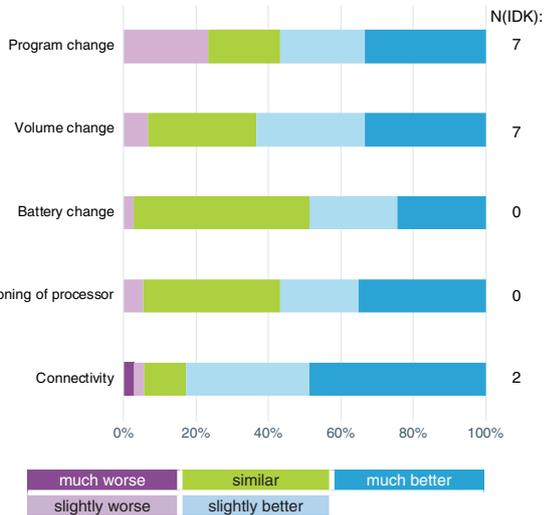


Fig. 8: Rating of everyday use tasks compared to the previously used system by upgrade users. All items were rated as significantly better with the current AB Hearing System. N(IDK) indicates the number of respondents who chose the “I don’t know” option for each item.

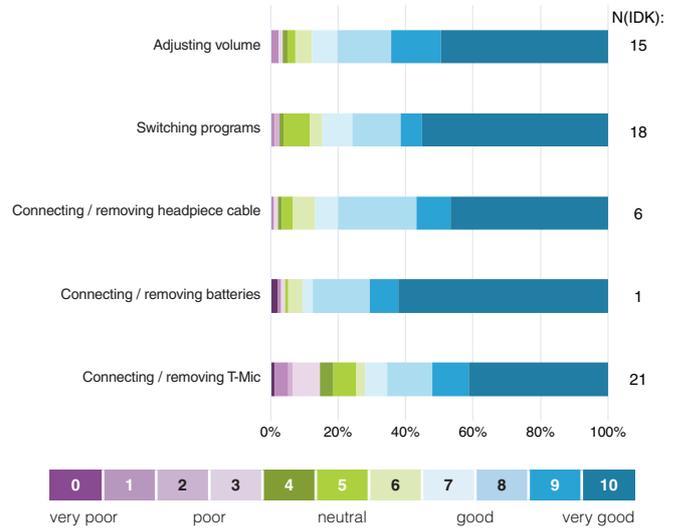


Fig. 9: Rating of everyday use tasks on a scale from 0 (very poor) to 10 (very good) by experienced users. All items were rated as significantly higher than 6 out of 10. N(IDK) indicates the number of respondents who chose the “I don’t know” option for each item.

OVERALL SATISFACTION

Pediatric CI users are highly satisfied

Pediatric upgrade users rated all aspects of wearing comfort and aesthetics as significantly better* than their previously used device (see Fig. 10). Experienced pediatric CI users rated the overall satisfaction and the satisfaction with the cosmetic appearance of the Marvel CI Hearing System significantly* higher than 6 out of 10 with median ratings of 9 out of 10, on a scale from 0 (very poor) to 10 (very good).

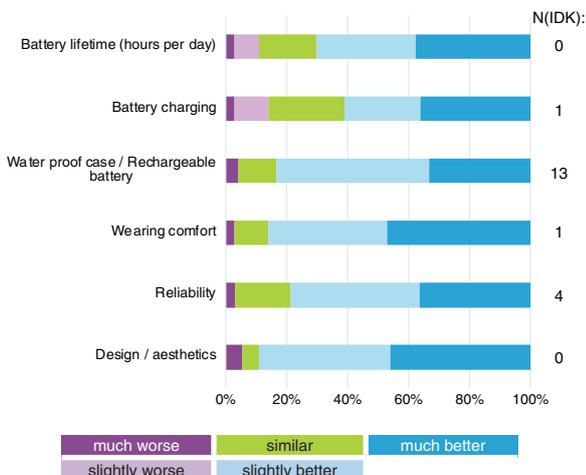


Fig. 10: Rating of comfort and aesthetics compared to the previously used system by upgrade users. All items were rated as significantly better with the current AB Hearing System. N(IDK) indicates the number of respondents who chose the “I don’t know” option for each item.

