



ELSEVIER

1  
2 **Case report**

3 **Applied kinesiology methods for a 10-year-old child with**  
4 **headaches, neck pain, asthma, and reading disabilities**

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98 Neck pain;  
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25 Applied

**Abstract**

**Objective:** The purpose of this case report is to describe the chiropractic care of a 10-year-old boy who presented with developmental delay syndromes, asthma, and chronic neck and head pain and to present an overview of his muscular imbalances during manual muscle testing evaluation that guided the interventions offered to this child.

**Clinical Features:** The child was a poor reader, suffered eye strain while reading, had poor memory for classroom material, and was unable to move easily from one line of text to another during reading. He was using 4 medications for the asthma but was still symptomatic during exercise.

**Intervention and Outcome:** Chiropractic care, using applied kinesiology, guided evaluation, and treatment. Following spinal and cranial treatment, the patient showed improvement in his reading ability, head and neck pain, and respiratory distress. His ability to read improved (in 3 weeks, after 5 treatments), performing at his own grade level. He has remained symptom free for 2 years.

**Conclusion:** The care provided to this patient seemed to help resolve his chronic musculoskeletal dysfunction and pain and improve his academic performance.

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36 **Introduction**

37 Developmental delay syndromes (DDSs) encompass  
38 the conditions known as dyspraxia, dyslexia, learning

disabilities, and attention-deficit/hyperactivity disorder. Over the past decade, there has been a dramatic increase in the number of DDS-related visits to health care providers. The percentage of children with severe behavioral and language problems is increasing.<sup>1</sup> A study by the US Department of Education stated that more than 50% of minority and nonminority children are not reading at their grade level.<sup>2</sup> With the increase of Ritalin use by 700% since 1990,<sup>3</sup> it may occur to parents of children suffering from DDS to consider chiropractic and other means of treatment.

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A recent case series suggests that a link may exist between motor impairments and DDSs in children. The muscle inhibitions found in 157 children with DDS were diagnosed using a manual muscle test protocol (MMT) developed in applied kinesiology (AK). Common psychometric tests used in the fields of educational psychology and special education were used pre- and posttreatment, revealing measurable improvements in cognitive function for 157 children with DDS between 6 and 13 years of age after the application of chiropractic treatments specified by AK.<sup>4</sup>

A growing body of research evidence has found that poor muscle tone is related to postural disorders, sensory-motor and coordination disorders, and kinaesthesia in children with DDS.<sup>5-7</sup> It has been shown that motor dyscoordination, especially affecting the postural and ocular muscles, is the most common comorbid condition associated with this spectrum of disorders.<sup>8</sup> Because motor dysfunction, and specifically muscular inhibition, has been found as a common comorbidity associated with DDS, a reliable clinical tool for the diagnosis of this muscular inhibition is desirable. Poor motor performance is most practically assessed, with good reliability and validity in the clinic using MMT.<sup>9-14</sup>

Applied kinesiology evaluates muscle function using MMT, a diagnostic test that has shown good reliability and validity for patients with muscle strength impairments. The use of MMT procedures is for 2 purposes in AK: to aid in the diagnoses of structural, chemical, and/or mental aspects of disease and to determine the effectiveness of treatments. In so doing, AK has been presumed to guide the therapeutic application itself.<sup>15,16</sup>

In AK, muscular dysfunction is thought to reflect neural function. First, Kendall et al<sup>17</sup> in the 1950s, then Goodheart<sup>18</sup> in the 1960s, followed by many others, have expanded the construct validity and the clinical usefulness of the MMT<sup>9-19</sup> because of the recognition that muscular imbalance is a key characteristic of spinal and articular dysfunction. Applied kinesiology is a diagnostic and therapeutic chiropractic technique that has gained peer-reviewed published support within the chiropractic, dental, biofeedback, acupuncture, veterinary, and other health care literature.<sup>20-27</sup> The theories underlying the AK manual muscle testing procedures as this relates to the treatment of children have been reported.<sup>4,28-31</sup> A recent narrative literature review by Pauli<sup>32</sup> presents the AK concepts and the clinical research articles regarding the treatment of children with DDS.

