Software-based auditory training program found to reduce hearing aid return rate

By Melody Martin

For more than half a century, hearing healthcare providers have known the important role of aural rehabilitation in fitting hearing aids.[1-6] Yet, for those working in the trenches of a busy dispensing office, incorporating aural rehabilitation (AR) into their practice procedures is a challenge. In fact, AR is often completely omitted from the intervention protocol,[4,7] despite strong evidence that it improves patient satisfaction with hearing aids and decreases hearing aid returns.[3,4,8,9]

Recently, a new auditory training software program has been introduced that holds promise as a post-fitting aural rehabilitation approach. Called the Listening and Communication Enhancement program (LACE), it was developed by Robert Sweetow, PhD, and Jennifer Henderson Sabes, MA, at the University of California, San Francisco, in collaboration with Neurotone, Inc.

LACE is individually paced, intuitive software that uses a top-down auditory training approach designed to establish a positive feedback loop that enhances communication.[7,10] Unlike many other types of AR, LACE uses an auditory training approach to address areas such as understanding speech in noise, rapid speech, auditory memory, competing speakers, and use of context that can be problematic for the hearing-impaired listener and to help the user adjust to amplification.[7,10,13,14] A distinctive feature of LACE is that patients can use it independently on a home PC or in a computer lab in the dispenser's office, so that it requires less direct professional time by the practitioner.

IMPACT ON RETURN RATES STUDIED

The study reported here explored the impact of LACE on a private practice's return-for-credit (RFC) rate. Specifically, the study asked, could aural rehabilitation software programs such as LACE be effective in reducing returns for credit?

Figure 1. *A LACE Lab participant is shown using the easy custom keypad.*

Participants

All 625 people who purchased new hearing instruments from our practice within the 6-month period May 1 through July 31, 2006, participated in this study. We recorded data from May 1, 2006, to March 1, 2007, to allow participants who purchased late in the initial 6-month period ample opportunity to return their hearing aids for credit within the 60-day return window.

Clients who returned one of two instruments were not classified as having made a return for credit. Those who canceled hearing aid orders prior to receipt were excluded from the study. All participants were encouraged to participate in the LACE program, but were not required to complete the training. LACE participants included anyone who started the program, while non-LACE participants were those who chose not to start it. Participants were given the option of working on their home computer or using the LACE lab in the office.

Procedure

Across our four clinic locations, we followed the same dispensing protocol as closely as possible for all participants. We developed an evidence-based protocol that included subjective and objective measures administered pre-fitting as a needs assessment and then re-administered post-fitting as an outcome measure.[15-20] Most (62%) of the subjects were given the Abbreviated Profile of Hearing Aid Benefit (APHAB) and selected lists from QuickSIN. LACE participants took the tests before starting the program and after completing it. The non-LACE participants were first tested at the same time as the LACE participants and then re-tested after an interim period.[21-26]

We used visual speech mapping to verify all the new fittings for audibility when the hearing aids were dispensed.[27] During the dispensing process, all participants were counseled on the care and use of the instruments and they were also counseled post-fitting to have realistic expectations.[28] Subjects were provided with written checklists, hearing aid user booklets, and counseling cards outlining ways to adjust to their new hearing aids and what to expect post-fitting.

We attempted to accommodate for non-English speaking participants and for participants who were multiply handicapped or appeared to be confused. Family participation

was strongly encouraged from the initial hearing consultation throughout the follow-up visits. Routine post-fitting follow-up visits were scheduled 1 week, 2 weeks, and 3 weeks after the hearing aids were dispensed, and then monthly unless problems were encountered. The option of an immediate appointment for problem fittings was provided to any participant wishing it.

Participants had 60 days to return their hearing instruments for credit if they chose. All data were recorded on an Excel spreadsheet and submitted to a statistician at a local university for analysis.

Table 1. *Summary of returns for credit (RFC) by LACE and non-LACE patients.*

Use LACE	Return for Credit		
	Yes	No	Total
No	59 13.1%	393 86.9%	452
Yes	6 3.5%	167 96.5%	173
Total	85 10.4%	580 89.6%	625

DATA AND RESULTS

The study included 625 patients, of whom 173 were LACE participants and 452 were not. Table 1 gives a summary of the return rates for the two groups. For instance, 59 of the 452 non-participants (13.1%) returned their hearing aids for credit, while only 6 of the 173 LACE participants (3.5%) did so. The overall patient return rate was 10.4%.

Comparing return rates

In analyzing the RFC rates for LACE and non-LACE users, we used a Pearson chi-square test to see if there was a significant difference in rates. Using a McNemar's test allowed us to reject the hypothesis that the proportion of patients returning was the same in both groups. Further investigation revealed that patients who did not participate in the LACE program returned their hearing aids at an appreciably higher rate than those who did participate.

The risk (probability) of a patient returning his/her hearing aids when participating in LACE is $\pi_1 = 0.0347$, compared to $\pi_2 = 0.1305$ when not partici- pating, yielding a significant decrease in risks of when a patient signs up for the LACE program and is considered a participant.

