

The Oticon Alta Fitting Approach

EDITORS OF ISSUE

Donald J. Schum, PhD, Vice President, Audiology & Professional Relations, Oticon, Inc.

Randi R. Pogash, Au.D., CCC/A, Manager, Clinical Studies, Oticon, Inc.

ABSTRACT

In the healthcare environment, the patient's overall experience can be affected by many factors including the success of the treatment, interaction with the professional, interaction with support staff, the physical environment of care, etc. The outcome measure of **satisfaction** tends to capture this range of variables.

In this paper, satisfaction ratings are reported for a group of users fitted with Oticon Alta Pro, including the full Personalisation Process. Ratings on eleven dimensions of satisfaction were collected two weeks after the final fitting session and then again 6 to 9 months later. Compared to industry norms, the combination of Oticon Alta and the Personalisation Process led to significant improvements on multiple dimensions of satisfactions, both immediately after the fitting, and also 6 to 9 months into the fitting.



Donald J. Schum,
PhD., Vice President, Audiology &
Professional Relations, Oticon, Inc.



Randi R. Pogash,
Au.D., Manager, Clinical Studies
Oticon, Inc.

Introduction

A major element in the development and design of Oticon Alta is the focus on personalising the performance of the instruments to best reflect the listening needs and preferences of the user. This approach was developed based on the recognition that perceptual differences exist from user to user and that our traditional fitting approaches do not fully capture these differences (Schum & Weile, 2013). Our conceived fitting approach includes the use of sound preference questions (with supporting sound samples) at the initial fitting, along with a session of structured listening as follow-up, once the user has had the opportunity to use the new instruments for up to several weeks.

As part of the development process, a group of Hearing Care Professionals (HCP) was given the opportunity to fit patients with Alta Pro using the described Personalisation Process. This paper presents the results from that investigation, including longer term follow-up data from a subgroup of the patients fitted.

There is no universally accepted “best” way to measure the outcome of a hearing instrument fitting. As a field, we have traditionally focused on audiologically-defined measures of success, such as aided speech understanding or subjectively-rated communication performance. Since the use of amplification is a voluntary choice, there is intrinsic value in outcome measures that somehow reflect the attitude of the user. Furthermore, since the patient does not only experience the direct effect of the amplification but, more broadly, the total care experience, an outcome measure that captures this broad range of experience is also valuable.

Many other areas of healthcare have made use of patient **satisfaction** measures as a primary outcome measure (Korda, 2012; Kravitz, 1998), as this correlates with factors such as patient compliance, return use of services, lower rates of malpractice suits, etc. (Ware, 1987; Weisman & Koch, 1989). Satisfaction captures both the outcome of the treatment and patient impressions of the clinical process. Both elements have been identified as being important components of satisfaction. For the last 20 years, Sergei Kochkin has been evaluating patient satisfaction with commercially-available hearing instruments as part of the MarkeTrak

approach. Using his technique, he measures both overall satisfaction and a wide variety of specific components that contribute to overall satisfaction. These specific components include both situational-specific performance with amplification (e.g., performance in noise performance in small groups) and elements of the clinical treatment process (e.g., on-going expense, quality of service). Given that we are combining a new product with a new approach to fitting, it seemed appropriate to focus on satisfaction as the appropriate outcome measure.

Purpose: To evaluate whether the Alta Pro fitted to experienced users using the full Personalisation approach can provide **satisfaction** ratings that are significantly higher than the industry standards.

Method

Product: For this project, the Alta Pro miniRITE was used.

