Infant Motor Dyspraxia as a Predictor of Speech in Childhood Autism

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ABSTRACT

We previously proposed that a subgroup of children diagnosed with autism spectrum disorder (ASD) can also be characterized by severe developmental verbal dyspraxia (DVD). DVD is a motor-speech programming disorder resulting in difficulty coordinating and sequencing the oral-motor movements necessary to produce and combine speech sounds. DVD often co-exists (in non-ASD children) with manual dyspraxia (i.e., difficulty coordinating and sequencing the movements for tasks such as gestures, pointing, and sign language). We proposed that young ASD children who are also characterized by DVD are likely to remain minimally verbal.

What is Verbal Dyspraxia?

Developmental verbal dyspraxia is best defined as a motor planning disorder. Children with this disorder may share a developmental history characterized by:

√ little cooing or canonical babbling

√ few consonants heard in babble

√ very delayed first words (if present at all) with many phonemes deleted or replaced with other (easier) phonemes

√ oral scanning or groping

The Role of Motor Planning in ASD

• Oral- and manual-motor planning but NOT gross-motor planning correlates with lower expressive language in ASD (Page & Bouchert,1998)

• Voluntary non-verbal oral skills (e.g., imitating lip puckering) but NOT basic oral-motor functions (e.g., control of oral secretions) discriminate verbal vs. nonverbal ASD children (Amato & Slavin,1998)

The Role of Motor Planning (continued)

• Motor imitation ability but NOT play level or joint attention predicts speech at age 4 (Stone & Yoder, 2001)

• Mute ASD children cannot point proto-declaratively despite full Piagetian sensorimotor development (Curcio,1978)

• Nonverbal ASD children under age 3.5 have EQUALLY low rates of contact and distal pointing (Stone et al.,1997)

Assessment

A landmark-event based structured telephone interview was conducted with the primary caregiver of a child/ren with ASD. This screening interview contained critical oral-motor and manual-motor items at 6, 12, 18, 24 and 36 months, in addition to questions on traditional motor milestones as a check against general motor delay.

Blowing raspberries
6 month oral-motor item

Reaching into birthday cake
12 month manual-motor item

Pointing to an object
18 month manual-motor item

Sample

• 160 children with ASD living in Dane County, WI (about 60% of all existing cases in this area)
  • 26% of the sample who had "medical complications" (e.g., seizure disorder, Landau Kleffner, Cerebral Palsy, failure to thrive, etc.) were excluded from analysis

• 40 typically-developing (TD) children
  • Age- and sex-matched with ASD group

Results

A. Do challenges in oral- and manual-motor behaviors distinguish ASD children from TD controls?

• **Yes,** individual items from a group of 7 oral-motor and 21 manual-motor markers, such as those shown at the left, significantly differentiated the ASD and TD groups.

• These oral- and manual-motor markers distinguish ASD from TD better than the classic motor milestones of sitting up, crawling, and walking.

• Some of the oral- and manual-motor markers rival classic diagnostic signs (e.g., orienting to name) in ability to distinguish ASD from TD.

B. Are oral-motor and manual-motor abilities related within the ASD group?

Yes, r =.62 for composites of these two domains.

C. Do oral-motor and manual-motor markers predict later speech within the ASD group?

Yes, as the following two examples show:

Current (childhood) Speech Level

	Nonverbal	Fluent
6 months		
YES blow raspberries	**20%**	**60%**
NO blow raspberries	**80%**	**40%**
	$\chi^2 = 6.984$, $p < .01$	
24 months		
YES protrude tongue	**0%**	**64%**
NO protrude tongue	**100%**	**36%**
	$\chi^2 = 20.15$, $p < .0001$	

Results (continued)

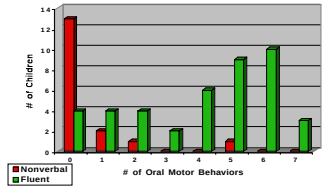
• Manual-motor markers predict speech nearly as well as the oral motor markers.

• The prediction is stronger when oral-motor (N=7) and manual-motor (N=21) are combined to form composites.

D. Do the dyspraxia markers cluster within certain individuals?

Yes, these markers cluster in a subset of perhaps 15% of ASD children. The figure below shows the clustering of oral-motor markers within ASD children. This figure also shows that these dyspraxic children are overwhelmingly nonverbal.

Current Speech Fluency vs. Oral-Motor Ability in Early Childhood



Future Directions

Current research on this sample is aimed at confirming diagnoses, further specification of speech status, and in-home assessment of motor dyspraxia using standardized tests.