

# Early intervention: Improvement in motor developmental speech delay in a 2-year-old male following chiropractic care: a case report

By Andrew Dorough DC<sup>1</sup>

1. Private Practice, O'Fallon, Missouri  
Email: dr.dorough1031@gmail.com

## ABSTRACT

**Objective:** To chronicle the improvements in a non-verbal 2-year-old male presenting without the age appropriate receptive language. At the time he presented, he was unable to pronounce simple vowel sounds. **Methods:** Online review of the literature on motor development delay, speech delay and chiropractic were performed using the index to chiropractic literature, PubMed and Google Scholar. Search terms “motor developmental delay”, “speech delay”, “child apraxia”, “speech delay and chiropractic”, “speech and language delay” and “spinal manipulation” were used. **Clinical Features:** A 2-year-old male with apparent motor speech delay reported to the office for chiropractic care. This child was almost completely non-verbal and unable and or unwilling to articulate simple vowel sounds, simple words or word sounds. His expressive vocabulary consisted of 5-8 words that were poorly pronounced. His main form of communication was crying or using bodily gestures. The child had seen no other professional for this complaint nor had he received any treatment by another professional for this complaint. **Intervention and outcome:** The child received cervical and cranial chiropractic care for 7 visits over 8 weeks using digital vibration with hands (Gonstead technique) and Sigma-Instrument (instrument assisted) technique to correct cervical vertebral and atlanto-occipital segmental dysfunction. Throughout chiropractic care, the child showed steady progress in articulating vowel sounds, word sounds and simple words including pronunciation attempts upon reading words. Parents also report, subjectively, that child has become more “affectionate” and “loving”. **Conclusion:** An early intervening course of chiropractic care using modified Gonstead Technique and Sigma Instrument assisted adjusting technique for the correction of cervical vertebral and atlanto-occipital bone subluxation were associated with improvement in the child's presenting motor developmental speech delay.

**Keywords:** motor developmental delay, speech delay, child apraxia, speech delay and chiropractic, speech and language delay.

## Introduction

The World Health Organization defines developmental delay as a child who is not meeting a range of milestones at the expected rate of development.<sup>1</sup> Developmental delay includes a variety of areas including but not limited to cognitive skills, fine and gross motor skills, speech and language skills and social and emotional skills.<sup>2</sup> This paper will investigate the speech component of child development and the effects and treatment options if delay is present.

Speech is the oral expression of thought. Apraxia is a motor speech disorder that makes it difficult for children to speak requiring significant effort to articulate sounds and words. To speak, neuronal messages need to travel from the brain expressed through appropriate oral motor function. If your child has apraxia of speech (Childhood Apraxia of speech, aka: CAS), there is a “glitch” or fault in the transmission of the message to the appropriate muscles. A child might not be able to organize the required muscular movements of his lips or tongue to produce sounds, even though his muscles are not weak resulting in a small or simple vocabulary (expressive language). A child with CAS knows what

he or she wants to say, but cannot say it. CAS is a problem with the communicating with the muscles of the mouth to move appropriately, not a reflection of their cognitive ability.<sup>3</sup> CAS is often called verbal dyspraxia or developmental apraxia. Even if the term “developmental,” is used, CAS is not a problem that children simply outgrow.<sup>3</sup> A child with a developmental speech disorder learns sounds in a typical order, just at a slower pace. If a child has CAS, he will not follow typical patterns and will not make progress without treatment. With intense treatment and continued effort, a child's speech can improve. The cause is unknown.<sup>3</sup> According to ASHA, if a child is younger than 3 years of age and does not coo or babble as an infant, says her first words later than expected, makes only a few different sounds, has problems putting sounds together, has long pauses between sounds, does not always say a word the same way or has some problems eating, there is likely to be CAS present.<sup>3</sup> In addition, the University of Michigan Health System produced an information chart that articulates milestone norms in speech development (see figure 1).<sup>4</sup>

