

# Developmental advancements following chiropractic care in a four-year-old child with dyspraxia and associated developmental delays: A case report

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## ABSTRACT

**Objective:** To present the chiropractic management of a 4-year-old child diagnosed with dyspraxia and concomitant vertebral subluxations. **Clinical Features:** A four-year-old boy with a history of developmental motor delays was presented by his mother for chiropractic evaluation. The child was previously diagnosed with dyspraxia at one year of age, based on a delay in developmental milestones being met; specifically of speech and fine motor control. The patient was 1.25-years-old before starting to walk and 3-years-old before being able to produce any basic sounds such as “Ma” or “Da”. At the commencement of chiropractic care the child was undergoing concomitant speech therapy; six weeks of intensive repetitive therapy was the average amount of time required for the patient to learn and retain one new sound or word. **Intervention:** Modified Diversified (Touch-and-hold) and Sacro-Occipital Techniques were utilized to reduce subluxation indicators through the cranium, upper cervical and lumbopelvic spine. Fifteen adjustments were administered over a 4-month period. **Outcome:** The child experienced a number of developmental advancements over the duration of chiropractic care, specifically in speech, fine motor control and coordination. After 8 visits the patient learned 20 new words in one week, after 12 visits all primitive reflexes were tested to be within normal limits and after 15 visits their vocabulary consisted of hundreds of words and continued to expand. **Conclusion:** This patient experienced significant developmental advancements while receiving chiropractic care. Additional research is necessary to assess the role chiropractors may play in caring for children with developmental delays.

**Key words:** Dyspraxia, developmental delays, chiropractic, pediatric, vertebral subluxation.

## Introduction

Developmental delay is used to describe a child who does not reach the predicted developmental milestones at the expected times; delay can occur in one or many areas, including gross or fine motor control, speech and language development, cognitive/intellectual development and social and emotional development.<sup>1</sup> Children with developmental delays often have retained primitive reflexes. It has been documented that when a cluster of primitive reflexes remain they are counterproductive to normal neural maturation, contributing to developmental delays.<sup>2</sup>

Developmental dyspraxia, developmental delay syndrome, developmental coordination disorder or perceptuomotor dysfunction is a neurologically based disorder of unknown etiology that affects motor skill development.<sup>3</sup> Individuals with dyspraxia experience difficulty planning and executing tasks that require fine motor skills, affecting any or all areas of development including physical, intellectual, emotional, social, language and sensory. Each individual with dyspraxia is affected in a different way, at different stages of development and with differing severity. It is estimated that

up to 10% of individuals in New Zealand are affected by some degree of dyspraxia with approximately 2% of those individuals being severely affected and 70% of all those affected being male.<sup>3,4</sup>

Common treatment interventions for children with dyspraxia include occupational, speech, physical and sensory integration therapy in order to help the child improve fine and gross motor skills as well as develop the ability to plan and execute a process and increase activity and participation with others.<sup>3,4,5</sup>

Chiropractic Care for developmental delay syndromes, while controversial to some, has growing support in the research literature.<sup>6</sup> At this time there is no conclusive information on the causation of developmental delay syndromes, however current evidence supports the premise that some may be secondary to trauma and related to the sensory-motor impairment syndrome known as dyspraxia<sup>2</sup>. While the studies are inconclusive, there is emerging evidence that does show chiropractic care may be successfully employed in the treatment of patients with developmental

delay syndromes such as dyslexia, dyspraxia, learning disabilities, and ADHD.<sup>2-6</sup> The purpose of this case study is to add to this body of literature by reporting upon the developmental advancements and the restoration of appropriate sensorimotor function in a 4-year-old boy with dyspraxia who was receiving chiropractic care.

## Method

An online literature search was conducted using scientific journal databases; Google Scholar, Index to Chiropractic literature, PubMed, ChiroACCESS, Mantis, and Elsevier. Search key words and phrases included “developmental+delay”, “developmental+delay+toddlers”, “developmental+delay+dyspraxia”, “developmental+delay+primitive+reflexes”, “developmental+delay+chiropractic”, “developmental+delay+manual+therapies”, “sensory+integration+disorder”, “dyspraxia+pediatric+chiropractic”, “dyspraxia+primitive+reflexes”, “sensory+integration+disorder+chiropractic”, “dyspraxia+manual+therapies”, “primitive+reflexes+integration+exercises”, “dyspraxia+neurology+chiropractic”, “dyspraxia+pediatric+exercises.”

No searches that included chiropractic as a key word returned articles or studies similar to this case. However, there were a number of resources that provided adequate insight into pediatric neurology to deduce a hypothesis.<sup>2</sup> Other articles and resources were also used to provide background information.

## Clinical Presentation

A 4-year-old child was presented by his mother for chiropractic evaluation in May of 2013 with a primary concern of developmental delays. His parents first noticed these delays when the child was 1-year-old; upon medical assessment, he was diagnosed with dyspraxia. The parents noticed that there were differences in the child's movements compared to older siblings as well as significant delays in meeting developmental milestones. The patient seemed to avoid rolling over or crawling, was sensitive to the touch of different textures and moved his whole head as opposed to performing isolated movements of his eyes. The process of walking was delayed and not attempted until the patient was 1.25-years-old. As development continued there was no display of hand dominance and the patient did not start producing any sounds or the beginnings of words until 3-years old.

