Nonverbal Learning Disabilities, Asperger's Syndrome, Pervasive Developmental Disorder — Should We Care?

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Words are often considered the feature that differentiates humans from all other animals. It is clear that no other animals have the same anatomic-physiologic structures used by humans to create words. Anthropologists have long looked for archaeologic evidence of words as the beginning of humanness. The earliest evidence of written words—symbolic representation of spoken ideas—dates from about 10,000 BC, although we have no real idea when spoken words began. Nonetheless, modern life seems to be linked to the ability to understand and communicate in words.

Parents and physicians consider one of the most important milestones in child development to be the first words. Development of ability to use spoken and written words (reading) are key goals in school, and testing and ratings are based mostly on the ability to identify and use words appropriately.

Since the identification of aphasia by Paul Broca and subsequent explosion of interest in language disorders following the work of Norman Geschwind and colleagues, it has become evident that specialized areas of the brain, specifically left cerebral hemisphere structures, underlie the ability to understand and use words.

However, effective human communication and interaction requires more than simply words. Facial expression, posture, gaze, and body movement (gesture) are as important as words in communicating correct information to another individual. Not only should words be appropriate for the social context (proper pragmatic speech), but the facial expression, posture, gaze, gestures, and vocal quality (prosody) must also be congruent.

Much of nonverbal communication appears to be a normal function of the right cerebral hemisphere. Lesions of the right hemisphere produce a variety of problems in communication, evident as difficulties producing or recognizing the tone, pitch, and melody of speech and associated facial expression, posture, and body gestures. It is noteworthy that infarcts involving the right cerebral hemisphere are frequently more disabling than similar size lesions of the left hemisphere. Despite the lack of words, individuals with expressive aphasia from left cerebral hemisphere lesions can often still be understood by family members, on the basis of situation-appropriate emotional vocalizations and gestures.

Nonverbal communication actually begins at birth and contributes to the bonding between mother and infant. The right cerebral hemisphere is more developed than the left at birth, presumably because of the importance of right hemisphere-mediated visual-spatial and emotional interactions with the mother as a part of this bonding process. Mothers (even left-handed women) tend to cradle infants with the left arm against the left breast, apparently to allow the infant's left visual field to see and left ear to hear the mother better, since such inputs go more directly to the right hemisphere.

A variety of functions appear to be best performed by the right cerebral hemisphere (Table 1). Spatial analysis, sequencing, and object recognition, are all necessary for the proper interpretation of the facial and body movements used in communication. The right hemisphere mediates the attentiveness necessary to discriminate communications from background distractions. The right hemisphere maintains visual and auditory imagery that permits proper understanding of the surrounding world including appropriate recognition and interaction with animate and inanimate objects. Empathy (caring), wit, and vigilance (alertness) are other important functions of the right cerebral hemisphere.

Individuals with normal intelligence who have lifelong difficulties with the verbal functions of the left cerebral...
hemisphere, presumably on the basis of neurodevelopmental abnormality, are said to have learning disabilities. Specific learning disabilities have been Federally defined as "a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations," [PL94-142 (1975) and Individuals with Disabilities Act (1990)] and the prototype learning disability is dyslexia (poor reading ability). Thus, learning disabilities officially involve problems mainly with word tasks.

However, a large number of individuals have neurodevelopmental abnormalities involving functions of the right cerebral hemisphere. While not a part of the Federal definition for learning disabilities, these problems have been variously termed right hemisphere learning disabilities, visual-spatial and graphomotor learning disabilities, or social-emotional learning disabilities. However, the preferable designation is nonverbal learning disabilities. Combinations of a variety of difficulties characterize the child with a nonverbal learning disability. Graphomotor, visual-spatial, organizational, and sequencing problems produce significant difficulties both in school and in other environments. However, social interaction can be especially impaired by the difficulties recognizing faces and expression, aberrant prosody and emotionality in speech and gesture, pragmatic abnormalities of speech (appropriateness of the speech in relation to the social situation), misinterpretation of the tactile stimuli associated with interpersonal interactions (such as a handshake), and difficulty understanding the sequencing or interrelationship of events (problems "viewing the world as a series of interconnected events "). Depending on the range of dysfunctions and degree of severity, a wide variety of individual syndromes can be included under the heading of nonverbal learning disabilities (Table 2). In this issue of the Journal of Child Neurology, Bonnet and Gao provide a brief review of Asperger's syndrome, which appears to be a severe form of nonverbal learning disability in which a basic problem is expressive hyperdyspraxia and hyperemotionality. Individuals with Asperger's syndrome are uncomfortable in social settings because of the difficulty responding appropriately in interactions with other individuals, and they are rejected by others because their nonverbal communication is "out of context" in relation to their verbal communication. This discomfort and rejection produces isolation and a relatively restricted and stereotyped activity pattern. It is important to recognize that Asperger's syndrome is one of a number of brain-based social-emotional disorders that are the result of neurodevelopmental abnormalities. As more such patients are identified and studied with newer imaging techniques, a better understanding of this neurodevelopmental abnormality will be possible.

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