

DO CLINICAL PAIRED COMPARISONS PREDICT REAL WORLD RELEASE TIME PREFERENCE?

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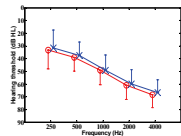
INTRODUCTION

Hearing aid compression release times range from milliseconds to seconds. There are currently no clinical methods available to assist in release time selection. Some studies (Neuman et al., 1995, 1998; Hansen, 2003) evaluated short and long release times using paired comparison tests in laboratory based settings. However, the hearing aid users' real-world performance had not been measured. The purpose of this study was to explore a method that might relate clinical performance to real-world preference in an effort to appropriately select release time for a hearing aid wearer. This study determined whether hearing aid wearers gave higher ratings in paired comparison tests to the release times they preferred in the real world. Prior to this study, twenty-four subjects' preferred release times were determined after wearing Oticon Adapto BTE hearing aids bilaterally with each of the short (40ms) and the long (640ms) release times for 4 weeks. Nine subjects preferred the short and 15 subjects preferred the long.

METHODS

A. Test and materials

Twenty-four subjects with bilateral sensorineural hearing loss took part in the study. The age ranged from 41 to 89 years. All subjects were previous bilateral hearing aid wearers before being fitted with the Adapto hearing aids for this study.



B. Test stimuli and judgments

	Own Voice (Normal effort)	Piano Genre	Ensemble Genre	Female quiet	Male quiet	Dialog in Traffic	Dialog in Restaurant	Nature (Birdsong)
Presentation level (dB SPL Leq 60s)		71.4	74.3	58.1	58.8	74.4	62.7	66.3
Naturalness	★	★	★	★	★	★	★	★
Clarity				★	★	★	★	★
Effort				★	★	★	★	★
Loadness		★	★					

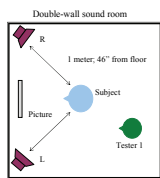
★ denotes rated condition

Sample ratings

Very unnatural			A		B			Very natural	
Very unclear						AB		Very clear	
Exhausting		B		A				No effort	
Very soft							A B	Very loud	
	1	2	3	4	5	6	7	8	9

C. Procedures

The hearing aids used in the real world were used in the paired comparison study. The two release times (nominally called A and B) were rated comparatively in all test conditions. One tester in the booth changed the pictures, interacted with the subject, and switched the hearing aid release times. The other tester was outside the booth and controlled the test signal delivery. For each subject, the entire test was conducted twice with ratings averaged.



RESULTS

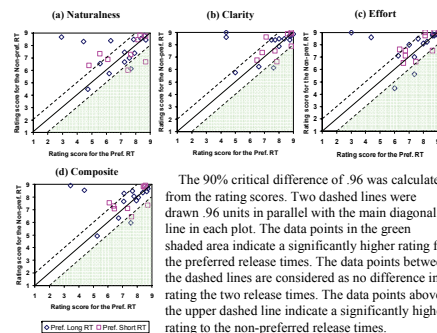
Two research questions aiming at our major research purpose were answered: (1) Do hearing aid users give higher ratings in a laboratory test condition with the release time settings they preferred in the real world? (2) If not, what release time do hearing aid users prefer in a lab test condition?

A. Loudness analysis

The ratings for "Loudness" were compared according to (1) the subjects' real-world preference, and (2) the short and long release times. No significant difference was observed for either comparison (sign test $p = .5$). These results suggest that the hearing aid release time preference was not based on loudness. The ratings for "Naturalness," "Clarity," and "Effort" were used in the following analyses.

B. Preference analysis

The rating scores within each dimension were averaged. Therefore, each subject had one rating per release time for "Naturalness," "Clarity," and "Effort." Also, composite scores for both preferred and non-preferred release times were calculated by averaging the mean ratings for the 3 dimensions for each subject. The mean ratings for each subject are shown in the figures below. The diamonds and squares represent the real-world release time preference of the subjects.



The 90% critical difference of .96 was calculated from the rating scores. Two dashed lines were drawn .96 units in parallel with the main diagonal line in each plot. The data points in the green shaded area indicate a significantly higher rating for the preferred release times. The data points between the dashed lines are considered as no difference in rating the two release times. The data points above the upper dashed line indicate a significantly higher rating to the non-preferred release times.