The purpose of this case report is to describe the chiropractic management of a child with DDS (slow

learning, reading disability, distractibility), complicated by neck pain, headaches, and asthma.

## Case report

A 10-year-old male elementary school student presented with a 3-year history of neck pain and headaches. At the author's request, the patient completed a pain drawing and a 1 to 10 numeric pain scale (NPS) of neck and head pain at his initial consultation. On the NPS, he rated his neck pain as 5 of 10 and headache as 5 of 10 at the time of his first appointment. When asked how many days a week he had the headaches, the patient replied "3 or 4 days out of the week."

Three years previous to his examination, while wrestling with his sister, the patient had tumbled backward while from the seated position a full 270°, landing on his chest and hyperflexing his neck. He experienced torticollis following this injury for 3 weeks. His mother and he agreed that his headache problem began at this time. Because he had a number of other chronic health issues, his torticollis and headaches were considered part of his usual health pattern; and no specific treatment was sought for these issues.

For the previous 4 years, the patient experienced episodes of severe occasional asthma exacerbated by exercise. The asthma symptoms were associated with nasal allergies and sinusitis symptoms. He had been prescribed albuterol, Flovent, Singulair, and Zyrtec by his pediatrician. These kept the asthma in check but were required daily and did not improve his ability to exercise without significant respiratory distress. He had not participated in organized sports for the past few years because he could not run and play without wheezing and bronchial restriction that forced him to use his medications. He had been to the emergency department 6 times previously for croup. He had eczema in the creases of his elbows and knees; he was modestly overweight, and his energy level was rated as low. Written informed consent was obtained from the patient's parents for publication of this case report.

A thorough battery of orthopedic and neurologic tests for the neck, spine, and pelvis was performed; and the test results were positive in the identical locations where pain was reported and muscle impairments were later found (Table 1). The positive orthopedic test results included Trendelenburg, Kemp, FABERE Patrick, Hibb, Soto-Hall, shoulder depression, and pain on palpation of the upper cervical facets.

t1.1 **Table 1** Manual muscle test results

t1.2		Strong	Weak
t1.3			
t1.4	Pectoralis (clavicular and sternal divisions)	XX	
t1.5	Deep neck flexors		XX
t1.6	Sternocleidomastoid (bilaterally)		XX
t1.7	Upper trapezius		XX (on right)
t1.8	Lower trapezius (bilaterally)		XX
t1.9	Cervical extensors (bilaterally)	XX	
t1.10	Biceps and triceps (bilaterally)	XX	
t1.11	Deltoid, serratus anticus, subscapularis, teres minor		XX (on right)
t1.12	Infraspinatus, supraspinatus, levator scapula, rhomboid, opponens pollicis, flexor digiti minimi brevis (bilaterally)	XX	
t1.13	Psoas (bilaterally)		XX
t1.14	Rectus femoris (seated)		XX (weakens with lumbar flexion)
t1.15	Tensor fascia lata (bilaterally)	XX	
t1.16	Left gluteus medius		XX
t1.17	Extensor hallucis (bilaterally)	XX	
t1.18	Flexor hallucis (bilaterally)	XX	
t1.19	Adductors (bilaterally)	XX	
t1.20	Piriformis		XX (on right only)
t1.21	Gluteus maximus (bilaterally)		XX
t1.22	Hamstrings (bilaterally)		XX
t1.23	Rectus abdominus		XX
t1.24	Posterior tibialis		XX
t1.25	Anterior tibial and peroneus longus and brevis	XX	

150 **AK examination**

151 Muscle tests were used to determine if there were  
 152 musculoskeletal impairments that could match the  
 153 patient's continuing subjective complaints. Positive  
 154 findings on MMT were used to guide interventions that  
 155 would move the muscle weakness toward strength. If  
 156 positive MMT findings were found, then the examina-  
 157 tion design continued to determine the cause of the  
 158 dysfunction and whether it could be improved. To  
 159 accomplish this, various sensory receptor stimuli were  
 160 applied to determine if the muscle dysfunction was  
 161 improved, indicating that the weakness was functional  
 162 in nature and had potential for improvement.

