UNIVERSITY OF Southampton

Institute of Sound and Vibration Research

# Freedom Processor for Nucleus CI24 Paediatric Upgrades
# The South of England Cochlear Implant Centre Experience

## Introduction

At the South of England Cochlear Implant Centre (SOECIC) there are 189 CI24 users who could be upgraded to the Freedom processor. The manufacturers believe that the cochlear implant user will benefit from the improved resistance to moisture damage, comfort and the trouble-shooting information from the LED. In addition the Freedom incorporates SMART sound features:

- Beam
- ADRO
- Whisper

The purpose of the project was to evaluate the benefits of the upgrade to the Freedom from the perspective of the patient and the clinician. This study followed a similar study carried out on a group of adults.

## Method

Twenty paediatric patients were approached and asked to try the Freedom speech processor. They were required to attend two appointments. During the first appointment, they underwent a hearing test and speech in noise testing with the ESPrit 3G, and then they were upgraded to the Freedom.

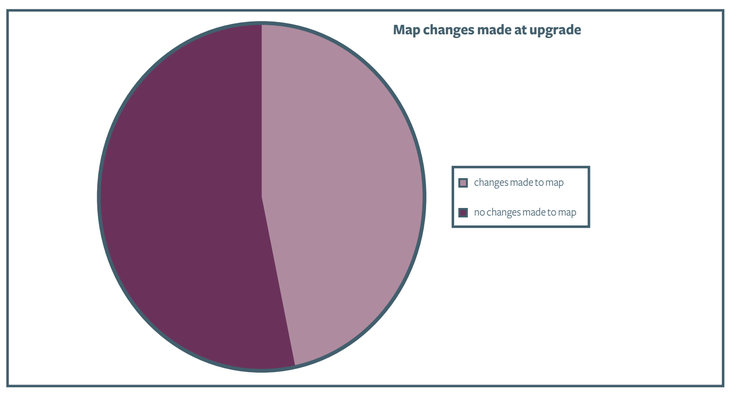
Patients were given at least 4 weeks to get used to the new speech processor and then they underwent the same tests with the Freedom.

- Aided Thresholds
- Adaptive Toy Test (ATT). The ATT presents the list of words used by the McCormick Toy Test at a level of 65dB(A) from a speaker at 0 azimuth at a distance of 1 metre. Pink noise at variable levels was introduced and a signal-to-noise ratio was calculated.
- Questionnaires – the APHAB (Adapted Hearing Aid Benefit) and an ergonomics questionnaire, which compared the wear-ability and ease of use of the two different processors, were given to patients to fill in regarding the ESPrit 3G and the Freedom.
- Map upgrade with the options of ADRO, Beam and Whisper

Data is presented on 15 out of 20 children/teenagers who were upgraded. 5 children/teenagers did not attend their follow up appointment. One of them returned the Freedom.

## Map Upgrade

Using Custom Sound software the maps were "upgraded". None of the patients required the map to be converted rather than upgraded.




## Aided Thresholds

Sound detection in quiet using the standard map with both processors revealed no difference between either processors.

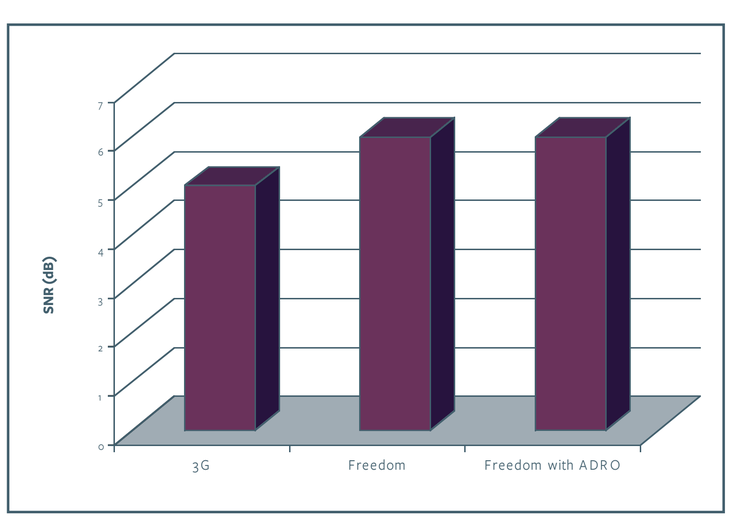
Average aided levels are shown below (dBHL)

