Optimizing first fit acceptance with 'First Time User – Onboarding'

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ABSTRACT

It is commonly accepted that people wearing hearing aids for the first time need a period of adjustment, and that some find it more difficult than others to get used to the amplified sound. Those who successfully acclimate to hearing aids may benefit more, tolerate more gain, and find amplified sounds to be less distracting or annoying. ReSound Smart Fit prescribes first fit settings that take both audiometric factors and hearing aid experience into account. This paper describes an 'onboarding' option that may help new hearing aid users who experience greater difficulty adjusting to amplified sound.

People who are new to hearing aids find many of the new sounds they are hearing to be distracting or even annoying and require time to adjust to them.[1] After an adjustment period commonly referred to as acclimatization, hearing aid users can potentially gain more benefit from amplification due to brain plasticity.[2,3] In addition, they may habituate to higher gain during the acclimatization period.[4] Immediate acceptance of the amplification provided by hearing aids is therefore an important fitting factor to consider, as it will contribute to whether people consistently wear their new hearing aids as they progress through the acclimatization period.

In many clinical settings, the gains and feature settings or even the hearing aids that are initially fit are based on a hearing aid user's immediate perception. Although prescriptive fitting targets always provide the starting point and the fitting may be verified, the hearing aid user is most often asked to make a choice or assessment about the amplified sound. The criteria for making this judgement are idiosyncratic, with preferences elicited by questions such as 'How does it sound?' or 'Which sounds better to you?'. At follow-up sessions, hearing aid settings may be gradually tuned as the person adjusts to the new listening experience.

ReSound offers varying prescriptive profiles that take the individual's experience with amplification into account in prescribing the initial fit. This is intended to contribute to spontaneous acceptance of hearing aids regardless of where the hearing aid user is in their journey. Beginning with ReSound Smart Fit version 1.17, there is a new option for the initial fit intended to give new users who are preoccupied with disturbing or annoying amplified sounds a gentle start in getting used to wearing hearing aids. To this end, the previous 'Comfort User' profile is replaced by 'First Time User – Onboarding'. To determine the best settings for First Time User – Onboarding, a listening test using an approach similar to clinical practice with immediate perceptual judgements by people new to amplification was carried out. To decrease bias and overcome short-term memory limitations, recorded stimuli played back over headphones were used in the test.

Methods

Participants

Eleven adults (8 men, 3 women; average age 67 years) with mild-to-moderate hearing loss and no hearing aid experience participated in the study. Participants were selected who had a hearing loss similar to the standard N3[5] audiogram such that the same hearing aid settings could be used for all.

Hearing aids and hearing aid settings

As mentioned, some practices ask hearing aid users to compare different hearing aids in addition to varying settings within a particular product. To account for this, ReSound receiver-in-ear (RIE) hearing aids and RIE hearing aids from two other premium brands were included in the test. The other brands' hearing aids were programmed to their default settings for people with no hearing aid experience. The ReSound hearing aids were programmed to default settings with the following variations:

- First Time User
- First Time User targets at 70% of prescribed gain
- Experienced Nonlinear User at 70% of prescribed gain

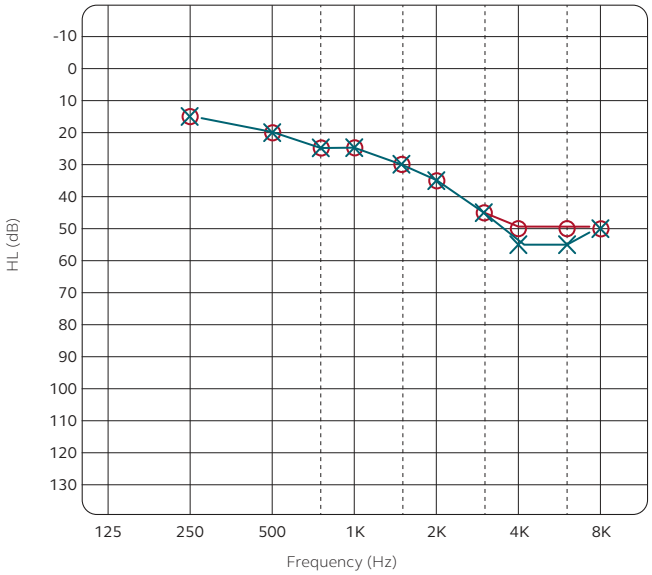

Figure 1. Average hearing threshold levels for participants in the listening test.

