LINKING AUDIOSCAN VERIFIT WITH OTICON GENIE: Comparison of Manual and Automatic Hearing Aid Fittings

Paula Folkeard, AuD[1] , John Pumford, AuD[2], Parvaneh Abbasalipour Kabirrah,PhD candidate[1] , Susan Scollie, PhD[1]
[1] National Centre for Audiology, Western University London (ON) Canada, [2]Audioscan, Dorchester (ON) Canada.

Rationale:

Failing to verify hearing aid fittings with real ear measurements (REM) has been listed as the number one mistake made by clinicians (Kochkin, et al., 2010). Even though routine verification of aided hearing aid responses using REM's is a part of recommended practice (AAA, 2006), this verification technique is frequently not performed by clinicians (Mueller, 2014, Mueller and Picou, 2014). This lack of use is attributed by some to the perceived complexity of the REM process and the lack of time available to complete measurements (Mueller, 2014). To address these concerns, closed loop fitting systems such as the VerifitLINK have been developed which connect the hearing aid fitting software with the REM equipment. An exchange of measurement and control data allows the fitting software to automatically adjust hearing instrument parameter settings to perform fine tuning for target matching (Koehler & Lulkanri, 2014; Beck & Crowe, 2017). The Audioscan VerifitLINK feature can be integrated into any hearing aid manufacturer's fitting software for use in coupler or real ear fittings. In this poster, we will describe performance of the VerifitLINK as integrated with the Oticon Genie 2 fitting software.

Materials and Methods

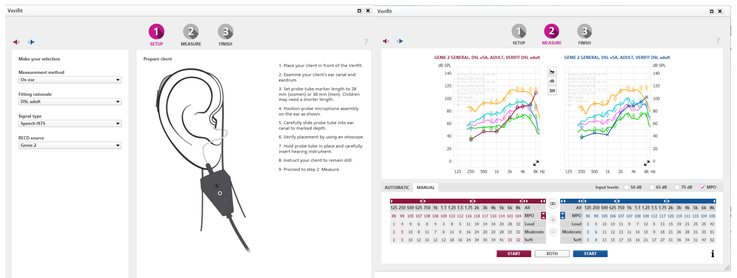
In the interim data reported here, binaural Oticon Opn 1 hearing aids were fit to thirteen (13) adult participants with sensorineural hearing loss that fell within the fitting range of the Oticon Opn 85 and 100 receivers. The aids were fit using Oticon Genie 2 (software:2018.1-4.0.784.31) and the Verifit2 (software: 4.13.38). Participants were fit with the dome type recommended by the Genie 2 software dependant on their hearing loss.

Match to target, SII scores, and the time taken to complete the fitting were compared for three fitting types: (1) the Manufacturer's fit; (2) an automated fitting to DSL v5 targets (50, 65, 75 dB SPL) using the VerifitLINK; and (3) a Clinician Fit method, using a clinically typical manual fit with fine tuning to achieve a close fit to DSL v5 adult targets (50, 65, 75 dB SPL).

The ISTS was used as the signal type for all levels and fitting types. Participants were fit by the same experienced audiologist for all three fitting types. The null hypotheses for statistics will be that there are no between-methods differences regardless of test level or test frequencies.

VerifitLINK On Ear Procedure

The VerifitLINK is a three step procedure and can be used with REM (on ear) or test box in either the Verifit1 or Verifit2. After set up, the VerifitLink and Genie 2 software communicate back and forth to measure and adjust the hearing aids to match the prescription target (DSL v5 adult, DSL v5 child, or NAL-NL2).



On-Ear Fittings using Manufacturer's First Fit, VerifitLINK, and Clinician Fit

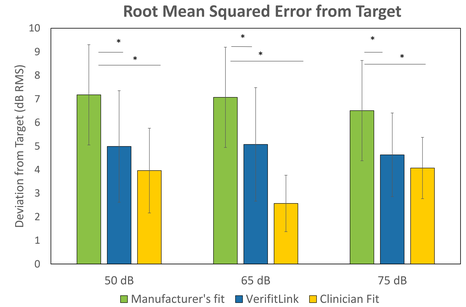
Manufacturer's First Fit **VerifitLINK** **Clinician Fit**

In this sample case, both VerifitLINK and Clinician Fit provided closer fits to target and improved SII scores compared to the manufacturer fit. Root mean square error from target (RMSE) is calculated from 500-6000 Hz and is largest with the First Fit. The time to match target for the VerifitLINK was under 4 minutes 30 seconds. The time to match target during the clinician fitting was 9 minutes and 17 seconds.