Signal Processing Technology: This product provides multi-channel, non-linear sound processing with dynamic behaviour controlled by the Speech Guard E algorithm (Nilsson & Behrens, 2013). In addition, automatic directionality is provided by a multi-modal approach called Free Focus Directionality, which varies the frequency range and the likelihood of activation of the adaptive directionality, depending on a variety of environmental and patient preference factors. Automatic noise reduction is provided by the TriState Noise Reduction system, which applies varying amounts of noise reduction in different frequency regions depending on certain environmental and patient preference factors. Binaural connectivity is employed to provide control over the nonlinear reaction of the instrument in order to maintain interaural level differences in the higher frequencies. The binaural connectivity also provides an environmentally-dependent reaction of the noise reduction and directionality, depending on the signal conditions on either side of the head; in relatively symmetrical conditions, the automatic changes in directionality and noise reduction are synchronised between the instruments; in asymmetrical conditions, the noise reduction response is maximised on the side with the poorer signal-to-noise ratio (S/N). Finally, the instrument offers state-of-the-art approaches to adaptation, feedback suppression and transient noise protection.

Personal Profiles: Modern, advanced technology hearing instruments provide a significant amount of flexibility in the setting of sound processing features. Although a significant amount of information is available describing how gain and compression should be set based on the patient's hearing loss, there is little information available in research literature to describe how other signal processing features should be configured on an individual basis. In fact, in many fittings, these features remain in the default settings based on manufacturers' recommendations.

For Oticon Alta, we have introduced the concept of Personal Profiles. This is an extension of our Identities Concept, which was introduced in 2004. With this concept, we attempted to predict appropriate settings for certain environmentally-adaptive systems in the hearing instruments, based on patient audiometric and demographic information. Although these predictive concepts still have their role in the Personal Profile approach, our emphasis has turned towards empirically selecting the best combination of settings based on patient feedback.

In Oticon Alta, changing the Personal Profile will change the level of assistance provided to the user in complex listening environments. Technologies such as directionality and noise reduction are designed to assist the listener when listening in environments with noise and other competition. However, not all users want these systems to work in the same way. Some listeners prefer all the assistance they can get, whereas others prefer the sound quality of hearing instruments with less active application of these assistance systems. It should be noted that when directionality or noise reduction is most active, the sound quality of the

instruments will change. Some patients would rather not make this compromise in sound quality if they feel they do not need the full signal processing assistance in some environments.

We have created five Personal Profiles that vary the likelihood of activation and the magnitude of reaction of environmentally-adaptive systems such as directionality, noise reduction, transient noise protection and binaural environmental management. Within each of these five Personal Profiles, there are actually sub-settings with smaller adjustments in the direction of both more assistance and less assistance, leading to 15 discrete combinations of settings. Based on patient audiometric and demographic information, we will predict the best initial Personal Profile for the patient. However, in keeping with our strategy of personalisation, we believe that individual testing of the patient to find the optimal Personal Profile provides the best opportunity for the patient to get the most out of the new fitting.

Personalisation Process: The Personalisation Process has two major parts (Schum & Weile, 2013).

During the initial fitting of the product, the patient has the opportunity to answer up to five questions about sound preferences and experiences (Table 1). Sound samples are used to guide the response to several of these questions. The sound samples are designed to be played unaided at an audible and comfortable level. They are primarily designed to mimic some of the signal processing behaviour alternatives of the instrument. This provides the opportunity to personalise the signal processing to meet the patient's preferences.

Personal Profile Questions	Purpose
I have difficulty understanding speech in quiet environments: Yes/No	To determine if a patient with a borderline ski-slope audiogram should be treated as having a ski-slope loss or a sloping loss
I get easily disturbed by sounds around me: Yes/No	To determine if the patient requires more active noise control and transient noise management
I prefer to hear the full range of sounds in the listening environment: Yes/No	To determine how much the patient feels the need for more frequent activity from systems such as directionality and noise reduction
I prefer the sound to be: Sharp/distinct / Soft/round	To determine if the patient prefers a modest gain boost (3-4 dB) in the higher frequencies
My everyday listening environments are: Variable/Less variable	To determine how often the patient is in complex, challenging listening environments

Table 1: Questions used during the initial fitting of the Alta Pro. The first question is only used for patients with a borderline ski-slope audiogram.