Current intervention includes multi-sensory cueing, in-

Age	Language Level
Birth	Cries
2-3 months	Cries differently in different circumstances; coos in response to you
3-4 months	Babbles randomly
5-6 months	Babbles rhythmically
6-11 months	Babbles in imitation of real speech, with expression
12 months	Says 1-2 words; recognizes name; imitates familiar sounds; understands simple instructions
18 months	Uses 5-20 words, including names
1 to 2 years	Says 2-word sentences; vocabulary is growing; waves goodbye; makes “sounds” of familiar animals; uses words (like “more”) to make wants known; understands “no”
2 to 3 years	Identifies body parts; calls self “me” instead of name; combines nouns and verbs; has a 450 word vocabulary; uses short sentences; matches 3-4 colors, knows big and little; likes to hear same story repeated; forms some plurals
3 to 4 years	Can tell a story; sentence length of 4-5 words; vocabulary of about 1000 words; knows last name, name of street, several nursery rhymes
4 to 5 years	Sentence length of 4-5 words; uses past tense; vocabulary of about 1500 words; identifies colors, shapes; asks many questions like “why?” and “who?”
5 to 6 years	Sentence length of 5-6 words; vocabulary of about 2000 words; can tell you what objects are made of; knows spatial relations (like “on top” and “far”); knows address; understands same and different; identifies a penny, nickel and dime; counts ten things; knows right and left hand; uses all types of sentences

**Figure 1. Speech and Language Delay Disorder. University of Michigan Health System.**

tegral stimulation, progressive approximation, phonetic placement, tactile facilitation, prosodic facilitation and gestural cueing.<sup>5</sup> Treatment selection depends on several factors, including the severity of the disorder and the communication needs of the child. Because symptoms typically vary both from child to child and for the same child. Multiple approaches may be appropriate at a given time or over time.<sup>6</sup> Diagnosis of CAS is age sensitive and evaluation begins at age three. Diagnosis of CAS in children under 3 is challenging for a variety of reasons, including but not limited to:

1. The potential presence of developmental disabilities and/or comorbid conditions;
2. The lack of a single validated list of diagnostic features that differentiates CAS from other types of childhood speech sound disorders (e.g., those due to phonological-level deficits or neuromuscular disorder);
3. The fact that some primary characteristics of CAS (e.g., word inconsistency, a predominant error pattern of omis-

sion, etc.) are characteristic of emerging speech in typically developing children under the age of 3 years;

4. The lack of a sufficient speech sample size for making a more definitive diagnosis;
5. The challenge of sorting out inability versus unwillingness to provide a speech sample or to attempt a speech target;
6. The possibility that changes occurring prior to age 3 (e.g., developmental maturation, social and linguistic peer exposure, and beneficial effects of therapy) may alter the diagnostic label.<sup>7,8</sup>

Preliminary research using retrospective analyses of home videos suggests some early indicators of CAS below the age of three.<sup>7,8</sup> However, given the preliminary nature of this data and the need for more research (e.g., longitudinal studies from infancy), diagnosis below age 3 is best categorized under a provisional diagnostic classification, such as “CAS cannot be ruled out,” “signs are consistent with problems

in planning the movements required for speech,” or “suspected to have CAS.”<sup>9</sup>

Chiropractic care for the pediatric population is growing in acceptance.<sup>10,11</sup> Chiropractic care intends to remove nerve interference caused by vertebral subluxation.<sup>12</sup> A vertebral subluxation represents an altered state of afferent input which can lead to maladaptive changes in central neural plasticity resulting in dysfunction.<sup>12</sup> Current literature regarding the chiropractic management of infants and children with developmental delays is limited.<sup>13-16</sup> The evidence to date suggests that chiropractic care may be beneficial for this population.<sup>13-16</sup> The purpose of this case report is to demonstrate the improvements in speech delay found in a 2-year-old male following early intervention utilizing age appropriately modified Gonstead Technique and Sigma Instrument assisted adjusting technique for the correction of cervical vertebral and atlanto-occipital bone subluxation.

### Methods

To review the definition of childhood Speech Apraxia and its relevance to chiropractic, an online review of the literature on motor development delay, speech delay and chiropractic were performed using the index to chiropractic literature, PubMed and Google Scholar. Search terms included: “motor developmental delay”, “speech delay”, “child apraxia”, “speech delay and chiropractic”, “speech and language delay” and “spinal manipulation” were used. Databases were searched from inception through February 2018, with utilized studies, case reports and research based standards, all of which are peer-reviewed.

