Nonlinear amplification schemes for hearing aids have been developed to deal primarily with the problems of speech intelligibility. The most commonly used forms of nonlinear amplification are compression schemes, which mean they are designed to reduce the dynamic range of the input signal. These schemes are designed to protect the hearing aid users from loud sounds while at the same time preserving the soft and moderate sounds that provide the auditory system with the information it needs to understand speech.

The goal of this study was to examine the physiological basis for the relative performance of linear amplifiers, NAL-RP, and ADRO. Sensorineural hearing losses were created in 12 subjects using a custom-built audiometer. Speech signals were presented at 52, 62, 74, and 82 dB SPL in quiet and noise. The speech enhancement performance was determined by comparing the AN “neurogram”, as shown in Fig. 3.

The model audiogram was used to compute the STMI. In general, linear aids work well for low SPLs and nonlinear aids for high SPLs. Differences between the different algorithms become apparent in the presence of background noise. In general, linear aids work well for low SPLs and nonlinear aids for high SPLs. Differences between the different algorithms become apparent in the presence of background noise.

In the case of no background noise, all the algorithms perform similarly well. However, the effects of the background noise, the presentation level, the hearing loss and the amplification scheme used are significant in determining the auditory system’s response. Preliminary results show that ADRO is better at mimicking the neural representation of speech than the other algorithms tested, even when the WCDR algorithms allow more time constants. In the case of background noise, the algorithms perform similarly well, however, when background noise is present, the ADRO scheme was more effective than the other algorithms tested, which simulate a wider range through the range of SPLs tested.

The model incorporated outer hair cells (OHCs) and inner hair cells (IHCs) to produce a range of hearing loss profiles. For this study, the model audiogram was used to test the effects of loud sounds at each of 52, 62, 74, and 82 dB SPL. The initial threshold level at each 52 dB SPL was created by ADRO and IHC inhibition.

Figure 1: Background noise and multi-band WDRC. For this study, the model audiogram was used to test the effects of loud sounds at each of 52, 62, 74, and 82 dB SPL. The model incorporated outer hair cells (OHCs) and inner hair cells (IHCs) to produce a range of hearing loss profiles. For this study, the model audiogram was used to create the ADRO's performance was superior to that of slow multi-band WDRC at high SPLs. Slower acting compression worked slightly better overall. However, it does not provide as much protection as faster acting compression because it does not reduce gain as much when exposed to sudden high-level sound.

Figure 7: Predictions of speech intelligibility for single-channel NAL-RP (top panel) and NAL-RP (bottom panel).

Figure 6: Predictions of speech intelligibility for ADRO.

Figure 5: Predictions of speech intelligibility for slow multi-channel NAL-RP (top panel) and NAL-RP (bottom panel).

Figure 4: Predictions of speech intelligibility for fast multi-channel NAL-RP (top panel) and NAL-RP (bottom panel).

Figure 3: Predictions of unaided speech intelligibility for DSL [10].

Figure 2: Predictions of speech intelligibility for NAL-RP [10].

Figure 1: The model audiogram was used to test the effects of loud sounds at each of 52, 62, 74, and 82 dB SPL. The model incorporated outer hair cells (OHCs) and inner hair cells (IHCs) to produce a range of hearing loss profiles. For this study, the model audiogram was used to test the effects of loud sounds at each of 52, 62, 74, and 82 dB SPL. The initial threshold level at each 52 dB SPL was created by ADRO and IHC inhibition.