For the $N = 625$ patients currently in the study, $RR_{Non} = 3.7636$, which suggests that the risk of returning increases when a patient is not enrolled in LACE. Specifically, patients not participating are nearly four times more likely to return.

Demographic assessment

To assess the differences in RFC rates for the various demographics, we performed a logistic regression analysis for the following predictors:

- x_1 = testing site/office location
- x_2 = patient age
- x_3 = gender
- x_4 = style of device
- x_5 = LACE participation
- x_6 = PTA-L
- x_7 = PTA-R
- x_8 = degree of hearing loss (0 – 5 scale).

The logistic regression model yields an equivalent calculation of odds allowing for the incorporation of co-variates or predictor variables. This formulation allows us to measure the amount of influence a given demographic has on the odds, or probability, of return.

LACE participation ($x^2 = 11.5604$, $p = 0.0007$) and PTA-L ($x^2 = 4.0357$, $p = 0.0445$) were found to be the only significant factors among the demographic variables using this stepwise procedure. The stepwise regression method initially fits a high-order model (all available co-variates, x) and then sequentially removes co-variates until only those that are significant to the modeling of the response remain. The negative value of the coefficient for PTA-L measurement indicates a negative relationship between odds of return and degree of hearing loss. In other words, as the degree of hearing loss increases, the odds of return decrease, at a rate determined by a patient's participation status.

Based on this formulation, we can estimate the odds ratio for a return given a patient's degree of hearing loss (as measured by PTA-L). Non-LACE patients are approximately five times more likely to return their hearing aids than those participating in the LACE program and the corresponding 95% confidence interval, $1.986 \leq OR \leq 12.960$, does not contain one, also indicating a significant difference in the odds of return for the two groups of patients.

Individual odds ratios and model significance

We obtained the following results through separate individual analyses of the relationships between demographic variables and the response, return for credit.

Analysis of effects and odds ratio estimates for office location indicates no significant differences in return over the following demographic variables: the four office locations, age, gender, style of instrument, or hearing loss when classified on a scale of loss 0-4 based on pure-tone average of frequencies 500, 1000, 2000, and 4000 Hz, with the five levels of loss defined as: normal (0), mild (1), moderate (2), moderately severe (3), severe (4), and profound (5).

Only an analysis of the degree of hearing loss as measured by PTA-L (not a scale of loss) indicated a borderline-significant relationship with returns. The analysis of effects for degree of hearing loss as measured by PTA-R was highly insignificant in the saturated model with a p value of .79 and indicates no significant relationship with returns.

DISCUSSION

Our findings suggest that the return-for-credit rate of LACE users is dramatically lower than that of non-LACE users. Non-LACE users were nearly four times as likely to return their instruments for credit than LACE users. A statistical analysis of several of the demographic variables of the two groups yielded no significant differences between groups except for LACE participation.

Previous studies have found a significant reduction in the RFC rate among aural rehabilitation participants.[2,3] Using a database of more than 7000 patients, Northern and Beyer presented a 6-month database review showing a 3% RFC rate among patients who participated in a series of three 1-hour AR classes (the H.E.L.P. program) as compared with a 9% return rate among patients who did not attend the classes.[2] However, they noted, the H.E.L.P. program, while effective in decreasing returns, was time-consuming for the audiologist, which could present a barrier to the program's implementation.

LACE is not only effective as an aural rehab tool in decreasing hearing aid returns, but it is also cost-effective and is *not* time consuming for the audiologist. As an auditory training program, it also offers other potential benefits, including improved QuickSIN scores and other subjective improvements noted on lifestyle inventories and questionnaires.[7,10,11]

The only other variable with borderline significance as a factor in the return for credit rate was degree of hearing loss (PTA-L). It may well be that no aural rehabilitation approach will be able to compensate for fitting new users with very mild losses.[29]

Admittedly, there is inherent bias in an observation study as compared with a designed experiment. Participants self-selected to participate in the LACE program and thereby introduced bias into the findings. It may be that the decision to participate in LACE is critical in the patient's journey to accepting amplification.

However, many studies in medical research are observational in nature, yet hold promise for providing insight into effective treatment protocols and intervention. As an observation study, it appears that this study offers insight into the one factor that impacts hearing aid acceptance and usage—aural rehabilitation.

SUMMARY

As hearing healthcare providers seek to better accommodate the hearing and lifestyle needs of the expanding "baby boomer" population,[30] the demand that they provide a standard of quality care increases. We know that hearing aids can improve the quality of life of a hearing-impaired adult,[31-33] but getting patients to accept amplification can be challenging. LACE holds promise in meeting this challenge.

Melody Martin, PhD, AuD, has worked as an audiologist for over 35 years and owns Martin Audiology, a large practice in central Texas with its corporate office in Waco. This article includes information presented at a poster session at AudiologyNOW! 2007. Readers may contact Dr. Martin at melody@martin-audiology.com or at mmartinphd@aol.com.

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