Afterwards, the patient has the opportunity to adapt to the new fitting, and an optimisation session is carried out. For existing users, we recommend that this optimisation session take place approximately one week after the fitting. For first-time users, we recommend that the optimisation session take place at the end of the adaptation process, which is typically 3 to 4 weeks after the initial fitting. During the session, the patient is given the opportunity to listen to sound samples through the hearing instruments. The patient is provided with the opportunity to listen with the hearing aid in its current setting and in a different personal profile, while listening to the same sound sample. We recommend that the patient be given this opportunity using somewhere between 2 to 5 sound samples and with the opportunity to listen to more than one alternative personal profile. We recommend that the initial contrast be two full personal profile settings away from the patient's current setting. If the contrast is clear to the patient and if there is a clear preference for one alternative compared to the other, then bracketing can take place using a smaller difference between alternatives. If the patient prefers the setting in a different personal profile from the one that was provided at the initial fitting, this provides the HCP with information about patient requirements and preference.

The Personalisation Process is not seen as a substitute for traditional fine-tuning. The knowledge base that each HCP employs to correct patient reports about performance, comfort or sound quality, is still relevant. However, the dimensions that are controlled by the Personal Profiles are typically not well addressed by traditional fine-tuning approaches.

Participants: Ten HCPs were recruited to participate in the project. They were brought together for a day-long training session on the product and the Personalisation Process. All HCPs were generally familiar with Oticon products, signal processing approaches and the Genie fitting software.

They were then instructed to fit up to six existing users with a pair of Alta Pro miniRITEs. The only requirement for the patients was that the hearing loss had to fall within the fitting range of the product on the ear(s) being fitted. Monaural fittings were allowed. The use of domes or custom fit moulds was left to the discretion of the HCPs.

The patients were offered the instruments at prices consistent with high-end hearing instruments. They were informed that they were being given early access to new instruments that would soon be on the market. The instruments were identical in all aspects to the products released for commercial sale approximately seven weeks after the start of this trial.

Procedures: Each HCP fitted between 4 and 5 patients from a total of 44 patients. All patients were existing users. They wore a variety of instruments, but most products were from the recent and high-end generation. All of the fittings were binaural. All hearing loss was primarily sensorineural. All hearing loss fell within the fitting range of the instruments, from 250 through 4000 Hz.

The patients were fitted using both elements of the Personalisation Process, along with whatever other fine-tuning the HCP found necessary. The optimisation session was scheduled to occur approximately one week after the initial fitting.

Outcome Measure: As indicated above, our main purpose was to evaluate the effects of fitting this new instrument using a new clinical approach to patient satisfaction. Since satisfaction has multiple components that relate to both functional outcome and to observable aspects of the clinical process, we felt that it best captures the overall effect of the new technology along with the new fitting process. We used questions drawn from the MarkeTrak survey (Kochkin, 2010). We chose to use the question on overall satisfaction, as well as the top ten predictors of overall satisfaction (Kochkin, 2010). These top ten predictors cover both patient performance with the instruments (e.g., use in noisy situations, performance in small groups, overall benefit) and aesthetic dimensions (clarity of sound, richness/fidelity of sound, naturalness). In keeping with the MarkeTrak format, the patient rated each of the eleven questions using the following seven categories: very dissatisfied, dissatisfied, somewhat dissatisfied, neutral, somewhat satisfied, satisfied, very satisfied.

The patients provided the responses to the MarkeTrak questions in relation to their instruments at the initial fitting appointment, before being fitted with the Alta Pro. The patients then completed the questionnaire in relation to the Alta Pro (and the Personalisation approach) one to two weeks after the optimisation session. The patients were asked to mail the questionnaire back to the second author. The purpose of this requirement was to reduce the likelihood of the patient giving positive satisfaction ratings simply to please the HCP.

Results

Figure 1 provides the ratings of Overall Satisfaction for the MarkeTrak norms for patients with instruments

that are four years old or less (Kochkin, 2010), the patients' own instruments and the Alta Pro instruments. As can be seen, the ratings for this test group of 44 patients for their own hearing instruments were nearly identical to the MarkeTrak norms. The satisfaction ratings for Alta Pro shift to the right, with a significantly greater number of ratings in the Very Satisfied category and with a corresponding drop in the Neutral and Somewhat Satisfied categories. Chi-square testing revealed a significant ($p < .05$) difference in the distribution of ratings for patients' own hearing instruments compared to Alta Pro.