Test box measurements were also carried out for all hearing aids and settings. The First Time User targets at 70% of prescribed gain were the lowest of the three Re-Sound hearing aid conditions, and they were found to be most similar to the other hearing aid brands' initial fittings for inexperienced hearing aid users. Therefore, this setting was considered to be the proposed target for the First Time User – Onboarding option. All hearing aids were fit bilaterally on a KEMAR in a test booth with open domes, and the feedback management system was calibrated.

Recording and test procedures

For each pair of hearing aids and fitting, three sound scenarios were played over a speaker at 0 degrees azimuth relative to the KEMAR and recorded in stereo from each device. The three sound scenarios were piano music, a diner scene, and a single female talker. The first 30 seconds of each recording were deleted to allow any adaptive features in the hearing aids to settle.

The listening test was carried out with the stimuli presented in stereo under headphones at a comfortable listening level determined by each participant. An internet-based tool to perform perceptual audio evaluation tests locally or on remote machines was used to run the test (https://github.com/BrechtDeManWebAudioEvaluationTool). A/B comparisons were made such that each condition was compared against all others. Stimuli were continuously looped so that participants could switch back and forth seamlessly. A screenshot of the user interface for the test (Figure 2) shows how participants could play the stimuli and make their choice. The order of sound scenes and A/B comparison was randomized. The task of the participant was to select which of the two stimuli was most 'comfortable'. This word was chosen because the object of the new profile was to maximize spontaneous acceptance among people who are inexperienced with amplification and the assumption was made that 'comfortable' sound would have higher immediate acceptance than, for example, 'clear' sound. The interpretation of 'comfortable' was left to each participant to decide for themselves to make the listening test similar to how new hearing aid users might be asked about their immediate perception of amplified sound during a fitting.

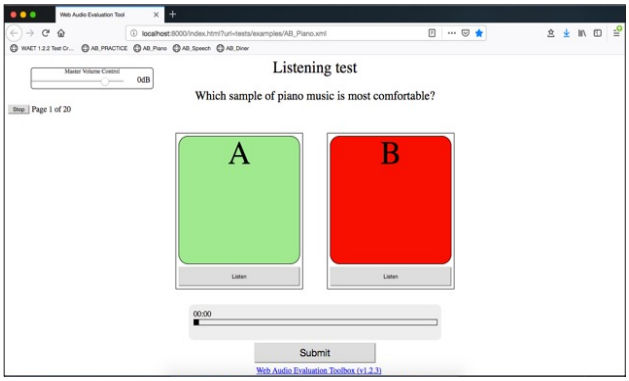

Figure 2. The user interface for the paired comparison listening test. Participants could switch back and forth between the samples before making their choice.

Data analysis

Because the data was binary and the sample was small, a binomial distribution or 'coin-toss' test was used. The advantage of this method for analyzing the listening test results is that it allows you to know if the number of observations you have for the target exceeds the predicted likelihood of chance and converts the results to a z-score which indicates the direction and degree of preference. Z-scores within -1 to +1 are considered at chance level.

Results and discussion

The z-scores for the paired comparison listening test are shown in Figure 3. The results of the paired comparisons for each of the three sound scenarios are shown for First Time User – Onboarding against each comparison response. Only one comparison showed a judgement that was not at chance level. This was an assessment that First Time User – Onboarding was more comfortable than First Time User for the single talker sound scenario. For the remaining 7 comparisons, results were non-significant, but in the direction of a First Time User – Onboarding 'win' (positive z-score) in three cases and 'tie' (z-score of zero) in three cases. The result was in the direction of Brand A (negative z-score) in one comparison.

Taken together, these results suggest that people with mild-to-moderate hearing loss who are not experienced with amplification may find the First Time User – Onboarding setting to provide a more comfortable first fit and will not perceive it as less comfortable than other options or other hearing aid brands' first fit settings. Therefore, it has the potential to support immediate acceptance of amplified sound.

