



Neuropsychology as a specialty in Speech Language and Hearing Sciences: Consensus of Brazilian Speech Language Pathologists and Audiologists

Neuropsicologia como especialidade
na Fonoaudiologia: Consenso
de Fonoaudiólogos Brasileiros

Neuropsicología como especialidad
en Fonoaudiología: Consenso
de Fonoaudiólogos Brasileños

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Abstract

In January, 2015, the Federal Council of Speech Language and Hearing Sciences in Brazil published a resolution which describes the competences and roles of Speech-Language Pathologists and Audiologists with Specialty in Neuropsychology. This article aims to present the history of professional's participation in the area and to reflect on the importance of this specialty. It is estimated that the recognition of speech pathologists in the field of neuropsychology will produce greater investment in the development of professional practices compatible with the high performance of neuropsychological assessment and intervention of cognitive communicative disorders in our country.

Keywords: *Neuropsychology; Speech Language and Hearing Sciences; Communication; Cognition; Brain.*

Resumo

Em janeiro de 2015 o Conselho Federal de Fonoaudiologia publicou a resolução que dispõe sobre as atribuições e competências relativas ao Fonoaudiólogo Especialista em Neuropsicologia. Dada à importância do reconhecimento dessa especialidade, faz-se necessário divulgar o histórico da atuação do fonoaudiólogo na área e refletir sobre seu papel na Neuropsicologia. Estima-se que o reconhecimento da atuação fonoaudiológica na área da Neuropsicologia produzirá maior investimento no desenvolvimento de práticas profissionais compatíveis com o alto desempenho em avaliação e intervenção neuropsicológicas para a saúde da comunicação em nosso país.

Palavras-chave: *Neuropsicologia; Fonoaudiologia; Comunicação; Cognição; Encéfalo.*

Resumen

En enero de 2015 el Consejo Federal de Fonoaudiología en Brasil publicó la resolución que prevé las competencias y misiones del Fonoaudiólogo especialista en Neuropsicología. Este artículo tiene como objetivo presentar el historial de participación de los fonoaudiólogos en el área y reflexionar sobre sus roles en Neuropsicología. Se estima que el reconocimiento de los fonoaudiólogos en el campo de la Neuropsicología producirá mayor investimento en el desarrollo de prácticas profesionales compatibles con la alta performance de la evaluación y intervención neuropsicologica para pacientes con trastornos cognitivo comunicativos en nuestro país.

Palabras claves: *Neuropsicología; Fonoaudiología; Comunicación; Cognición; Encéfalo.*

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Introduction

Neuropsychology is the interdisciplinary field that deals with the relationship between brain and cognition, and with the study of neuropsychological functions throughout life. The interest in neuropsychological functions involves both biological and psychosocial factors. These functions are mediated by context and are capable of development and rehabilitation through stimulation and learning. The notion that Neuropsychology is an interdisciplinary field is evidenced by classical works of aphasia in the second half of the 1800's. This idea is later emphasized during the two World Wars, due to the large number of victims who survived with brain damage and needed neuropsychological rehabilitation. The main approaches of cognitive rehabilitation in that time focused in the treatment of aphasia. In Russia, for example, the language of such patients was rehabilitated based in neuropsychological studies which investigated cognitive functions represented in the human brain¹.

The base of knowledge which formed neuropsychology comes from several areas, particularly Neuroscience, Linguistics, and Psychology. Undoubtedly, these fields of study represent important stones in the foundation of Speech Language and Hearing Sciences. Speech-Language Pathology and Audiology represent young professional fields which in Brazil are studied in the same course, dating from the decade of 1960. The fact that the profession is new somehow justifies the little knowledge of much of the Brazilian population and even of other professions about the depth of its relationship with neuropsychology. The construction of speech-language pathology was based on several sources, which form the knowledge essential for a broad understanding of human communication. Surely this is why there is consensus in the field that the understanding of human communication necessarily involves a thorough knowledge of brain function and cognition, requiring interdisciplinary training².