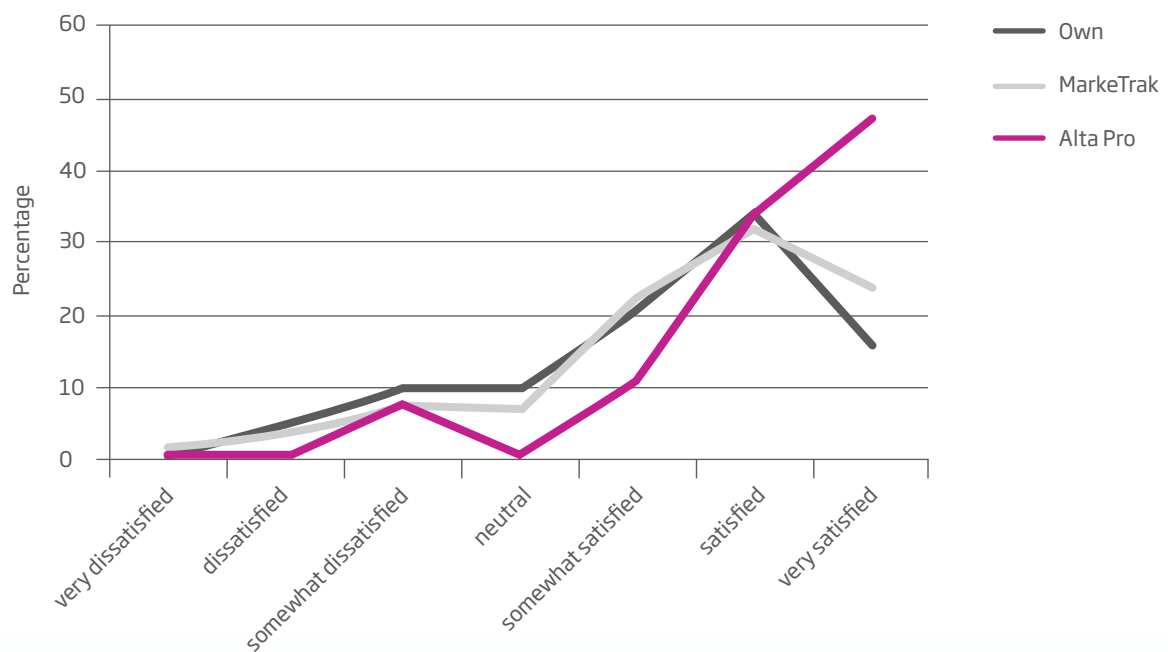


Figure 1: The ratings for Overall Satisfaction for the patients' Own Devices (dark grey), the MarkeTrak norms (light grey) and for Alta Pro (magenta).

Panels A through D in Figure 2 provide evidence of a similar significant shift towards greater satisfaction for the dimensions of Overall Benefit, Clarity, Use in Noisy Situations and Richness/Fidelity of Sound. Based on the findings of Kochkin (2010), Overall Benefit was the strongest predictor of Overall Satisfaction, and Clarity was the second strongest predictor. It should also be noted that Overall Benefit and Use in Noisy Situations can be considered as performance dimensions, whereas Clarity and Richness/Fidelity can be considered as aesthetic or sound quality dimensions. Again, chi-square analysis revealed significant ($p < .05$) differences in the distribution of responses between

patients' own hearing aid and Alta Pro for all four comparisons. It should also be noted that, for all four of these dimensions, the ratings of patients' own devices were generally similar to the MarkeTrak norms.

The data from the remaining six predictors of Overall Satisfaction showed similar, significant shifts towards more frequent ratings of greater satisfaction with Alta Pro than with the patients' own hearing devices. Furthermore, the match between the MarkeTrak norms and the ratings of patients' own devices were similar for all six remaining dimensions.