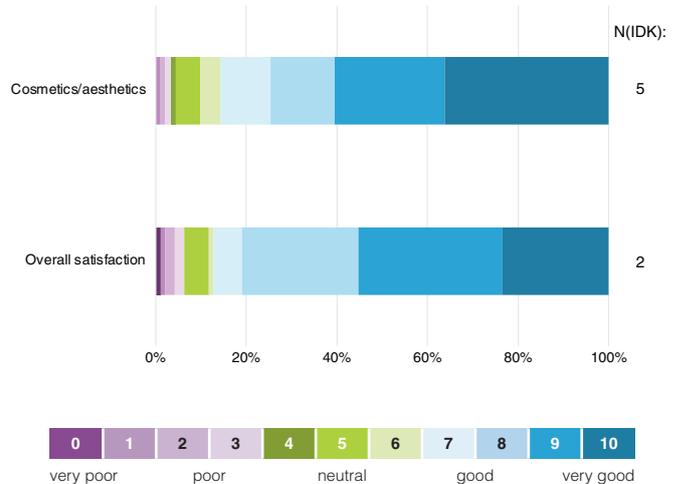


Fig. 11: Rating of overall satisfaction and aesthetic appeal on a scale from 0 (very poor) to 10 (very good) by experienced users. Both items were rated as significantly higher than 6 out of 10. N(IDK) indicates the number of respondents who chose the “I don’t know” option for each item.

*One-sample Wilcoxon signed rank test.

SUMMARY

A well-received innovation

Healthcare professionals reported using AutoSense OS only programs more frequently for pediatric CI users than adult CI users. This trend towards enabling automatic noise management features in pediatric CI recipients is in line with previously reported findings⁵.

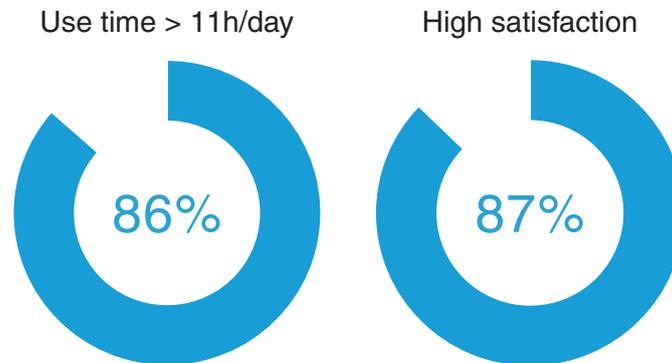


Fig. 12: Percentage of upgrade users wearing the current AB Hearing System for eleven hours per day or more (left) and percentage of experienced CI users rating the current AB Hearing System as good or very good (higher than 6 on a scale of 0 to 10, right).

For pediatric upgrade CI users, compared to the previously used hearing system, sound quality and speech intelligibility with the new AB Hearing System were rated as significantly better. The new system's comfort, aesthetics, and usability significantly improved compared to the previously used system. Thanks to the integrated Bluetooth capabilities, media streaming duration increased significantly following the upgrade, indicating increased, easier access. Similarly, daily use time increased significantly following the upgrade to the current generation of the AB Hearing System, resulting in an increase in auditory exposure. An increase in daily CI use time has previously been proven to result in increased language abilities⁶, further highlighting the importance of this finding.

For experienced pediatric CI users, sound quality and speech intelligibility, even in challenging listening environments, were rated very well by the survey respondents. Daily use and maintenance of the devices was found to be easily manageable, and the aesthetic appearance of the devices satisfied respondents. The Bluetooth capabilities integrated into the current generation of the AB Hearing System received positive ratings across the bench. Overall, the new AB Hearing System was well received by pediatric CI users.

REFERENCES

1. Marvel CI Technology - Leveraging natural ear acoustics to optimize hearing performance, White Paper, Advanced Bionics 2021, 028-Q049-02
2. AutoSense OS™ 3.0 Operating System - Allowing Marvel CI users to seamlessly connect with the moments they love, White Paper, Advanced Bionics 2021, 028-Q029-02
3. Buechner A, Bardt M, Kliesch S, Lenarz T and Brendel M (2024), Enhancing speech perception in challenging acoustic scenarios for cochlear implant users through automatic signal processing, *Front. Audiol. Otol.* 2:1456413, doi: 10.3389/fauot.2024.1456413
4. Agrawal S, Banik A, Nair A, Ajimsha KM, Jagmaag F, Backer S, Sasidharan P, Manoj MP. (2021). Real-world Evaluation of the Marvel CI Sound Processor in Children. 13th Asia Pacific Symposium on Cochlear Implants and Related Sciences. December 8th to 10th. Oral Poster: 28.
5. Findlen, U. M., Benedict, J., & Agrawal, S. (2022). Clinical Practice Patterns of Fitting Advanced Device Features in Children With Cochlear Implants. *Journal of speech, language, and hearing research : JSLHR*, 65(2), 797–815. https://doi.org/10.1044/2021_JSLHR-21-00168
6. Glaubitz, C., T. Liebscher, and U. Hoppe. (2021). "Age-Related Language Performance And Device Use in Children With Very Early Bilateral Cochlear Implantation." *International Journal of Pediatric Otorhinolaryngology*, 110780. doi:10.1016/j.ijporl.2021.110780.