The specialty recognition process

In 2013, the commission responsible for analyzing specialist titles and specialization courses (CATECE) of the Brazilian Federal Speech-Language and Audiology Council began a systematic study with the goal of deciding whether

Speech-Language Pathologists and Audiologists with expertise and training in the area of Neuropsychology could receive the title of "Specialist in Neuropsychology". The study was based on criteria of the Brazilian Classification of Occupations. Many well known and respected Speech-Language Pathologists who worked with communication disorders as clinicians and researchers in the area of Neuropsychology were consulted in this process. In 2014, Speech-Language Pathologists and Audiologists also opined in forums that took place in the different regions of Brazil. In addition, the proposal was submitted to public consultation in an online survey to Brazilian speech-language pathologists and audiologists. The consultations with speech-language pathologists who had expertise in neuropsychology, the votes on regional forums and the results of the survey showed agreement upon the creation of the Neuropsychology specialty, gaining wide approval of the Speech-Language Pathology and Audiology professional class. The recognition of the specialty was then published in the resolution CFFa of 466/2015³.

Speech-Language Pathology and Audiology's scope of practice in Neuropsychology

The Brazilian Speech-Language Pathologist and Audiologist's title of specialist in Neuropsychology confirms expertise at the interface between human communication, cognition and its relation to brain function. Such specialist is entitled to work in the prevention, assessment, treatment, and management of communication disorders affected by cognition and brain functioning. Therefore, he or she may work with people who have any communication needs, complaints or difficulties associated with neuropsychological deficits resulting from neurological, psychiatric, neuropsychiatric and developmental disorders³. It is possible to identify the study of brain-mind relationship, which lies within the scope of Neuropsychology, not only in the area of language, but in all areas of speech-language pathology and audiology².

Language and human communication

Cognitive-communicative disorders include difficulties in any aspect of communication affected by cognitive deficits. Communication includes verbal and nonverbal aspects and processing of audi-



tory input, speech, gestures, reading and writing, as well as different linguistic domains (phonological, morphological, syntactic, semantic, pragmatic and discursive)².

Cognition is traditionally defined as the set of unequivocally intelligent processes and products of the human mind⁴. Higher mental processes include: knowledge, consciousness, intelligence, thought, imagination, creation of plans and strategies, reasoning, inferences, problem solving. Systems such as perception, attention, memory, executive functions and language are the most investigated. Functional communication aspects affected by cognition include social interaction, learning and academic and vocational performance⁴.

The relationship between language and other neuropsychological functions is robustly demonstrated in the literature^{5,6,7,8}. It is a fact that effectively communicating necessarily involves the development of attention⁹. Language development in children is closely related to global motor development, integrity of auditory and neurological pathways, sensory integration of auditory and visual systems and cognitive development. The field of Developmental Neuropsychology is closely related to speech-language pathology, especially in view of the importance of language to cognitive function. It is well known that language plays a key role throughout the development of learning⁹.

The relationship between adult communication and cognition is also evident. Discourse coherence and informativeness in Alzheimer's disease is related to executive functioning and memory⁶. Working memory is a key skill both in the acquisition and in the processing of oral and written language, being considered in most speech therapy interventions⁵. Today it is known that a large number of disorders which were once regarded as purely linguistic or related to speech, such as stuttering, for example, involve attention, auditory processing and working memory deficits⁷. Another example lies in the study of the interrelationship between language and numerical processing and calculation. The discussion about the interference of language in numerical processing and calculation is old and there is evidence that numeracy and language overlap, considering individual variability's in neurological impairment⁸.

Swallowing and Orofacial Sensory-motor disorders

The cognitive status of the patient should be considered both in evaluation/diagnosis and in rehabilitation processes of Orofacial sensory-motor functions and Swallowing. Conditions that affect cognition, such as depression, dementia and even the aging process can impact in orofacial motor function, especially in chewing, swallowing, speaking and using facial expressions. The identification of atypical myofunctional tonus, poor facial expression, oral functioning disorders as well as speech motor difficulties can signal certain neurological disorders, especially in older adults. The early detection of these signs can contribute to differential diagnosis of neurological pathologies. In addition, the knowledge that Speech-Language Pathology has accumulated in the understanding of certain dissociations, for example, between mental processes related to the production of speech movements and those related to the production of non speech oral motor praxis, can be very useful in neuropsychology¹⁰. There is also evidence that the neuropsychological profile of patients with dementia is closely related to the prognosis of treatment for oral motor and swallowing difficulties¹¹.

