



ORIGINAL ARTICLE

Hearing in Noise Test Brazil: standardization for young adults with normal hearing^{☆,☆☆}



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KEYWORDS

Speech perception;
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Abstract

Introduction: Individuals with the same ability of speech recognition in quiet can have extremely different results in noisy environments.

Objective: To standardize speech perception in adults with normal hearing in the free field using the Brazilian Hearing in Noise Test.

Methods: Contemporary, cross-sectional cohort study. 79 adults with normal hearing and without cognitive impairment participated in the study. Lists of Hearing in Noise Test sentences were randomly in quiet, noise front, noise right, and noise left.

Results: There were no significant differences between right and left ears at all frequencies tested (paired $t - 1$ test). Nor were significant differences observed when comparing gender and interaction between these conditions. A difference was observed among the free field positions tested, except in the situations of noise right and noise left.

Conclusion: Results of speech perception in adults with normal hearing in the free field during different listening situations in noise indicated poorer performance during the condition with noise and speech in front, *i.e.*, $0^\circ/0^\circ$. The values found in the standardization of the Hearing in Noise Test free field can be used as a reference in the development of protocols for tests of speech perception in noise, and for monitoring individuals with hearing impairment.

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PALAVRAS-CHAVE

Percepção da fala;
Adulto;
Ruído;
Perda auditiva

Hearing in Noise Test Brasil: padronização em campo livre – adultos com audição normal**Resumo**

Introdução: Indivíduos com as mesmas habilidades de reconhecimento de fala no silêncio podem apresentar resultados extremamente diferentes em ambientes ruidosos. **Objetivo:** Padronizar a percepção da fala em adultos com audição normal em campo livre no Hearing in Noise Test Brasil.

Método: Estudo de coorte contemporâneo com corte transversal. Participaram 79 adultos com audição dentro dos padrões de normalidade (normo-ouvintes), sem alterações cognitivas. Foram aplicadas aleatoriamente listas de sentenças do HINT no silêncio, ruído à frente, ruído à direita, ruído à esquerda.

Resultados: Não houve diferença significativa entre orelhas para todas as frequências testadas, sexo e interação entre as condições. Observou-se diferença entre as condições testadas, exceto entre as situações de ruído à direita e ruído à esquerda.

Conclusão: Os resultados da percepção da fala em adultos com audição normal em campo livre em diferentes situações de escuta no ruído indicaram pior desempenho na situação ruído e fala à frente, ou seja, 0°/0°. Os valores encontrados na padronização do HINT em campo livre poderão ser utilizados como referência na construção de protocolos para utilização de testes de percepção da fala no ruído e no acompanhamento de indivíduos com deficiência auditiva.

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Introduction**Speech perception in noise**

Speech recognition is essential for social integration, as it enables efficient interpersonal communication. The ability to understand speech in the presence of background noise is a major challenge for any listener, especially for those with hearing impairment.¹ The evaluation of this skill should be considered a very important aspect to be measured in human auditory function, as it allows for evaluation of receptive communicative function, providing data on how the subject functions in everyday listening situations, by means of easily quantifiable information.^{2,3} Speech is an acoustic signal in which information is transmitted by means of changes of frequency, intensity, and time. The normal auditory system has the inherent ability to identify, process, and encode this information.^{4,5} The aspects of variability in speech are well known, namely: speaker's gender, rate of speech, dialect, vocabulary, and grammatical complexity.⁶ Thus, at the time of assessment, factors such as the type and level of presentation of the material and of its response, and listener characteristics, including language and listening experience, can directly affect the outcome.⁷⁻⁹

In daily life, many communicative situations occur in environments where listening is impaired by the presence of competitive noise.^{4,10} Because of this, and knowing that the same patient may have very different abilities for speech recognition in a quiet environment than in a noisy one, it is important to emphasize testing in a noisy environment.^{3,11}

In order to measure a patient's hearing difficulties, the phonoaudiologist needs to resort to a battery of tests that not only will allow the identification of a potential hearing loss, but also will analyze the understanding of auditory

stimuli, including speech in clinical situations and mainly under conditions close to those found in everyday life.¹²

Research shows that patients with normal hearing have their speech perception affected by environmental noise.^{3,9,13,14} Complaints of difficulty understanding speech in the presence of noise have become increasingly common, whether or not some hearing impairment exists.¹⁵ To assess and diagnose the impairment of hearing capacity of an individual, several tests are used in clinical practice. However, these tests are unable to detect the patient's functional ability to perceive and understand speech in noisy environments, as these tests are applied in quiet environments.³

In Brazil, speech-in-noise tests are not yet part of the conventional audiologic battery; the comparison of performance, in quiet and in noisy environments, is not often performed, based on protocols already standardized. In addition, few studies indicate the perception-of-speech performance in noisy environments expected for adults with normal hearing in the free field, especially with the values obtained in the Hearing in Noise Test (HINT).^{1,16,17}

HINT is a speech recognition in noise test simulating hearing situations similar to everyday life, and is available in several languages, including Brazilian Portuguese.¹⁸

HINT assesses the auditory function by measuring the signal/noise (S/N) ratio for sentences in a quiet environment and in three noise conditions: (a) noise in front (speaking in front and noise at 0° azimuth); (b) noise to the right (speaking in front and noise at 90° to the right), and (c) noise to the left (speaking in front and noise at 90° to the left). The HINT test consists of 12 lists of 20 sentences each, totaling 240 representative sentences of everyday speech. The sentences are short, phonemically balanced, easy to understand, and with the same degree of difficulty.¹⁶ However, for its validation, the HINT-Brazil was applied only *via* supra-aural headset, *i.e.*, the results were not assessed in

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