### Case Report

**History:** A 2.5 - year-old male with speech delay presented for chiropractic care. The mother and father report that labor was chemically induced (Pitocin) and lasted approx. 22 hours. The mother reported that she pushed for 1.5 hours until her child was delivered vaginally. Both parents reported that there is a family history of Asperger’s and autism, however, the child did not appear to demonstrate these developmental issues.

The mother reported that the child had no breastfeeding challenges however, both parents noted that this child had trouble lying prone and was not able to lift his head up well (did not extend at C01) while prone between months 4-8. He was able to do perform pushups (extending from the waist recruiting his trapezii and levator scapulae), however would cry while doing this activity. The child had no other apparent development motor delays.

Before treatment, the child had an expressive vocabulary that consisted of 5-8 words, he was not retaining newly learned words, he would not try to mimic or attempt to say

unfamiliar words when asked to, he would not try to sound words or syllables out. Parents reported that he started to make minimal vowel sounds and speech sounds at 2 years of age.

**Examination:** Upon visual chiropractic examination, there was evident restriction in the oral pharyngeal complex which was assessed by observing the TMJ which deviated to the left, head was in flexion. Upon command, the patient had trouble opening his mouth widely and extending his tongue beyond the teeth and lower lip. Excessive salivation was also noted.

Orthopedic and neurologic examination, revealed the following: Cervical Distraction Test was within normal limits bilaterally, Flexion Compression was positive. Jackson’s Compression Test was within normal limits on left-side and was positive on right-side. Maximal Foraminal Compression Test was within normal limits on left-side and was positive on right-side. The last three tests elicited facial wincing, pupillary constriction and withdrawal reflex which presented throughout test thus indicating tension pain and soreness. Reflexes: Biceps reflex, Triceps reflex, and Brachioradialis reflex were within normal limits bilaterally.

Range of Motion (Passive): Cervical ROM: Flexion was within normal limits. Extension is 40° (66% of normal), limited by: Spasm, Guarding; Left Lateral Flexion was within normal limits; Right Lateral Flexion was within normal limits; Left Rotation was within normal limits; Right Rotation was within normal limits. Spinal Fixation/Malposition/ Palpatory findings: Occiput restricted on the right; C1 facet capsular swelling on the right; C2 facet capsular swelling on the right; C3 facet capsular swelling on the right. All the aforementioned restrictions were associated with patient irritability upon palpation.

Patient was fussy and cried when light touch (approx 1-2 pounds of pressure) was applied to right cervical paraspinal tissue.

Hypertonicity was found in the following areas: Left-Cervical paraspinal musculature and Right-Cervical paraspinal musculature.

Trigger points were found in the following areas: Left-Cervical-Spine (mild), Right-Cervical-Spine (moderate).

Edema was found in the following areas: Left-Cervical-Spine (moderate), Right-Cervical-Spine (moderate), (posterior) Left-TMJ (mild), (posterior) Right-TMJ (mild-moderate), (posterior) Left-Cervical-Spine (mild-moderate), (posterior).

Tenderness was found in the following areas: Left-Cervical-Spine (mild-moderate), Right-Cervical-Spine (moderate to severe), (posterior) Right-Cervical-Spine (moderate-severe).

**Intervention:** Cervical spine chiropractic care was administered over a period of 8 weeks where the child was seen 7 times, approximately one time per week. Vertebral subluxation was assessed using commonly used, and reliable, clinical indicators of restricted inter-segmental range of motion, asymmetric intervertebral muscle tension and abnormal spinal joint play.<sup>17-19</sup>

After the appropriate information regarding treatment for the patient was delivered to the parents and consent was obtained, chiropractic adjustments were made using age appropriately modified Gonstead Technique and instrument assisted Sigma-Instrument. Most chiropractic techniques are modifiable for use in the pediatric population based on their developmental stage anatomically and physiologically.

