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Free Field Word recognition test in the presence of noise in normal hearing adults[☆]

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Abstract

Introduction: In ideal listening situations, subjects with normal hearing can easily understand speech, as can many subjects who have a hearing loss.

Objective: To present the validation of the Word Recognition Test in a Free Field in the Presence of Noise in normal-hearing adults.

Methods: Sample consisted of 100 healthy adults over 18 years of age with normal hearing. After pure tone audiometry, a speech recognition test was applied in free field condition with monosyllables and disyllables, with standardized material in three listening situations: optimal listening condition (no noise), with a signal to noise ratio of 0 dB and a signal to noise ratio of -10 dB. For these tests, an environment in calibrated free field was arranged where speech was presented to the subject being tested from two speakers located at 45°, and noise from a third speaker, located at 180°.

Results: All participants had speech audiometry results in the free field between 88% and 100% in the three listening situations.

Conclusion: Word Recognition Test in Free Field in the Presence of Noise proved to be easy to be organized and applied. The results of the test validation suggest that individuals with normal hearing should get between 88% and 100% of the stimuli correct. The test can be an important tool in measuring noise interference on the speech perception abilities.

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PALAVRAS-CHAVE

Percepção auditiva;
Testes auditivos;
Ruído;
Audição

Teste de reconhecimento de palavras em campo livre na presença de ruído em indivíduos adultos normo-ouvintes**Resumo**

Introdução: Em situações ideais de escuta, indivíduos com audição normal conseguem realizar e reconhecer a fala facilmente. Porém, na presença de ruído competitivo, é comum as pessoas sentirem dificuldades de compreensão, principalmente se tiverem perda auditiva.

Objetivo: Apresentar a validação do teste de reconhecimento de palavras em campo livre na presença do ruído em indivíduos adultos normo-ouvintes.

Método: A amostra foi composta por 100 sujeitos hígidos, com audição normal e maiores de 18 anos. Depois da audiometria tonal foi aplicado teste de reconhecimento da fala, com monossílabos e dissílabos, em campo livre, com material padronizado, em três situações de escuta: condição ótima de audição (sem ruído), com ruído em relação de 0 dB, e com ruído em relação de -10 dB. Para tanto, montou-se um ambiente de teste em campo livre calibrado, onde a fala foi apresentada ao indivíduo em teste com duas caixas acústicas localizadas a 45° e o ruído em uma terceira, localizada a 180°.

Resultados: Todos os participantes tiveram resultados de logaudiometria em campo livre entre 88 e 100% nas três situações de escuta.

Conclusão: O teste de reconhecimento de palavras em campo livre na presença do ruído mostrou-se de fácil organização e aplicação. Os resultados obtidos na validação do teste sugerem que indivíduos com audição normal devem acertar entre 88 e 100% dos estímulos apresentados. O teste pode configurar um instrumento importante na mensuração da interferência do ruído sobre as habilidades de percepção de fala.

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Introduction

To understand speech satisfactorily, some auditory tasks are necessary, including: attention, analysis, synthesis, memory, among others. Such skills, when combined, promote auditory recognition, which implies deriving meaning from what is heard. Thus, the understanding of speech is a very complex activity that depends directly on the peripheral hearing mechanisms, central auditory processing and cognition.¹

In ideal listening situations, that is, acoustically comfortable environments, individuals with normal hearing easily can perform the auditory recognition. However, when the environment is degraded, due to the competitive noise or reverberation,² it is common for people to have difficulty understanding.

In individuals with hearing loss and hearing aid users (conventional or implantable) this difficulty is greater.^{3,4}

Among other uses, the speech perception test in the presence of noise has been developed and used in audiological diagnosis⁵ to evaluate central auditory processing¹ and to select and evaluate the performance of hearing aids.⁶ Most available tests use supra-aural headphones or insert earphones¹; a minority are performed in a free field setting.⁷ Some of these tests require expensive technological apparatus that can make it less available for use in routine speech therapy.

Because of this, a low-cost, easy to install audiology laboratory was designed, consisting of an acoustically treated booth and a free field system attached to three speakers, to perform speech recognition testing in the presence of noise.

The aim of this paper is to present the validation of the Free Field Word Recognition Test in the Presence of Noise in normal-hearing individuals.

Methods

This is an experimental, self-controlled study, aimed to verify the accuracy of the Free Field Word Recognition Test in the Presence of Noise. The study was approved by the Institutional Ethics Committee under protocol 937 031/15.

One hundred individuals who agreed to participate were randomly selected. All of them were oriented about the study and signed the Informed Consent.

The study included persons 18 years of age or greater on the date of the tests, who had normal hearing and no hearing complaints. We excluded individuals with speech problems.

For data collection a booth, a two-channel audiometer, conventional open field equipment (for speech stimulus output) and auxiliary equipment (for noise emission) were used.

The equipment

The auxiliary equipment called "third channel" for free field has been developed specifically to control and amplify a third sound source used as "competitive sign" inside the booth. This one has the circuit composed of the following blocks: input preamplifier, calibration circuit with gain adjustment of 0–40 dB, linear output attenuator with 5 dB

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