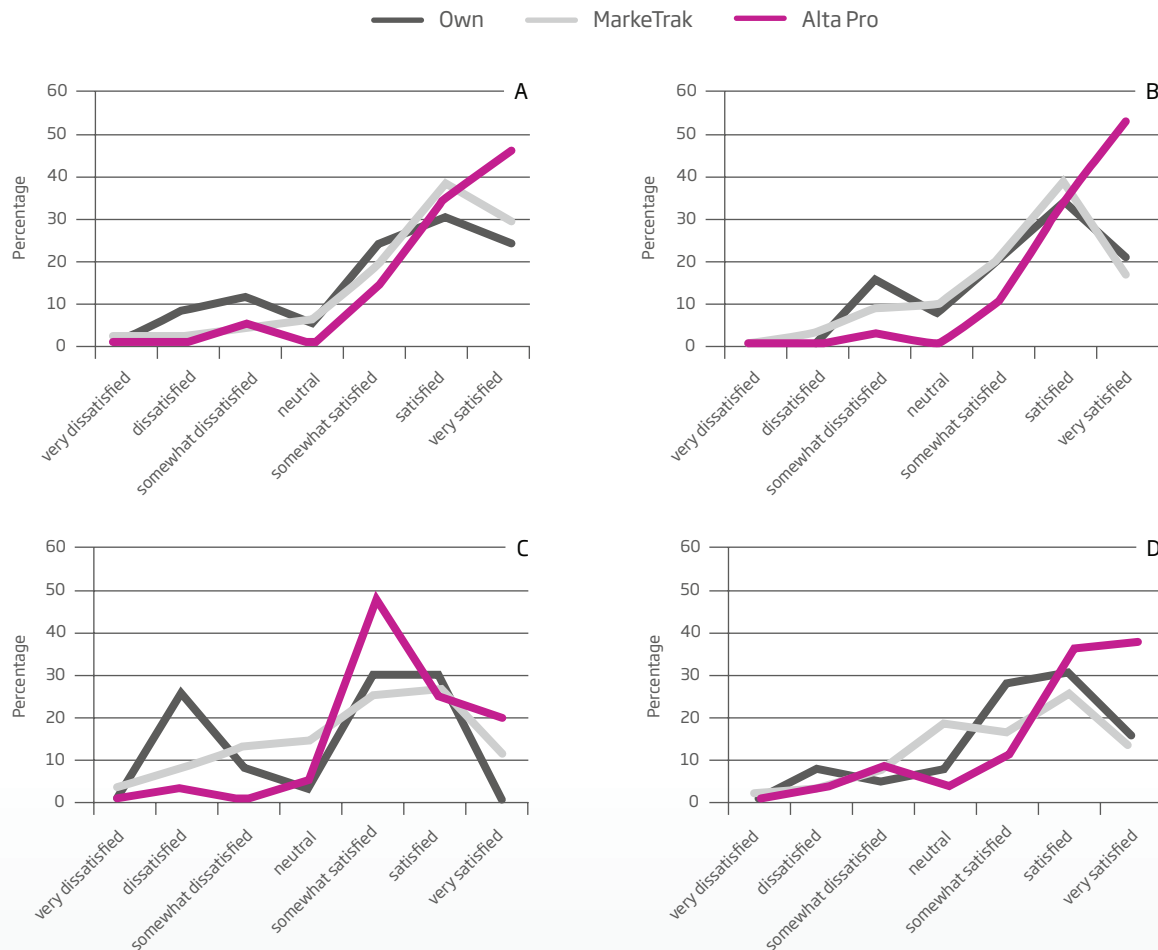


Figure 2: Satisfaction ratings for the patients' Own Devices (dark grey), the MarkeTrak norms (light grey) and for Alta Pro (magenta): (A) Overall Benefit, (B) Clarity, (C) Use in Noisy Situations and (D) Richness/Fidelity of Sound.

Discussion

A patient's overall reaction to their health care experience can be affected by many variables (Jackson, Chamberlin & Kroenke, 2001). Overall Satisfaction is assumed to be the most comprehensive assessment of the patient experience. The satisfaction rates for hearing aids have been documented carefully by Kochkin over the last 20 years. There have been steady, modest increases in the ratings of Overall Satisfaction across the various MarkeTrak surveys, with the most recent assessment showing that 79% of patients fitted within the last four years provide ratings in one of the "satisfied" categories.

