

## The Role of Motor Planning In AAC and Language Acquisition

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People with cerebral palsy, traumatic brain injury and a wide variety of neuro-degenerative conditions depend on motor planning to perform simple movements to an even greater degree than their non-disabled peers. Motor plans are developed through hundreds of repetitions. A well-developed motor plan can allow people to perform actions without thinking, *i.e.*, automatically. Some activities can never become automatic and are called control processes. Control processes differ from automatic processes in the constant need to perform visual search tasks as well as cognitive and physical readjustments. The authors will explore the role of motor planning in AAC and language acquisition.

The history of augmentative communication features an early and influential role for the study of iconicity. Teachers had observed that children with cognitive impairments could recognize and recall highly iconic graphics - pictures that clearly represented objects. Belugi & Klima suggested three measures of iconicity: transparency; translucency; and opaqueness (Belugi & Klima, 1976). Roger Brown further legitimized the idea of using iconicity as an important variable in learning manual signs (Brown, 1977). Brown hypothesized that the iconic relationship between many words and their visual sign language representation could explain the ease of learning sign languages compared to the difficulty in learning spoken languages.

Macalyn Fristoe and Lyle Lloyd introduced iconicity measures to the nascent AAC community (Fristoe & Lloyd, 1979). Since that era, more than 25 doctoral dissertations worldwide have been written concerning iconicity measures in AAC.

Iconicity is often the overriding factor in the evaluation of the utility of graphical symbols in AAC. If a non-reading client is able to guess the meaning of a symbol, then that correct guessing is taken to be a predictor of successful use. Guessability has become a scientific and intuitive predictor of successful symbolic use in AAC.

In order to have a concrete representation of a word or concept, many symbol systems in AAC have produced libraries of thousands of symbols/pictures. These libraries have led clinicians and teachers to design many separate pages of symbols on speech generating devices (SGDs). A multiplicity of pages conforms to our current notions of iconicity, but navigating among these pages subverts the development of motor planning.

Motor plans are neuronal pathways in the central and peripheral nervous systems that facilitate ease and accuracy in the execution of any movement. Motor plans are not conscious. Motor plans are automatic or semi-automatic. The simplest to the most complex neuro-motor activities of daily life are made possible by motor plans. Activities rich in complex neuro-motor planning include walking, talking, driving, climbing or descending stairs, eating, dressing, swallowing, typing, reading, and computer access.

Any mind/body activity, from rolling dice to playing the violin, depends on motor planning. The months of infant babbling are a preparation for automatic motor planning of the articulatory apparatus to produce the phonemes of the ambient language surrounding the child.

Language processes are located not only in the cerebral cortex but throughout the brain. Although auditory nuclei process acoustic information, the information does not take on meaning until it goes to other areas of the brain including the cerebellum where the acoustic information is mixed with motor information. This bundle of neural impulses travels to cortical processing areas as a mixture of motor, postural, and emotional information. These come together in the cortex to produce meaning. The left cerebral hemisphere has the ability to attach language to self-experiences – motoric, volitional, mind/body activities.

The attachment of language to motoric self-experiences is a necessary step in language acquisition and the development of meaning and comprehension.

SGDs often have their interfaces designed with no attention to the development of discrete motor plans to access specific words. Environmentally coded pages teach early communicators that there is no relationship between meaning and the motor plan that causes an SGD to speak. The resulting feedback is disordered without the bodily afferents needed to think with language (Windeck & Laurel, 1989).

#### Bibliography

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