

1936

## A Comparative Study of the Normal and Pathological Ear with Regard to Intensity Level Preference and Intelligibility of Speech sounds

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### Recommended Citation

Kelly, Noble H. (1936) "A Comparative Study of the Normal and Pathological Ear with Regard to Intensity Level Preference and Intelligibility of Speech sounds," *Proceedings of the Iowa Academy of Science*, 43(1), 289-299.

Available at: <https://scholarworks.uni.edu/pias/vol43/iss1/97>

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A COMPARATIVE STUDY OF THE NORMAL AND  
PATHOLOGICAL EAR WITH REGARD TO IN-  
TENSITY LEVEL PREFERENCE AND  
INTELLIGIBILITY OF SPEECH  
SOUNDS

NOBLE H. KELLY

Dr. S. N. Reger, of the University of Iowa, independently discovered that the relationship between intensity level and loudness in the abnormal ear is strikingly different from that in the normal. For example, in the normal ear a frequency of 4096 cycles a given number of decibels above the threshold is judged as loud as 2048 cycles approximately the same number of decibels above the threshold. However, in abnormal ears, in which acuity is normal up to 2048 cycles but raised 60 decibels above threshold at 4096 cycles, an intensity level 10 decibels above the threshold at 4096 is judged as loud as 2048 cycles at 40 decibels above the threshold.

In order to achieve further insight into the above observed phenomenon, an investigation was made with regard to intensity level preference; that is, the intensity level above threshold at which both normal and abnormal ears prefer to listen to speech sounds. By means of a high quality speech amplification system, it was found that the normal ear prefers to listen to ordinary propositional speech at a level approximately 40 decibels above the threshold. On the other hand, the abnormal ear prefers to listen to the same speech at approximately 20 decibels above threshold. In order to place the normal ears studied on a more comparable basis with the pathological, the normal ears were occluded, thus raising the threshold by about 40 decibels, an amount approximate to the deafness of the abnormal ears. Under this condition of occlusion the normal ear still preferred to listen to continuous speech at a level approximately 40 decibels above the threshold.

The disparity between intensity level and loudness in the abnormal ear was further investigated with regard to intelligibility of speech sounds. For this purpose sentences of interrogative and imperative form and containing a simple idea were used. In the normal ear there is about 10 per cent intelligibility at 4 decibels above the threshold and about 90 per cent intelligibility at

12 decibels above threshold. In the abnormal ear intelligibility does not operate until the intensity is 6 decibels above threshold, and reaches a value between 90 and 100 per cent at a level 14 decibels above threshold. The investigation was made in steps of 2 decibels. The only significant difference between the two types of ears is the retardation of 2 decibels in the abnormal ear. The normal ears were occluded so as to raise the threshold by approximately 40 decibels. Under this condition of occlusion, the response with regard to intelligibility of speech sounds is about the same as that of the abnormal ear. That is, the value for intelligibility is about 10 per cent at 6 decibels above threshold, reaching an amount greater than 90 per cent at an intensity level 14 decibels above threshold.

The results of the investigation with regard to intelligibility have thrown no light upon the phenomenon of the disparity between intensity level and loudness in the abnormal ear. A further study to determine the response of both the normal and pathological ear with regard to articulation of speech sounds, that is for vowels and consonants, is now in process.

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