163 The muscle tests listed in this examination as strong  
 164 were equivalent to 5 on the 5-point strength scale  
 165 provided in the *Guides to the Evaluation of Permanent*  
 166 *Impairment, Fifth Edition*, by the American Medical  
 167 Association.<sup>33</sup> Grade 5 is normal muscle strength,  
 168 demonstrating a complete (100%) range of movement  
 169 against gravity, with firm resistance offered by the  
 170 practitioner. Grade 4 is 75% efficiency in achieving  
 171 range of motion against gravity, with slight resistance  
 172 and with decreasing increments of 25% efficiency with  
 173 each lower grade to a minimum of 0. Muscles graded 4  
 174 or less were considered weakened, warranting inter-  
 175 ventions as described below. Blood pressure sitting was

107/72, and pulse rate was 100; standing blood 176  
 pressure was 104/79, and pulse rate was 103. Stated 178  
 height was 4' 8", and weight was 115 lb. 179

Additional findings related to the MMT were that the 180  
 deep neck flexor, right upper trapezius, and sternoclei- 181  
 domastoid muscles strengthened with forced expiration 182  
 held. The AK ocular lock test showed disorganization 183  
 in the use of the extraocular eye muscles, indicating 184  
 neurologic disorganization of cranial nerves III, IV, and 185  
 VI. This test has been described in the literature<sup>4,34</sup> and 186  
 indicates that the eyes do not work together efficiently 187  
 and that, when the eyes are used in binocular vision, 188  
 they create weaknesses in postural muscles. In this 189  
 patient's case, when the eyes were turned in the left 190  
 inferior direction, previously strong indicator muscles 191  
 throughout the patient's body weakened. Saccadic 192  
 motion of the eyes was evident during movement of the 193  
 eyes through the left inferior cardinal field of gaze. 194

The patient was asked to read text that he had not 195  
 been exposed to before. He read this slowly; and after 196  
 the first few words but especially at the end of every 197  
 line of text as his eyes turned to the next line of text 198  
 below and left, previously strong indicator muscles 199  
 would weaken.<sup>4,34</sup> 200

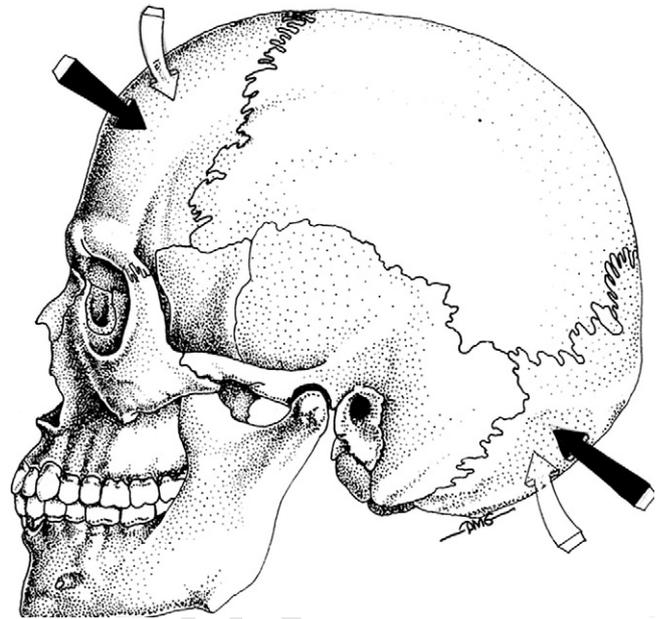
Hypertonicity in the upper cervical spine posterior 201  
 paraspinal muscles was palpable. Positive therapy 202  
 localization to the left temporomandibular joint 203

(TMJ) (but not the right) was elicited with clenching of the teeth. Therapy localization is a diagnostic procedure unique to AK that consists of placing the patient's hand over areas of suspected involvement and observing for a change in the MMT. This method is hypothesized to assist the doctor in finding areas that are involved with the muscle dysfunction found on MMT.<sup>18,35</sup> It is hypothesized that stimulating the skin and the cutaneomotor reflexes may produce changes in muscle function.