With these norms as a backdrop, the ratings provided by these Alta Pro/Personalisation patients are impressive. The single most common rating was "very satisfied" for Overall Satisfaction and for 6 of the 10 top predictors of Overall Satisfaction.

It makes sense to question the relative influences of the product itself, compared to the Personalisation Process, on the ratings of satisfaction. This is a difficult and, in many ways, abstract issue to address. In the clinical environment, the recommendation is that the Personalisation approach is integral to the fitting of Alta Pro. It is true that the product can be fitted using the traditional prediction and fine-tuning approach. However, the Personalisation approach was designed specifically to provide the patient with better opportunities to experience the flexibility inherent in an advanced technology product like Alta Pro. Our goal was to determine the sum total of the new product and the new fitting strategy. Please note that the patients were using recent generation, high-end devices when they entered the study and that these devices provided a level of satisfaction that was very similar to the MarkeTrak norms. Although Alta Pro introduced new signal processing capabilities that these patients had not experienced before, the significant change in satisfaction seems to be greater than what may be expected just from new technology. As noted previously, satisfaction is not solely determined by out-

come, performance, or benefit. It can be influenced significantly by aspects of the clinical encounter that go beyond the effect of a specified treatment on a medical condition. The Personalisation approach is a significant opportunity for the patient to be engaged in the decision-making aspects of the fitting in a proactive manner. Engagement and individualisation of treatment are aspects of the clinical process that can positively influence overall satisfaction.

Follow-up Project

There is a reasonable concern that satisfaction ratings provided soon after a new fitting may be artificially inflated. This concern is partially mitigated by the fact that the patients had agreed to be fitted under the assumption that they would be paying for high-end hearing devices. Nonetheless, given that the satisfaction ratings obtained soon after the fitting were significantly higher than the well-established MarkeTrak norms, it seemed reasonable to revisit patient satisfaction at a point in time that was more remote from the initial fitting. To that end, a follow-up satisfaction assessment was performed between six to nine months after the initial assessment of satisfaction.

Participants: Attempts were made to collect data from all 44 of the original subjects. However, data for only 19 of the original 44 patients was available, for a variety of reasons. Firstly, some patients simply chose not to participate at that point in time. Additionally, some HCPs chose not to approach the patients again. Since the follow-up project was not part of the original investigation, these HCPs felt that they did not want to re-engage the original participants.

Furthermore, some patients underwent a change in the make or model of the devices worn and it was therefore not appropriate to take satisfaction ratings for a different product from the one initially fitted.

Finally, some patients were simply lost to follow-up. Audiometrically and demographically, these 19 patients were similar, on average, to the original group of 44.

Procedures: The 19 patients were mailed the satisfaction questionnaire. They responded to the 11 items and then mailed the questionnaire back to the second author. Again, in this way, we were attempting to minimise the influence of the patient wanting to please the HCP. The questionnaires were filled out somewhere between six to nine months after the first satisfaction assessment.

Long-term results: Figure 3 provides the satisfaction ratings for the initial assessment for these specific 19 patients along with long-term ratings for the same patients. For the sake of reference, the MarkeTrak data for hearing aids that were \leq four years old are included. As can be seen, the data from the long-term assessment of overall satisfaction are very similar to the ini-

tial assessment of satisfaction for these 19 patients. Chi-square testing reveals a non-significant ($p > 0.05$) difference between these distributions. Please also note that, once again, the distributions are significantly shifted to the right compared to the MarkeTrak norms.

Figure 4 (panels A-D) provides the same comparison for the four predictors of overall satisfaction: Overall Benefit, Clarity, Use in Noisy Situations and Richness/Fidelity of Sound. Again, it is clear that the data from the initial and follow-up evaluations of satisfaction are quite similar. In addition, these distributions all show the tendency for higher levels of rated satisfaction compared to the MarkeTrak norms.