Neuropsychological models of speech processing help to understand the distinction between language and speech¹⁰. Given the complexity of the relationship between language and speech, an integrated vision that considers neuropsychological processing is essential, allowing not only a clear differentiation between disorders, but an understanding of the role of cognitive systems such as attention and working memory in the motor planning of speech¹². There is evidence that one of the properties of the language system is the ability to maintain a production plan for an extended period of time through multiple levels of linguistic representation. The brain regions responsible for phonological coding are also responsible for short-duration retention of speech in working memory. The language system benefits from the fact that representations of working memory and long term memory are coupled and share long term memory representations^{13,14}.

Voice disorders

The relationship between voice production and perception with certain cognitive skills, such as the ability to self monitor voice production, has



been increasingly studied for the benefit of patients with or without neurological disorders^{15,16}. Often, patients with neurological and cognitive disorders present vocal and prosodic changes and require treatment that considers these aspects along with cognition^{15,16}.

Hearing disorders

The field of audiology has excelled in the study of processing auditory stimuli, whether linguistic or not, and understanding the involvement of neuropsychological functions in this process¹⁷. Auditory processing studies were driven by the description of Broadbent¹⁸ of hemispheric lateralization for verbal stimuli and since then there have been many developments in the investigation of the relations between central processing, understanding (language) and other cognitive domains, particularly memory and attention. Research shows that the audiologist should consider skills such as attention and working memory to design intervention programs and auditory training^{19,20}. The importance of cognitive assessment for the intervention of children and adults with auditory processing disorders is evident. Understanding the interrelationship between auditory processing and other neuropsychological aspects is fundamental to the process of adapting to the use of a hearing aid²¹.

Public health

According to the College of Audiologists and Speech-Language Pathologists of Ontario, Canada²², at least 80% of people suffering from neurological disorders such as traumatic brain injury, have cognitive-communicative disorders. Given the high incidence of neurological injury in the population, and considering the presence of these communication disorders, the need for service in this area is evident. To ignore the needs of the population and disregard the importance of speech-language pathologists with expertise in Neuropsychology is to put interests that target market reserve ahead of public health².

The increase of dementia in the population and the continuous growth of life expectancy demands interdisciplinary health care programs for older adults. Language disorders are frequently accompanied by disturbances in other domains of cognition and, therefore, patients with dementia need the service of professionals who have an in-

tegrated view of language and cognitive functions for intervention⁶.

In the last decades, health professionals have experienced a growth of awareness about the need to avoid fragmentation of the patient. How can we accept a segmentation of the brain, when it is known that an injury or dysfunction carried out by nature will rarely affect exclusively language, or memory or attention? A person with communication disorders resulting from various cognitive deficits should be examined from an integrated perspective. The fundamentals of Neuropsychology offer a transdisciplinary basis for health professionals working with the population with neurological disorders. It is a consensus that a perspective that promotes isolated attendance of numerous experts, each using their own terminology within their unique fields of knowledge is totally obsolete and inadequate. Health professionals must act towards the construction of interdisciplinary work. The adoption of this approach is ethical and even economical in terms of health for the population.

History of participation in the field of Neuropsychology

Although only recently the title of specialist in neuropsychology has been recognized, research and clinical practice of Brazilian speech-language pathologists and audiologists in this area has been developed for more than four decades²³. The creation of the specialty is, therefore, first of all, due to the great engagement of Brazilian speech-language pathologists and audiologists in the area.

Speech-language pathologists have been and still are represented through active participation in pioneering interdisciplinary groups which study and practice neuropsychology in the country and even in the foundation of the Brazilian Society of Neuropsychology (SBNp)²⁴. Since its foundation, for over 25 years, this society has emphasized the interdisciplinary nature of Neuropsychology. In 2007, SBNp held the Multidisciplinary Forum to discuss the performance of different professional areas in neuropsychology, respecting their interfaces and the limits established for each area of knowledge and training. The respect for interdisciplinary ethics has been expressed over the years by the recognition of the contribution of speech-language pathology and audiology to the field.