| | 250 Hz | 500 Hz | 1 KHz | 2 KHz | 4 KHz |
|---|---|---|---|---|---|
| ESPrit 3G | 35 | 35 | 30 | 30 | 30 |
| Freedom | 35 | 30 | 25 | 30 | 30 |

## Patient Comments

The patients were also asked to comment about their experiences using the Freedom processor. Some of the comments are shown below:

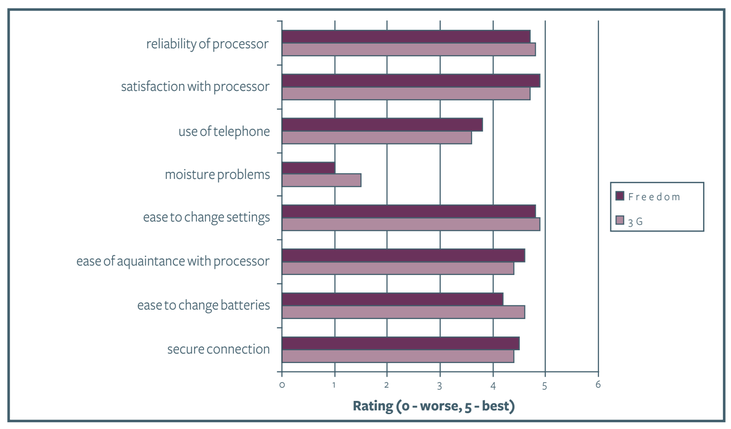

## Speech in Noise Testing




Patients did not perform significantly differently with the ESPrit 3G or the Freedom. They were tested using ADRO with the Freedom processor and this did not yield different results either.

## APHAB

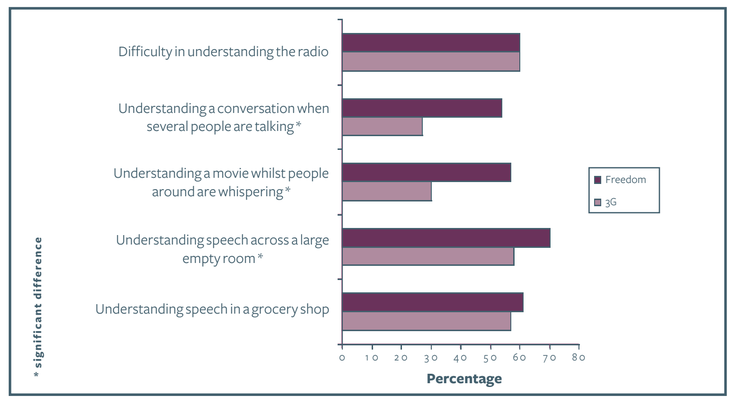
The APHAB questionnaire did not yield any differences between the ESPrit 3G and Freedom.




However, patients mentioned that they adjusted the settings on the Freedom more than they did on the ESPrit 3G.

## Ergonomics Questionnaire

No significant difference was noted between the 2 speech processors for any section of the ergonomics questionnaire.




## Conclusions

Even though no major significant differences between ESPrit 3G and Freedom were shown, patients liked the new processor mainly for the choices of the different programmes it gave them.

The upgrade itself takes very little time but the patients required time to understand how to change the programmes and to alter the sensitivity etc.

The controls of the Freedom are not as intuitive as the ESPrit 3G.

## Recommendations

- Use Accessory mixing ratio of 1:1 for FM use
- Local professionals working with children should be invited to hands-on workshops to aid transition
- Patients should be given a sheet explaining the features of each of the programmes and how to use them
- Use of Telecoil mixing with a high ratio of telecoil to microphone on one of the programmes

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