**Outcomes:** Over the course of chiropractic care, the child made considerable progress in speech and ability to make sounds and no adverse reactions to treatment were reported. Following the first 2 visits, he began making more letter sounds without solicitation from parents, he also began babbling differently and more clearly. After the third treatment, he began to pronounce more syllables and more words. At the sixth visit, the parents noticed that he was beginning to read syllables off of signs at the stores they went to and would attempt to say complicated words from these signs. After the seventh visit, the parents noticed that their child was more engaged with other children at the parks during play time and they also noticed that their son was becoming more affectionate. For example, after treatment he is now saying “hi” and “bye”, blows kisses and gives hugs whereas this was not happening before treatment. Before treatment began, the parents reported that their child seemed unaffected and not playful with others. The parents reported that they have observed him performing more focused play and his general wellbeing has seemed to improve greatly.

### Discussion

Gonstead technique is a widely utilized technique with a report of 58.5% of chiropractors using this technique (although not exclusively), with 28% of their patients receiving Gonstead care.<sup>20</sup> This is a procedure that utilizes digital palpation, motion palpation and visual analysis. This technique was utilized, singularly, for the first three treatments. The Sigma-Instrument adjustment was utilized to assist with the modified Gonstead technique. Sigma-Instrument is an oscillating percussion technique similar to the adjustment tool mechanics of the Activator Technique. Sigma-Instrument delivers an impulse that ranges from 1 Hz to 12Hz

per impact. Mechanical vibration was introduced in the 1950's by Fulford.<sup>21</sup> Later on, Carnigan et al. demonstrated, in his works on Parkinson's, that specific frequencies have specific effects on the musculature, namely: 0-4 Hz creates inhibition of voluntary muscles, 4-8 Hz creates stimulation of the voluntary muscles and 8-12 Hz creates stimulation of the involuntary muscles.<sup>22</sup> For the purpose of this case, the instrument was set at 8 Hz to invoke an effect in the stimulation of voluntary muscles of the cervical spine and occipital region. The Sigma-Instrument was set on a delivery force of 10 pounds or 44.48 newtons per impact and an adjustment limit was set to 10 impulses per vertebral motion segment. Home care advice consisted of gentle massage of the cervical spine 2 times daily for 5-minute increments.

Speech and sound propagation improvements were reported in a 2.5 year old male over the course of 8 weeks of chiropractic care. The child had initially presented with motor speech and sound propagation delay with an inability to sound out words, pronounces syllables and say more than 5-10 words. Typical interventions for developmental delay involve a multi-disciplinary approach that includes physical therapy, occupational therapy, speech therapy, psychological therapy and early special education.<sup>23</sup>

It is important for early speech patterns to develop to support the development of higher brain functions later in life. Language and speech proper emerges in late infancy; and yet during a short three years the child should have a highly developed system of linguistic habits that he uses for the expression of his every need and desire, both physical and intellectual. In addition, he should be able to use complex forms of sentences with appropriate inflections, and his expressive vocabulary should consist of several thousand words later on in childhood.<sup>24</sup> Therefore, it is very important to identify speech pathology early on, before, three years of age. Moreover, it is important to investigate the role of chiropractic care in the treatment of cervical spine dysfunction in a child who has apparent motor developmental speech and language delay. Collaboration with speech and language pathologists holds the promise of providing comprehensive evaluation and treatment for children with these issues.

### Limitations

There are inherent limitations of one case study. This includes a lack of a control group, the inability to include spontaneous remission or self-limiting clinical presentation. In this case the assessment of motor developmental speech delay was not made through a formal assessment or professional instrument or method due to the child's age, rather through subjective parental observations, objective clinical observations and reports of the parents and doctor of chiropractic. Additionally, it is unknown whether

the parents followed the homecare advice given, and if followed whether this resulted in the improved in speech changes observed.

### Conclusion

Chiropractic care, using modified Gonstead technique and Sigma-Instrument technique for the correction of vertebral subluxation, was associated with improvements in the child's presenting speech and language delay. More research is needed to investigate the role chiropractic may

play in collaboration with speech and language pathologists in supporting children who present with similar conditions.

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