	N=24		
	Higher rating for the preferred RT	Higher rating for the non-preferred RT	No difference
Naturalness	3 (13%)	5 (21%)	16 (66%)
Clarity	2 (8%)	3 (13%)	19 (79%)
Effort	3 (13%)	3 (13%)	18 (74%)
Composite	3 (13%)	4 (16%)	17 (71%)

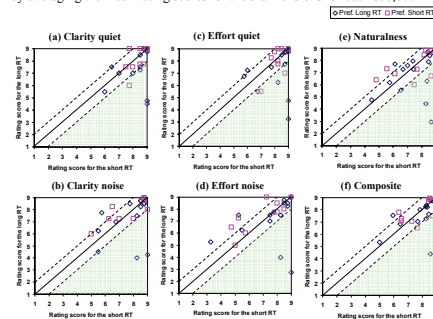
The results show that:

- more than two thirds of the subjects did not give significantly different ratings to the two release times in the test conditions;
- there were about 11% of the subjects on average across dimensions who gave significantly higher ratings to their real-world preferred release times.

Therefore, we conclude that most hearing aid users do not give higher ratings in a lab test condition to the release times they preferred in the real world.

C. Release time analysis

The rating scores were regrouped and the ratings for the short and the long release times were compared. The rating scores for "Naturalness" were averaged across the test conditions, whereas the rating scores for "Clarity" and "Effort" were collapsed according to the noise background, resulting in 4 dimensions of "Clarity quiet," "Clarity noise," "Effort quiet," and "Effort noise." Similar to the preference analysis, composite scores were calculated by averaging the mean rating scores for the 5 dimensions for each subject.



As with the preference analysis, two dashed lines indicating the 90% critical difference were drawn in each plot. The data points located in the green shaded area indicate a significantly higher rating to the short release time. The data points between the dashed lines are considered as no difference in rating the two release times. The data points above the upper dashed line indicate a significantly higher rating to the long release time.

	N=24		
	Higher rating for the short RT	Higher rating for the long RT	No difference
Naturalness	6 (25%)	3 (13%)	15 (62%)
Clarity quiet	7 (29%)	1 (4%)	16 (67%)
Clarity noise	3 (13%)	2 (8%)	19 (79%)
Effort quiet	7 (29%)	1 (4%)	16 (67%)
Effort noise	2 (8%)	5 (21%)	17 (71%)
Composite	5 (21%)	2 (8%)	17 (71%)

The analysis results show that:

- about two thirds of the subjects did not give significantly different ratings to the two release times in the test conditions;
- 29% of the subjects rated the short release time significantly higher than the long release time in "Clarity quiet" and "Effort quiet";
- there was no clear trend for subjects to choose either release time when they listened to speech in noise;
- when they have a preference, there is a tendency for subjects to find short release time more natural.

Therefore, we conclude that fewer than one-third of listeners have a clear preference for either short or long release time in a laboratory test condition. Among listeners who have a preference, there is a tendency to prefer the short release time when they listen to speech in quiet. However, there is not a clear preference for listening to speech in noise.

DISCUSSION

The scatter plots in the preference analysis and the release time analysis show that most of the subjects rated no significant difference to the short and the long release times. However, about 20-30% of the subjects were clearly inclined to listen with one of the release times in the laboratory test conditions. However, even when subjects gave significantly different ratings to the two release times, they did not necessarily give higher ratings to the release time they preferred in the real world.

For those who had a significant release time preference in the paired comparison tests, more subjects gave higher ratings to the short release time for understanding speech in the quiet conditions. There is a slight trend in "Effort noise" that subjects gave higher ratings to the long release time when listening to speech in the noisy conditions. This observation is somewhat consistent with the findings of Neuman et al. (1995, 1998). They reported that there was no significant difference in the preference for release times. Nevertheless, there was a trend that longer release times were preferred for the higher level noises. The possible reason was that a longer release time results in the compression being activated not only when speech is present, but also during pauses.

Neuman et al. (1995, 1998) also suggested that if variable release times were implemented, a short release time should be available for quieter listening situations while a longer release time should be available for listening in noisier environments. Our study is consistent with that suggestion.

The selection of test dimensions and test conditions could influence the paired comparison test results to some extent. Considering the difference in release time preference between real world and laboratory conditions, the judgments made in the real world were perhaps not based on the same 4 dimensions used in the paired comparison tests in the present study.

CONCLUSION

Results showed that, even though subjects had a clear preference for short or long release times in the real world, most of the subjects did not give significantly different ratings to the short and the long release times in the paired comparison tests. Therefore, a paired comparison test appears not to be a valid way to assist in selecting an appropriate release time in a clinical setting.

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