Helbing sign (indicative of foot pronation) was present in both feet, and the AK shock absorber test (SAT) result was positive on both feet (Fig 1). The SAT involves striking the foot in various directions and then assessing changes in muscle strength. The SAT has recently been found to be a reliable tool for the discovery of subluxations of the foot that create muscle weaknesses in the proximal leg muscles.<sup>36</sup>

The theories in AK assume that once the dysfunctional muscle has been identified, several treatment options should be considered. The one that appears to be most effective in restoring strength to the inhibited muscle (using the challenge and therapy localization test procedures) should be selected as a possible treatment for the patient.<sup>18,37</sup> Through this approach, ineffective therapies that produced no improvements in muscle strength were rejected; and only those that elicit a positive muscle response were used. These theories guided the treatment given to this patient.

Treatment began with an attempt to correct the causes of the muscular deficits found on examination.



**Fig 2.** In AK, the cranial challenge method involves an external pressure applied to the cranial bones and/or sutures.<sup>10</sup> Muscle testing procedures are then performed to determine a change in the muscle strength as a result of the stimulus.

Gentle cranial corrections were performed to return strength to the muscles of the neck and jaw that tested weak (Fig 2). A right inspiration assist and left expiration assist cranial fault correction to the temporal bones strengthened the sternocleidomastoid and deep neck flexor muscles to normal.<sup>37</sup> A right lateral sphenoid strain correction eliminated the positive



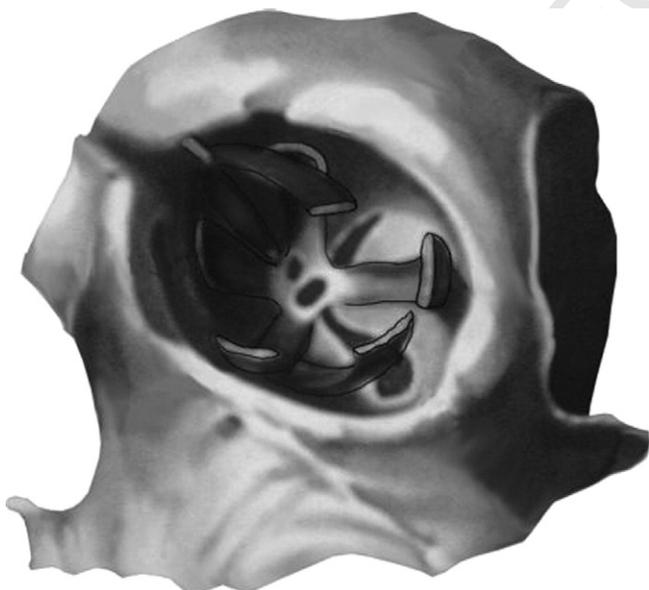
**Fig 1.** Shock absorber test. After striking the foot in various directions, the psoas major muscle will be tested. If the manual muscle test shows weakness in a previously strong muscle, then a foot dysfunction is indicated. After effective treatment to the foot, the SAT result should be negative.

263 ocular lock test result and eliminated the positive  
264 temporomandibular joint challenges<sup>4,34</sup> (Fig 3).

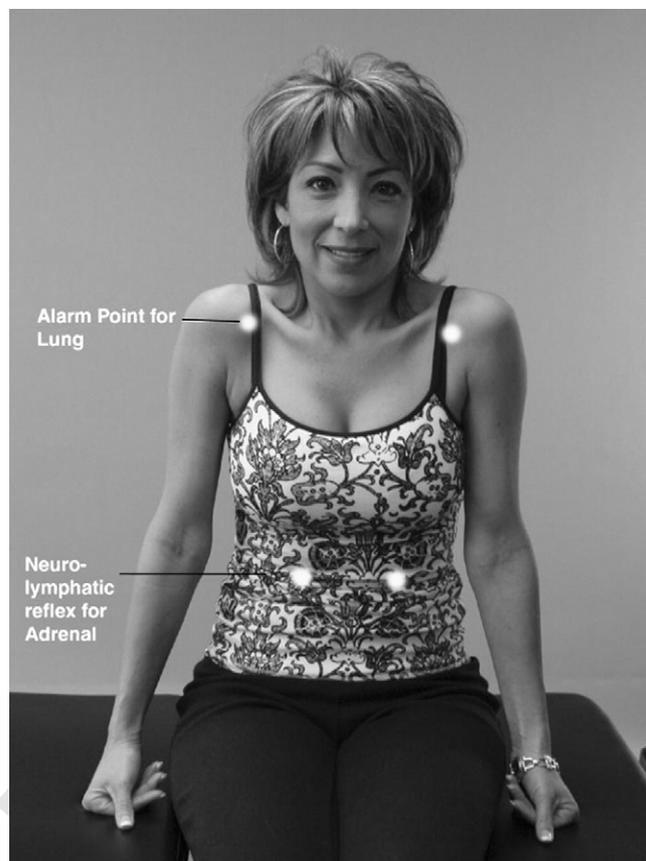
265 When the patient touched (therapy localized) the  
266 adrenal gland's neurolymphatic reflexes as well as the  
267 acupuncture area called *conception vessel 9* (a  
268 tonification point for the conception vessel meridian  
269 that is associated with the adrenal glands),<sup>18,37</sup> several  
270 previously weak indicator muscles strengthened; and  
271 several previously strong indicator muscles weakened.  
272 This finding suggested that these areas influenced a  
273 portion of this patient's problems. Insalivation of an  
274 adrenal support supplement immediately corrected  
275 this muscular finding and additionally improved pain  
276 on palpation of the adrenal neurolymphatic reflex  
277 points (Fig 4).

