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ORIGINAL ARTICLE

Temporal processing and long-latency auditory evoked potential in stutterers[☆]

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KEYWORDS

Stuttering adult;
Auditory processing disorder;
Auditory evoked potential

Abstract

Introduction: Stuttering is a speech fluency disorder, and may be associated with neuroaudiological factors linked to central auditory processing, including changes in auditory processing skills and temporal resolution.

Objective: To characterize the temporal processing and long-latency auditory evoked potential in stutterers and to compare them with non-stutterers.

Methods: The study included 41 right-handed subjects, aged 18–46 years, divided into two groups: stutterers ($n = 20$) and non-stutters ($n = 21$), compared according to age, education, and sex. All subjects were submitted to the duration pattern tests, random gap detection test, and long-latency auditory evoked potential.

Results: Individuals who stutter showed poorer performance on Duration Pattern and Random Gap Detection tests when compared with fluent individuals. In the long-latency auditory evoked potential, there was a difference in the latency of N2 and P3 components; stutterers had higher latency values.

Conclusions: Stutterers have poor performance in temporal processing and higher latency values for N2 and P3 components.

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PALAVRAS-CHAVE

Gagueira adulta;
Distúrbio do
processamento
auditivo;
Potencial evocado
auditivo

Processamento temporal e potencial evocado auditivo de longa latência em indivíduos gagos**Resumo**

Introdução: A gagueira é um distúrbio da fluência da fala, e pode estar associada a fatores neuroaudiológicos ligados ao processamento auditivo central, entre eles as alterações das habilidades auditivas de processamento e resolução temporal.

Objetivo: Caracterizar o processamento temporal e o potencial evocado auditivo de longa latência em indivíduos gagos, e compará-los com indivíduos sem gagueira.

Método: Participaram do estudo 41 indivíduos destros, na faixa de 18 a 46 anos de idade, distribuídos em dois grupos: 20 com gagueira e 21 sem gagueira, comparados segundo idade, escolaridade e gênero. Todos os indivíduos foram submetidos aos testes de padrão de duração, teste de identificação de intervalos aleatórios e o potencial evocado auditivo de longa latência.

Resultados: Indivíduos com gagueira apresentaram pior desempenho nos testes de padrão de duração e *Random Gap Detection*, quando comparados aos indivíduos fluentes. No potencial evocado auditivo de longa latência, houve diferença na latência dos componentes N2 e P3, sendo que os indivíduos gagos apresentaram maiores valores de latência.

Conclusões: Os indivíduos com gagueira apresentaram processamento temporal com desempenho abaixo do esperado e um maior valor de latência para os componentes N2 e P3.

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Introduction

Individuals with speech and language disorders may exhibit changes in the processing of information received through the sense of hearing. Studies have shown that there is a correlation between the processing of auditory information, visual pathways, and expressive language difficulty, which can affect speech fluency and be characterized as stuttering.¹⁻³

Stuttering is known as a break in the flow of speech, a multifactorial disorder in which biological, psychological, and social aspects are correlated in a complex manner.¹ Changes in perception or auditory information processing are among the biological aspects.^{2,4-6}

The processing of auditory information is related to the temporality of the sounds, rhythm, and prosody, aspects in which stutterers may show changes.¹ Particularly when the degree of dysfluency is severe, the processing abnormalities in these areas have been proposed as the immediate cause of stuttering, since temporal auditory processing is critical for speech perception and closely related to the spoken language processing.^{1,7,8} Therefore, it is necessary to evaluate the neuroaudiological processes of this population, which can be performed through auditory behavioral tests and auditory evoked potentials.

Auditory temporal processing refers to an individual's ability to detect changes in temporal features of sounds, such as duration, intensity, frequency, and pauses between stimuli.⁹ There are several procedures available to evaluate the temporal processing aurally, such as the tests of frequency pattern and duration with pure tone¹⁰⁻¹² and musical tone.¹³ The discrimination of pauses between stimuli can be evaluated with the with the Random Gap Detection Test (RGDT).¹⁴

In a study of children with developmental stuttering that evaluated the temporal patterns (frequency and duration

aspects), it was found that stuttering children had worse performance and greater number of changes compared to their non-stuttering peers.¹ Some authors have studied the temporal resolution and observed worse performance in stutterers.^{15,16}

One of the electrophysiological procedures available to evaluate the aspects related to attention, memory, and auditory discrimination¹⁷ is the long-latency auditory evoked potential (LLAEP). Studies that investigated stuttering and the LLAEP have reported differences in P3 amplitudes, with stutterers showing a lower amplitude.^{4,18} In another study, there was no difference in latencies and amplitudes of P3 between stutterers and non-stutterers.¹⁹

Recent national studies showed no differences in P300 latencies when comparing stutterers and non-stutterers.^{5,6}

Given these findings in the literature, it is evident that there are links between the auditory ability of temporal processing and the occurrence of stuttering. However, there is still no consensus on the way through which the skills of temporal processing, long-latency auditory evoked potentials, and manifestation of stuttering correlate. One hypothesis for the lack of consensus in the literature would be the heterogeneity of stutterers groups in each study. Moreover, as stuttering is a multifactorial disorder with biological, psychosocial, and environmental influences, such factors can also lead to inconclusive results, requiring more studies to increase the knowledge about these relationships.

Thus, the aim of this study was to characterize temporal processing and long-latency auditory evoked potential in stutterers and compare with non-stutterers.

Methods

The study design was approved by the Research Ethics Committee under the No. 26574/2012. A cross-sectional and observational study was performed; the sample of

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