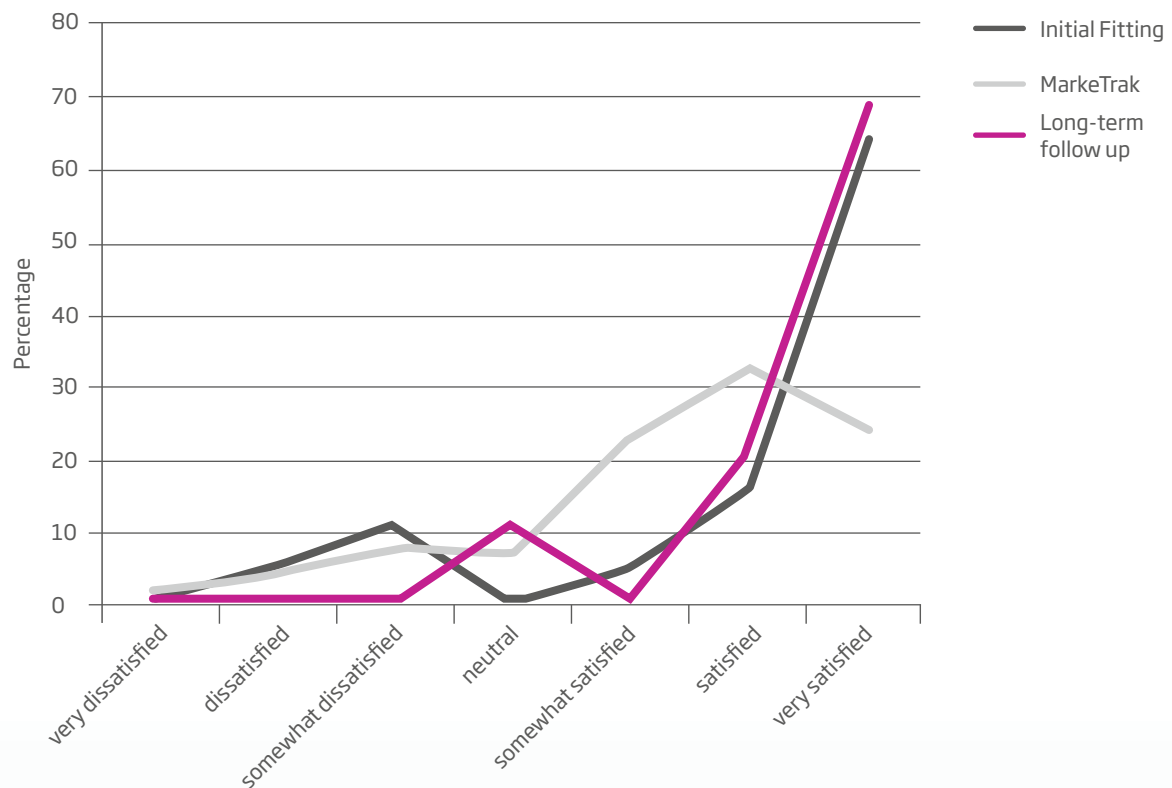


Figure 3: The ratings for Overall Satisfaction for Alta Pro immediately after the fitting process (dark grey) and 6 - 9 months later (magenta). The MarkeTrak norms for hearing aids that were \leq 4 years old are also included (light grey).

Final Thoughts

Changing professional behaviour in the clinical environment is not a simple task. Techniques that have led to overall high levels of rated satisfaction on the part of consumers have served our profession well over the years. However, it is clear that there are elements of the way that advanced technology hearing aids can perform that can be more specifically tailored to individual needs and preferences. The Personalisation

Approach that we have introduced with Alta is a significant step forward in trying to match the settings of very flexible advanced technologies to the specific requirements of each individual patient. The satisfaction ratings both immediately after the fitting experience and after many months of hearing aid use indicate that the combination of the new product along with a new approach to fitting can significantly influence the needle of satisfaction for our patients.