278 In addition, when the patient touched the alarm point  
279 for the lung below the clavicle medial to the apex of the  
280 coracoid process, there was immediate weakening of  
281 previously strong indicator muscles (Fig 4) (alarm  
282 points are diagnostic reflexes from traditional Chinese  
283 medicine related to the meridian system).<sup>38</sup>

284 A category II pelvic fault was found by challenge  
285 and corrected supine with DeJarnette blocks and prone  
286 using high-velocity, low-amplitude manipulation with  
287 a drop table. A left posterior occipital correction  
288 strengthened the gluteus medius and psoas muscles  
289 bilaterally and improved the cervical facet joint tension



**Fig 3.** Five of the 6 muscles that move the eye attach to the sphenoid bone. When the patient turned his eyes into the left inferior cardinal field of vision, muscles throughout his body weakened. Cranial manipulation to the sphenoid (in the direction determined by cranial challenge) eliminated this finding and also removed the saccadic motion of his eyes when he looked left inferior.



**Fig 4.** Location for the neurolymphatic reflexes to the adrenal glands and alarm points for the lungs. Pollard et al in a recent literature review have presented some of the research that underlies the AK concept of therapy localization.<sup>5-7</sup> Collectively, this research demonstrates that stimulating the skin can cause changes in muscle function.

on the left from C1 through C6. Bilateral deltoid, 320  
serratus anticus, subscapularis, and teres minor weak- 328  
nesses were strengthened with correction of T3 through 329  
T4 (which is also the associated point to the lungs in 330  
traditional Chinese medicine).<sup>38</sup> An upper cervical 331  
fixation correction was still required to strengthen the 332  
gluteus maximus muscles, which were weak bilaterally. 333

Treatment of the foot was accomplished with high- 334  
velocity, low-amplitude manipulations. The direction 335  
of misalignment and corrective manipulation was 336  
guided by the AK challenge method. These corrections 337  
abolished the muscle weaknesses in the legs resulting 338  
from the SAT and all subsequent directions of 339  
challenge to the foot. 340

Ocular lock testing and the saccadic motion of the 341  
eyes in the inferior left cardinal field of vision no longer 342  
caused any muscle weakness. The patient was also able 343  
to read text that was unfamiliar to him without this 344  
causing indicator muscles to weaken. Provocative test 345  
results at the cervical articulations were now negative. 346

This suggested that the causative factors for a portion of the head, neck, and visual dysfunction had been found and corrected using AK structural methods. Cranial corrections not only improved the visual tracking tests for the eyes but also strengthened the cervical flexor and extensor muscles and thereby reduced the tension in the upper cervical extensor muscles.

The patient reported that, at the end of his first treatment, his headache was gone. Over the next 10 days (3 visits), the headaches remained at the NPS level of 1 in the suboccipital area only. After 5 visits (covering a 3-week period), all of his symptomatology was resolved with the score of "0 of 10" on the head and neck NPS.