The child worked continually with a speech therapist from a young age. As he was unable to produce words easily, the goal of each block of speech therapy was to teach him how to formulate one new sound so that eventually the necessary sounds could be combined in order to create a full word. To learn an individual sound, a block of therapy with an approximate duration of 6-weeks was required. His his-

tory also included 2 visits to a cranio-sacral osteopath after falling off the back of a utility vehicle at 2 years of age with no notable residual problems or concerns.

## Examination

The child was engaged and alert during the initial examination process however due to frustration as a result of communication difficulties he was somewhat non-compliant and had trouble following directions. The chiropractic physical examination revealed abnormalities in the following primitive reflexes: Positive bilateral asymmetrical tonic neck reflex, positive Fukuda Stepping test, positive tonic labyrinthine reflex and positive Moro reflex. A spinal examination was performed and objective indicators of vertebral subluxation at C2 and sacrum were identified through static and motion palpation. High dural tension through the cranial sutures was also noted.

## Intervention

The child was checked by the chiropractor twice a week for the initial three weeks of care, followed by one visit per week for six weeks before reducing the visits to fortnightly. Adjustments were performed at every visit. Techniques utilized included modified Diversified (touch and hold) for C2 and sacrum as well as Sacro-Occipital Technic to address dural tension and enhance craniospinal meningeal dynamics through increased cranial suture mobility. These adjustments included occipital molding, dural balance, sutural and sphenobasilar release and adjustments to improve cerebrospinal fluid flow.

During the first phase of care, “walking on the ceiling” and “superman” exercises were prescribed to be performed at home daily. “Walking on the ceiling” involves a cross crawling action that is performed with the child laying supine and raising a straight leg with the opposite arm. The “superman” exercise is performed prone with arms by their side and requires the child to lift their chest and head off the floor by engaging the posterior spinal muscles only. A new exercise - “the snow angel” - was added late in the second phase of care

## Outcome

Over the course of the first six visits there was a vast improvement in the patient's ability to produce sounds, as well as his ability to perform cross-over exercises. During the second phase of care, on the eight visit the patient had learned how to say twenty new words in the space of a week and also spoke his very first full sentence; “I love you, mum.” The patient's vocabulary continued to expand at a rapid rate and by the 12th visit all primitive reflexes had integrated and there were vast improvements in fine and gross motor control. In the third phase of care, by the 15th visit, his expressive vocabulary had expanded to include

hundreds of new words and it continued to grow; he was also able to start school. No adverse events were observed, nor reported as a result of chiropractic care.

### Discussion

Development advancements in a four-year-old child with dyspraxia and associated developmental delays were observed and documented over a 5-month period of chiropractic care. Care was warranted based on the child's failure to meet important developmental milestones at the appropriate time. A infant's brain matures from most basic to most complex, so the automatic, unconscious, regions of the brain are the first to function.<sup>2</sup> The brain of a fetus and newborn infant is wired in a way to promote initial survival at a reflex level, a reflex being an unconscious predictable response to a specific stimulus. The stimulus, involving a simple sensorimotor pathway, does not interact with the higher conscious brain and the reaction is always the same.<sup>7</sup> Sometimes the changes in wiring of a child's brain from primal to more conscious does not proceed as it should, therefore the various specialised centres do not develop as well or as fast as they should and consequently cannot function appropriately; the result is developmental delay.<sup>7</sup>

Conventional treatment methods for developmental delays include and are not limited to sensory integration therapy, speech and language therapy, physical therapy, behaviour therapy and medication.<sup>3</sup>

Although causes of dyspraxia may involve multiple systems<sup>8</sup>, in this case the symptoms of dyspraxia appeared to be reduced when the patient's upper cervical and cranial subluxations were corrected. It is important also to note that this case included efforts made by the parents to successfully complete the prescribed at home exercises. Although it is unclear exactly how specific movements aid in the integration of primitive reflexes, it has been speculated that utilizing these exercises increases the sensory stimulation and feedback to the nervous system, which in turn stimulates the genes responsible for synaptogenesis and neuroplasticity of the more complex areas of the brain. This ultimately results in enhanced long-range connections between the right and left hemispheres of the brain and in turn, increased synchronization and connectivity of large cortical networks.<sup>2</sup> The second phase of care involved increasing the difficulty of these exercises in order to further improve fine motor control.

The primary areas adjusted in the child were the cranial system, C2 and sacrum. A proposed hypothesis for the improvements noted in the child over the course of care is as follows: through enhancing craniosacral motion, reducing tension at the falx cerebri and tentorium cerebelli and reducing dural torsion, normal neurological transmission

was promoted, thus optimizing neurological function by promoting neuroplasticity through normalized sensory input. This leads to appropriate somatosensory filtering and processing as well as improved sensorimotor integration, ultimately resulting in accurate perception and motor planning, (normalized neurologic function).<sup>9,10</sup> It is possible that through this restoration of accurate sensorimotor integration and increased processing speed, the child's brain was able to more efficiently process and integrate stimulation from the prescribed exercises. This could ultimately result in normalized brain maturation through enhanced cortical connectivity and synchronization.<sup>2</sup>

A limitation of this, and all, case studies is that the conclusions are based on the outcomes of one individual; arguably the innate ability of neurological maturation and development due to natural progression may have ensued without the intervention of the adjustments. Due to the retrospective nature of the case study, subjective notes were not documented in fine detail on each visit, therefore incremental improvements were unobtainable and other details may have been overlooked. Performing additional case studies of similar patient symptoms, dyspraxia and associated developmental delays, may further illuminate the outcomes.

### Conclusion

This case study reports a possible association between chiropractic care and improvements in delayed development in a four-year-old child. Additional research is necessary to further understand the role chiropractors may play in caring for children with developmental delays.

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