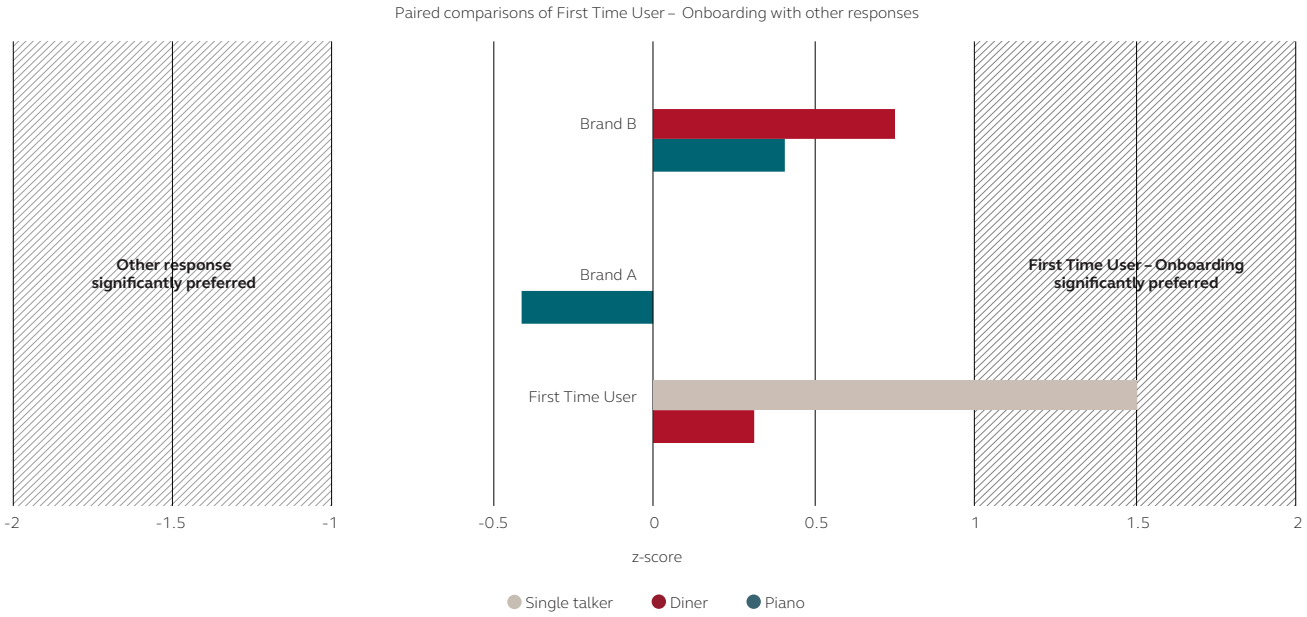

Figure 3. Z-scores for the paired comparison listening test. All scores are compared to the First Time User – Onboarding condition, with a score of zero indicating no difference. Scores to the right indicate First Time User – Onboarding was preferred and scores to the left indicate the other condition was preferred. The shaded regions show significant differences. The comparison to First Time User for a single talker sound scenario was the only significant difference, and favored First Time User – Onboarding.

What will you see in ReSound Smart Fit?

Gains

Beginning with ReSound Smart Fit version 1.17, the Comfort User profile will no longer be available. Instead, First Time User – Onboarding appears as a fitting option in the Patient Profile screen. When this option is selected, the First Time User prescription will be applied to the fitting and the percent gain option will automatically be set to 70%. When navigating from the Patient Profile screen to the Fitting screen, the targets shown will be for First Time User, but the gains will be set to 70% of these targets. The HCP can quickly return to First Time User settings by selecting '100%' in the percentage gain option. An alternative is to activate Acceptance Manager to gradually increase gains to the desired targets as the person wears the hearing aids. The differences between the prescribed First Time User gains and Comfort User gains are shown for two typical audiograms (Figure 4) in Figures 5 and 6. These examples illustrate:

- That First Time User – Onboarding has a clear and simple relationship to the First Time User prescription. Gains for First Time User – Onboarding are always lower, with the amount depending on the severity of the hearing loss.

- That First Time User – Onboarding provides less gain than Comfort User at lower frequencies, with similar or slightly higher gains in the mid and high frequencies. Compared to applying Comfort User for people who are having difficulty acclimatizing to amplification, this may ease loudness complaints without compromising speech clarity.