The patient discontinued his asthma medications with no return of respiratory symptoms. He was now running with his classmates and playing sports.

His performance in school was dramatically improved; and his mother, teachers, school nurse, and pediatrician reported how his scholastic performance, comprehension in reading, and physical endurance had gone from low average to above average. Report cards for the previous 2 years before treatment were acquired; and a grade point average of D and C grades was present, with the lowest grades in math and reading and no grade above a C. In the 2 years following treatment, his report cards showed that his grade point average went up to B and A levels, with no grade below a B; and his reading and math scores were A and B, respectively.

The patient has remained free of the head and neck symptoms; his asthma is no longer a problem; and his performance in school has remained above average since his first series of 5 initial treatments 2 years ago.

## Discussion

In this case, the muscular impairments associated with the pain appeared to be an accurate measurement of the distress the patient was under. Treatment for these factors eliminated the patient's pain and restored his postural and muscular balance. In AK, the assessment became treatment in that muscular inhibitions found with the MMT were given specific physical challenges that improved the patient's muscular strength; these challenges guided the manipulative treatment applied and normalized tissue tensions on follow-up MMT.

*Insalivation* refers to the fact that the taste buds on the tongue can detect extremely small concentrations of substances within a fraction of a second of stimula-

tion.<sup>39</sup> Oral nutrient evaluations are used in AK because they are clinically useful in the assessment process. Exposure to taste elicits a variety of neurologic, muscular, digestive, endocrine, cardiovascular, thermogenic, and renal responses.<sup>40</sup> The relationships between muscle function and specific nutritional deficiencies have been presented by Travell and Simons,<sup>41</sup> and biological plausibility of muscle and nutrient interactions is based on these rationales.

The nerve pathways causing change in muscle function as observed by MMT are still unclear; however, there is considerable evidence in the literature of extensive efferent function throughout the body from stimulation of the gustatory and olfactory receptors with actual insalivation<sup>39</sup> rather than merely the contact of a substance with the hand or belly as often taught and erroneously labeled AK to practitioners.<sup>42</sup>

Insalivation of choline (a component of the neurotransmitter acetylcholine) corrected this finding. The use of choline for exercise-induced asthma (EIA) has good evidence for efficacy.<sup>43,44</sup> This patient suffered from EIA; and *EIA* is defined as a bronchial constriction and a decrease in airflow that is triggered by exercise with symptoms of chest tightness, coughing, wheezing, and difficulty breathing.<sup>45</sup> A number of recent published reports have demonstrated the effectiveness of the AK system of analysis for acupuncture system dysfunctions.<sup>46-48</sup>

The treatments did not deal directly with the craniosacral system, nor did they appear to evaluate adequately the sensory input into the nervous system from the musculoskeletal and viscerosomatic system (adrenal glands and lungs). Applied kinesiology theory suggests that to resolve biomechanical, biochemical, psychosocial, and sensory problems, many areas of the body must be examined and corrected to achieve long-lasting symptomatic relief. This global view of integrated biomechanics and neurophysiology is one that may distinguish chiropractic practice from that of many of the other manipulative therapy professions.

## Limitations

Limitations to this study were that standardized asthma outcome scores, including peak expiratory flow rates,<sup>49</sup> daily  $\beta$ -2 inhaler use, depression anxiety stress scales,<sup>50</sup> and cortisol levels, were not recorded in this particular patient. Other objective measures such as reading test scores and headache pain diaries were not included. As in any case study, the natural resolution of symptoms in the patient cannot be ruled out. It is possible

444 that the patient's symptoms resolved on their own at the  
445 same time that the treatment was being rendered.

## 446 Conclusion

447 After 3 years of neck pain and headaches and 4 years  
448 of asthma, reading difficulty, and learning disability,  
449 this patient's symptoms resolved. The patient has  
450 remained free of symptoms in these areas of difficulty  
451 for 2 years since his initial treatments.

## 452 Funding sources and potential conflicts 453 of interest

454 The authors are associated with the nonprofit entity  
455 the International College of Applied Kinesiology–USA.  
456 Scott Cuthbert serves on the Board of Directors and  
457 Anthony Rosner is hired as a research consultant for the  
458 International College of Applied Kinesiology–USA.

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