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ORIGINAL ARTICLE

The influence of (central) auditory processing disorder in speech sound disorders☆

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KEYWORDS
Articulation disorders;
Auditory perception;
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Abstract
Introduction: Considering the importance of auditory information for the acquisition and organization of phonological rules, the assessment of (central) auditory processing contributes to both the diagnosis and targeting of speech therapy in children with speech sound disorders.
Objective: To study phonological measures and (central) auditory processing of children with speech sound disorder.
Methods: Clinical and experimental study, with 21 subjects with speech sound disorder aged between 7.0 and 9.11 years, divided into two groups according to their (central) auditory processing disorder. The assessment comprised tests of phonology, speech inconsistency, and metalinguistic abilities.
Results: The group with (central) auditory processing disorder demonstrated greater severity of speech sound disorder. The cutoff value obtained for the process density index was the one that best characterized the occurrence of phonological processes for children above 7 years of age.
Conclusion: The comparison among the tests evaluated between the two groups showed differences in some phonological and metalinguistic abilities. Children with an index value above 0.54 demonstrated strong tendencies towards presenting a (central) auditory processing disorder, and this measure was effective to indicate the need for evaluation in children with speech sound disorder.

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PALAVRAS-CHAVE
Transtornos da articulação;
Percepção auditiva;
Percepção da fala;
Avaliação

Influência do transtorno do processamento auditivo (central) no transtorno fonológico

Resumo
Introdução: Considerando a importância das informações recebidas auditivamente para a aquisição e organização das regras fonológicas, a avaliação do processamento auditivo (central) traz contribuições significativas para o diagnóstico e direcionamento da intervenção fonoaudiologia das crianças com transtorno fonológico.
Objetivo: Estudar as medidas fonológicas e o processamento auditivo (central) de crianças com transtorno fonológico.
Método: Estudo clínico e experimental com 21 sujeitos com transtorno fonológico, entre 7,0 e 9,11 anos, separados em dois grupos: com e sem transtorno do processamento auditivo (central). Foram avaliadas as provas de fonologia, inconsistência de fala e habilidades metalinguísticas.
Resultados: O grupo com transtorno do processamento auditivo (central) apresentou maior gravidade do transtorno fonológico. O valor de corte obtido para o process density index foi o que melhor caracterizou a ocorrência dos processos fonológicos para crianças acima de sete anos.
Conclusão: A comparação do desempenho das provas avaliadas nos dois grupos mostrou diferenças quanto a alguns aspectos fonológicos e metalinguísticas. As crianças com valor do índice acima de 0,54 demonstraram uma forte tendência a apresentar alteração no processamento auditivo (central), sendo que esta medida foi efetiva para indicar a necessidade de avaliação de crianças com transtorno fonológico.

Introduction

Several aspects have been explored in the studies of children with speech sound disorder (SSD), which is a speech disorder characterized by an inadequate use of phonological rules of language (DSM-IV F80.0 – 315.39). The dynamic models that attempt to explain the development of speech production indicate an interaction between auditory perception, sound production, and sound representation.[1,2] Thus, a detailed observation of the performance of children with SSD regarding central auditory processing skills can contribute a great deal to the understanding of speech and language manifestations. The central question of this study was to investigate whether children with SSD who were diagnosed late (between 7 and 9 years, 11 months) also have (central) auditory processing disorders.

An impairment in the phonological system is the main feature of SSD and may stem from specific difficulties related to cognitive-linguistic processing (organization of phonological rules), auditory processing, and/or speech production. The interrelationship among these three processings has been the subject of several studies[3–5] that sought to improve the understanding of the manifestations observed in children with SSD.

Regardless of the SSD classification system used, the literature points to the existence of subtypes,[6,7] demonstrating a variety of difficulties that may exhibit different manifestations and varying degrees of expression. Such manifestations can be identified by various tests complementary to phonological tests; for instance, speech inconsistency, metalinguistic skills, and those involving auditory organization, assessed in (central) auditory processing (CAP) tests.

The classification of SSD severity is a complex task, because the clinician must consider the phonological changes, speech intelligibility, and age of the child, among other factors. Some severity index classifications can be found in the literature, such as the Percentage of Consonants Correct (PCC),[8] its revised version, the PCC-R,[9] and the Process Density Index (PDI).[10]

Both PCC and PCC-R are intended to indicate the percentage of correct consonants in a conventional speech sample. The main difference between these tools is the fact that PCC considers substitutions, omissions, and distortions as speech errors, while PCC-R considers only consonant substitutions and omissions as errors.

PDI verifies the occurrence of phonological processes, and is distinct from PCC and PCC-R, inasmuch as these two latter indexes account for the correct consonants of speech samples. PDI is inversely proportional to PCC and to PCC-R, in that the lower the value of PCC (or of PCC-R), the higher the value of PDI; that is, the lower the percentage of correct consonants employed in speech, the higher the frequency of use of phonological processes.[11]

PCC-R and PDI have been applied on Brazilian Portuguese (BP)-speaking children with SSD in the same region of the country where the children of this study live. Studies show that this is an efficient index for classifying SSD severity.[12–14]

Intelligible speech depends on efficient phonological programming, which reflects the individual's ability to select the target phoneme and organize the sounds in the correct sequence.[15] Difficulty in phonological programming can be evaluated by the speech inconsistency test,[12,15] which indicates a possible deficit in cognitive-linguistic processing that interferes with the internalization of phonological rules of the language the child is exposed to.