The academic participation of speech-language pathologists in the area is undeniable. In Brazil, until about ten years ago, the largest number of doctoral theses defended by speech-language pathologists concentrated in the area of language²⁵. The tradition of Brazilian speech-language pathology in the study of language was influenced both by approaches which value standardized assessment and by discourse theoretical models. The neuropsychological tradition appeared in Brazilian Speech-language Pathology and Audiology shortly after the start of undergraduate courses in the 1970s and early 1980s. During this period, standardized instruments of language evaluation, such as the Minnesota, the Boston, and the Montreal-Toulouse batteries, were first introduced in Brazil thanks to the commitment of speech-language pathologists to the profession²³. In recent decades, the contribution of speech-language pathologists persists and increases. The evolution of neuropsychological models that demonstrate the role of extra-linguistic functions in communication produces a growing panorama of neuropsychological evaluations adapted and validated through the scientific leadership of speech-language pathologists (23.26).

Fidelity to the interdisciplinary nature of the area led speech-language pathologists to teach in many different academic areas. Some are professors in Neuroscience and Psychology departments of different Brazilian universities. The active participation and academic recognition of speech-language pathologists also contributed to the creation of specialized courses in neuropsychology that include speech-language pathologists as students and teachers.

On the international scene, the role of speech-language pathologists in neuropsychological rehabilitation goes back to the great wars, when there was an effort to develop therapeutic approaches aimed at treating soldiers with brain injuries. Much of the cognitive rehabilitation approaches emerged from concepts that had their origin in the treatment of aphasia, area in which there was particularly greater contribution from speech-language pathology worldwide¹. This movement influenced Brazilian speech-language pathology and today there is a growing concern with the development and the effectiveness of cognitive intervention programs for communication, applied both for the prevention and rehabilitation of cognitive-communicative disorders²⁷.

The role of Speech-Language Pathologists in Neuropsychology

According to the Brazilian Law 6.965 and to the Decree 87.218 of 1982, the three key roles of the Speech-Language Pathologist are: to assess, to prevent and to rehabilitate communication and swallowing disorders. The practice of these roles may be supported by Neuropsychology, which is interested in the neurobiological phenomena related to functional recovery and seeks to identify principles that can optimize rehabilitation.

Neuropsychological assessment and Speech-Language Pathology

Speech-language pathologists may use assessment tools of oral and written language, cognition and learning. The assessment of cognitive skills is among the large areas of competence of the Speech-Language Pathologist registered in the Brazilian Classification of Occupations. Speech-language pathologists have recognized competence in neuropsychological assessment in many countries. For instance, the Academy of Neurological Disorders and Communication Science (ANCDs) has published evidence-based practice guidelines for speech-language pathologists in scientific periodicals specializing in Neuropsychology².

The main goal of a speech-language pathologist carrying out neuropsychological assessment should be to find and characterize cognitive associations and dissociations for the diagnosis, prognosis and intervention plan. Patients who seek speech-language therapy with suspected aphasia, dyslexia, dysorthographia, dysphonia, auditory processing disorder, specific language impairment, dysphagia, among other cognitive-communicative disorders, need to have their complaints contextualized and investigated considering the broad spectrum of cognitive skills that may be related to communication impairments. Thus, speech-language pathologist serving individuals in the areas of language, orofacial motor function, audiology, dysphagia, educational speech therapy, public health, voice, neurofuncionnal speech therapy, occupational speech therapy and gerontology, may consider the relationship between communication and other cognitive functions throughout the diagnostic process of communication disorders³.

The use of neuropsychological tests by different professionals has been discussed deeply in the



consensus paper about the interdisciplinary nature of Neuropsychology led by Haase²⁴. This consensus written by many recognized Brazilian researchers in the field clarifies that neuropsychological assessment is not synonymous with application of psychometric tests. According to Haase and colleagues, the use of neuropsychological tests requires interpretation in terms of neurocognitive models and the goals of neuropsychological assessment are different from those of psychological evaluation. Psychological evaluation originated from the first studies and development of psychological tests in the late nineteenth century with the introduction of the psychometric approach. Although neuropsychological assessment has received very useful contributions from the psychometric approach, this knowledge is complementary and not at all the main basis of Neuropsychological assessment. Neuropsychological assessment exceeds the concept of psychometrics, and is not therefore synonymous with psychological evaluation.