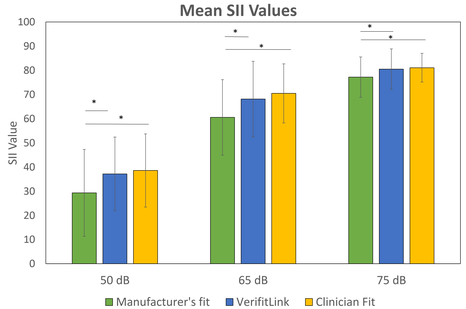
Interim Analysis from On-Ear Fittings

Group data were analyzed for the first 13 participants. Repeated measures Analysis of Variance (ANOVA, GLM SPSS v24) was used to evaluate measurement differences between fitting types for (1) root mean squared error from target (RMSE: McCreery et. al., 2013); (2) Speech Intelligibility Index (SII); and (3) time to complete fitting. If significant differences were revealed, post-hoc paired comparisons were completed with Bonferonni corrections.

RMSE from Target: The RMSE from 500-6000 Hz was calculated for each of the fitting types. Within subjects variables of ear, test level and fitting type were evaluated. Overall, the average manufacturer fit deviation was 7 dB RMS off target, which is outside the 5 dB recommendation (McCreery et al., 2013). VerifitLINK and Clinician-fitted were 5 dB RMSE and 3-4 dB RMSE, respectively. There was an overall effect of fitting type ($F(1.697, 20.098)=23.056$, $p=<.001$, $\eta^2=.658$). Test level and ear were not significant. There was a significant interaction between test level and fitting type ($F(2.801, 33.616)=4.879$, $p=<.002$, $\eta^2=.289$). Pairwise comparisons indicated a significant difference between the Manufacturer's First Fit and both the Clinician Fit ($p=.<001$) and VerifitLINK ($p=.002$) but no significant difference between the Clinician Fit and the VerifitLINK. The interaction between fitting and level was a result of a significant difference at the 75 dB test level between VerifitLINK and Manufacturer's First Fit ($p=.02$).



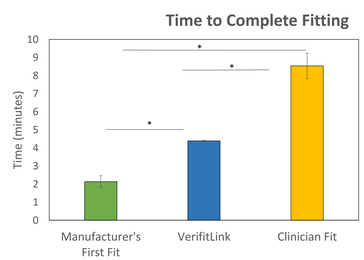
SII: Within subjects variables of ear, level, and fitting type were evaluated. As expected there was an overall effect of level ($F(2, 16.902)=240.8$, $p=<.001$, $\eta^2=.953$). In addition, there was an overall effect of fitting type ($F(2, 22.699)=21.019$, $p=.<.001$, $\eta^2=.637$) and an interaction between level and fitting type ($F(2.24, 26.929)=121.608$, $p=.002$, $\eta^2=.386$). Pairwise comparisons indicated a significant difference between the SII obtained using the Manufacturer's First Fit and both the Clinician Fit ($p=.001$) and VerifitLINK ($p=<.001$) but no significant difference between the SII obtained in the Clinician Fit compared to the VerifitLINK. The level by fitting type interaction was a result of significant differences between the Manufacturer's First Fit and the other two fitting methods at all three levels. There was no significant difference between the VerifitLINK and Clinician Fit at any of the three levels.



Time: Time to complete 50 dB, 65 dB, 75 dB, and MPO binaurally was measured for each of the fitting types. Durations were timed in stages:

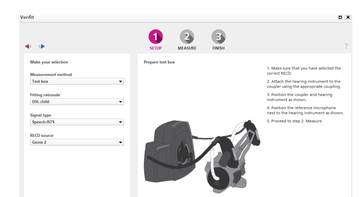
1. When the fit to target icon was clicked for the Manufacturer's First Fit;
2. When the start button was clicked in stage 2 of the VerifitLINK screen; and
3. When the first stimulus was presented for the Clinician Fit method.

Mean times to achieve fit to target were: Manufacturer's First Fit: 2 minutes 14 seconds; VerifitLINK: 4 minutes 39 seconds; Clinician Fit: 8 minutes 53 seconds. The ANOVA revealed a significant overall effect of time ($F(1.325,15.911)=66.556$, $p<.001$). Pairwise comparisons with Bonferroni corrections were completed and indicated the time for each of the three methods were significantly different from each other ($p=<.001$).



Summary

In the cases that have been evaluated, the VerifitLINK provides a fit to target that is closer to target than the Manufacturer's First Fit with no significant difference in SII or RMSE to a Clinician Fit in under 5 minutes. This project will continue with investigation into on-ear fittings with varying configurations, degrees of hearing loss, and asymmetry. Test box fittings in the Verifit1 and Verifit2 will be analyzed using DSL v5 child and NAL NL2 targets. Test-retest reliability for on-ear and test box fittings will also be captured and analyzed.



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