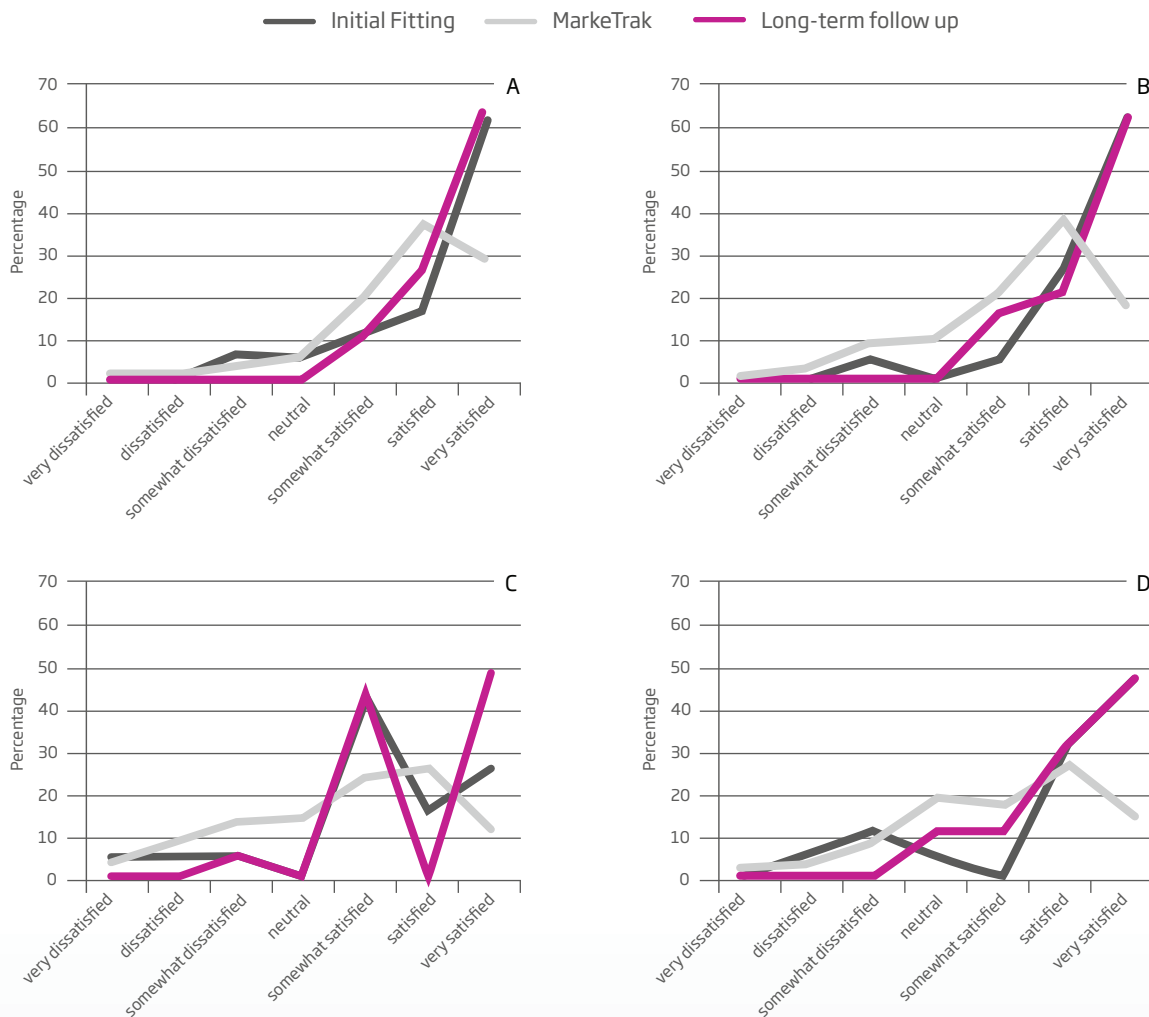


Figure 4: Immediate (dark grey) and long-term (magenta) satisfaction ratings for (A) Overall Benefit, (B) Clarity, (C) Use in Noisy Situations and (D) Richness/Fidelity of Sound. The MarkeTrak norms are also included in each panel (light grey).

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