According to the College of Audiologists and Speech-Language Pathologists of Ontario, Canada²², speech-language pathologists should evaluate neuropsychological functions which impact on communication. It is noted that the focus of the speech-language pathologist in using neuropsychological assessment is in the determination of the impact of possible cognitive deficits in communication. These should be considered in planning the intervention. In addition, the Canadian agency recommends that, whenever the patient has previously been assessed by a psychologist, the speech-language pathologist should contact this professional, contribute to interdisciplinary practice and avoid unnecessary duplication of assessments.

Promoting cognitive health and neuropsychological rehabilitation

In recent decades multidisciplinary studies have investigated the adaptive capacity of the central nervous system (plasticity) and examined how neurons and other brain cells, have the ability to change structure and function in response to a variety of internal and external pressures, including cognitive training. In other words, the brain can encode experience, learn and develop new skills. It may also be stimulated to promote cognitive health. In the presence of a neurological injury or disease, neuroplasticity can promote the relearning of skills²⁸.

It is important to understand basic principles of neuroplasticity that govern learning both in the healthy brain and in the brain that has been damaged in order to identify behavior and neurobiological signs that may lead to recovery. Research in neuroscience has accumulated information about how neural plasticity depends on the experience and it is no exaggeration to bet that this knowledge can be incorporated into various areas of speech-language pathology. There is enough evidence, recognized from neuroimaging technology that speech-language pathology practices lead to structural and functional reorganization of the brain²⁸.

Regarding the promotion of cognitive health, an example of speech therapy in this scope is the cognitive training in healthy elderly people. The use of preserved skills, teaching compensatory strategies and stimulation of deficient cognitive abilities benefit greatly communication elderly, particularly the narrative skills. This field of activity has grown considerably in Brazil and worldwide.

It is worth mentioning some examples of how neuropsychology can contribute to the work of speech-language pathologists in rehabilitation. In the area of dysphagia, there is evidence that the effective treatment of swallowing disorders in demented patients requires the therapist to consider memory rehabilitation principles in order for the patient to learn maneuvers that facilitate swallowing. The use of the spaced retrieval technique is efficient for learning strategies that help people with dementia to swallow more safely¹¹. There are also findings that motor orofacial therapy requires sustained attention and that this cognitive function is greatly recruited during speech-language therapy¹⁴.

In the area of auditory processing, there is evidence of neural correlates that appear to be related to the reversal of central processing difficulties²⁹. In the area of voice, the widely used Lee Silverman method for rehabilitation of patients with Parkinson's disease³⁰ is based on principles of plasticity of motor learning and achieves success through practices based on top-down processes and remodeling of phonation. In the area of aphasia rehabilitation, neuroimaging studies and rehabilitation are to the point that many researchers and scholars²⁸ held consensus to discuss criteria for determining treatment effects and mechanisms associated with neural recovery of aphasia induced by language therapy. In any of the above specialties, the speech-language pathologist needs to develop

research and apply models that promote learning or relearning cognitive skills while considering brain function.

Conclusion

The role of speech-language pathologists which have expertise in neuropsychology is limited to the relationship between neuropsychological functions and speech-language pathology aspects, in particular the assessment, prevention and rehabilitation of cognitive-communicative disorders, which is clearly defined by Resolution 466/2015 of CFFa.

The history of participation of Speech-Language Pathology and Audiology in the area and the need for involvement in terms of public health are obvious. The relationship between neuropsychology and speech-language pathology and audiology is reciprocal; the knowledge of these fields complements each other and can be used to better understand development processes and communication disorders.

Considering that Neuropsychology is an interdisciplinary specialty, one of the challenges faced by Speech-Language Pathologists and Audiologists who specialize in this field is to establish a dialogue with other professions that work in the area. The recognition of the Brazilian Speech-Language Pathologist's practice in Neuropsychology agrees with the positioning of ASHA⁵, that neuropsychology is not owned by any profession and that all relevant professions should contribute to its knowledge base, as well as its applications in patient care. Given the interdisciplinary history of neuropsychology, the respect for the work of Speech-Language Pathologists with expertise in Neuropsychology and for the ethical principles of interdisciplinary cooperation are current needs.

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