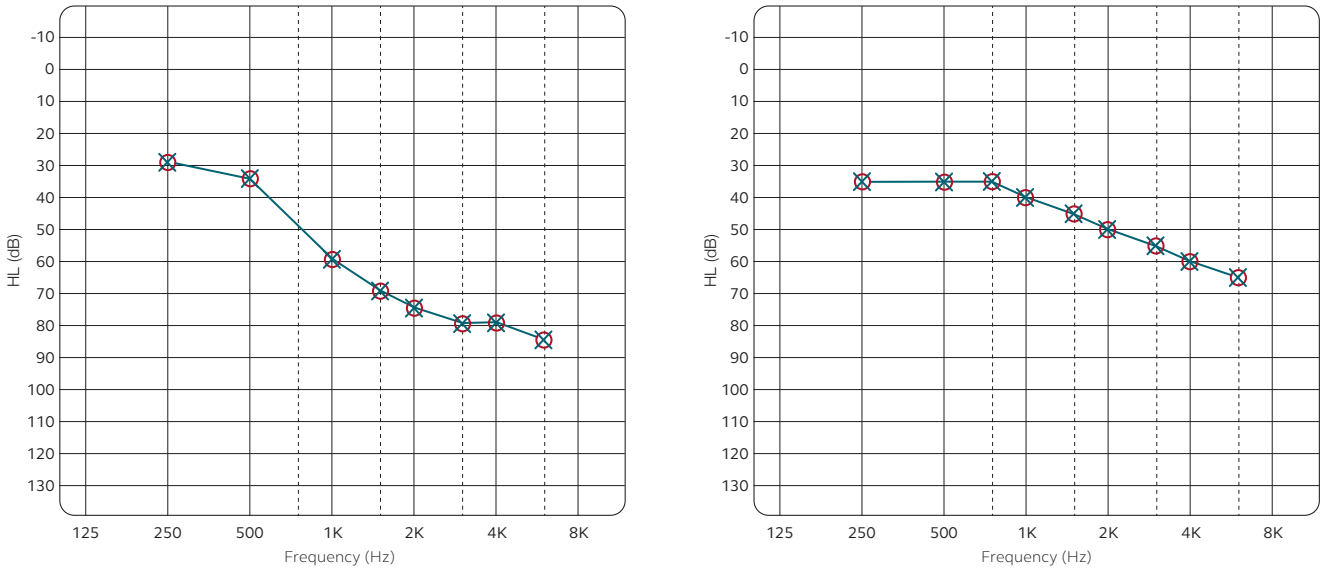

Figure 4. Standard audiograms S3 (left panel) and N3 (right panel). Both are representative of audiograms that people new to hearing aids might have.

Figure 5. Because First Time User – Onboarding provides 70% of gains prescribed by the First Time User profile, the gains will always be lower for First Time User – Onboarding. The effect on the more severe S3 audiogram (left panel) relative to the less severe N3 audiogram (right panel) is a greater gain reduction.

Figure 6. The First Time User – Onboarding settings are not directly related to the Comfort User profile. Gains for First Time User – Onboarding tend to be lower than Comfort User in the low frequencies and the same or slightly higher in the high frequencies, although some variation depending on input level is also observed. First Time User – Onboarding may help with loudness complaints without disturbing clarity of the sound relative to Comfort User.

Advanced features

The feature settings that are applied in an initial fit are differentiated and prescribed depending on the individual's experience with amplification and severity of hearing loss as described in Koehler & Schumacher.[6] This evidence-based prescription is conservative, meaning that adjustments compared to the default feature settings are made only for features with multiple studies supporting the rationale for the setting, and only including individual patient factor data that are already available in the fitting software. With the introduction of the First Time User – Onboarding option, an additional conservative change is made in products that have environmentally based Noise Tracker II, which is intended to reduce the distraction of loud background noise further. For the loudest environments, the feature settings for Noise Tracker II are increased by one step. Other advanced features are set according to the First Time User profile and audiometric data when First Time User – Onboarding is selected.

Other fitting rules

Like the ReSound Audiogram+ proprietary formula, the NAL-NL2 prescription also can take into account whether the hearing aid user has previous experience with amplification. To ensure that a new user correction is applied when fitting to NAL-NL2 targets, it is necessary to select either the First Time User profile in the Patient Profile screen or the First Time User – Onboarding option. If the First Time User – Onboarding option is chosen for an NAL-NL2 fitting, the software will set the percentage gain option to 70% in addition to the corrections for a new hearing aid user. For any fitting rule in ReSound Smart Fit other than Audiogram+ and NAL-NL2, the First Time User – Onboarding option can be selected and the software will set the percentage gain option to 70% even if the particular fitting rule does not have a new user correction. This would apply to NAL-RP, NAL-NL1, DSL i/o and DSLv5 fitting rules.

Summary

The First Time User – Onboarding option can be selected with any fitting rule to apply 70% of the prescribed target gains. This is an easy way for HCPs to reduce gains for people new to hearing aids who might object to the amplified sound. A paired comparison listening test against the ReSound First Time User profile as well as the first fit settings for inexperienced users in two other premium hearing aid brands was carried out. The First Time User – Onboarding option was judged positively or the same in all but one comparison, suggesting that it may be helpful in supporting immediate acceptance of amplified sound.

Acknowledgement

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