Case Reports

Developmental Delay Syndromes: Psychometric Testing Before and After Chiropractic Treatment of 157 Children

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Abstract

Objective: This study presents a case series of 157 children with developmental delay syndromes, including the conditions such as dyspraxia, dyslexia, attention-deficit hyperactivity disorder, and learning disabilities who received chiropractic care.
Clinical Features: A consecutive sample of 157 children aged 6 to 13 years (86 boys and 71 girls) with difficulties in reading, learning, social interaction, and school performance who met these inclusion criteria were included.
Intervention and Outcomes: Each patient received a multimodal chiropractic treatment protocol, applied kinesiology chiropractic technique. The outcome measures were a series of 8 standardized psychometric tests given to the children by a certified speech therapist pre- and posttreatment, which evaluate 20 separate areas of cognitive function, including patient- or parent-reported improvements in school performance, social interaction, and sporting activities. Individual and group data showed that at the end of treatment, the 157 children showed improvements in the 8 psychometric tests and 20 areas of cognitive function compared with their values before treatment. Their ability to concentrate, maintain focus and attention, and control impulsivity and their performance at home and school improved.
Conclusions: This report suggests that a multimodal chiropractic method that assesses and treats motor dysfunction reduced symptoms and enhanced the cognitive performance in this group of children. (J Manipulative Physiol Ther 2009;32:660-669)
Key Indexing Terms: *Chiropractic; Developmental Delay Disorder; Apraxias; Dyslexia; Learning Disorders*

Chiropractic treatment of developmental delay syndromes (DDSs), a term that encompasses conditions such as dyspraxia, dyslexia, learning disabilities, and attention-deficit hyperactivity disorder (ADHD), has shown some interest.[1] The need for more observational and experimental studies in this area has also been pointed out.[2]

It has been shown that motor discoordination, especially affecting the postural and ocular muscles, is a common comorbid condition associated with this spectrum of disorders.[3-7]

At this time, DDSs are thought to have multifactorial etiologies.[3,4,8-11] The epidemiologic prevalence of these disturbances has been estimated to be as high as 5% to 20% (depending on a conservative definition).[10,11]

Over the past decade, there has been an increase in the number of DDS-related visits to health care providers, and the percentage of children with severe behavioral and language problems is increasing.[12] 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.[13] With the increase of methylphenidate use by 700% since 1990,[14] and because last year, doctors in the United States wrote an estimated 20 million prescriptions for methylphenidate, it is obvious why parents and children with DDS come to chiropractors and other physicians for help.

In a survey of children with DDS (specifically ADHD), 67.6% of families reported current or past use of complementary and alternative medicine to manage this condition, including chiropractic, modified diet, and vitamins, minerals, and dietary supplements.[15] The natural history of DDS is also a challenge. Medications are often used for these children, but these medications do not necessarily normalize these children's function.[16] In children treated pharmacologically, subtle and not-so-subtle neurocognitive impairments often persist into adulthood.[16-19] Problems with DDS are likely to affect employment status, educational achievements, health care consumption, traffic and other accidents, and criminality.

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A growing body of research evidence has found that poor muscle tone is related to postural disorders, sensory-motor and coordination disorders, and kinesthesia in children with DDS.[3-5,20-22] Although it has been fairly well known that attention deficit disorder and ADHD, for instance, are comorbid with other psychiatric disorders, what is less well known and more significant to the present study is the association between ADHD and motor control dysfunctions, or what has been termed *developmental coordination disorder* or *dyspraxia*.[3-5,21,22]

Because motor and cognitive functions often coexist, this study was undertaken to investigate whether chiropractic assessment and treatment of motor impairments in 157 children with DDS would have positive effects upon their cognitive performance. We used widely accepted and standardized assessment tools from the educational psychology and logopedic (speech therapy) fields. This report offers a standardized, quantitative data collection system for a consecutive sample of 157 children with DDS.

Clinical Features

Patients

The inclusion criteria for the cases included in this report were that each child tested positive for DDS after undergoing psychometric testing by a qualified logopedist (a speech therapist) on their initial examination while in school or earlier, and that each child had a documented history of learning, behavioral, reading, and/or performance impairments for his age group. Logopedists are university-trained speech therapists or orthophonists. They are specialists in various corrective treatments for the problems associated with DDS in children. The logopedist who evaluated these children was employed only for conducting the psychometric testing on the children and provided no treatment.

A consecutive sample of 157 patients (86 male, 71 female) between 6 and 13 years old was obtained from a group of young patients brought in by their parents for chiropractic care between January 1993 to February 2007 in Lausanne, Switzerland. The child and the parents were asked to provide detailed diaries to the logopedist to help document the status of the child before treatment began. Informed written consent was obtained from the subject or legal guardian after the procedure(s) of the treatment had been fully explained.

Because there are no "gold standards" in the literature to evaluate the effect of treatment upon children with DDS besides symptomatic remission and functional restoration,[17,18] in each case, the child was treated until their particular presenting problem (identified in the detailed history, questionnaire, and patient diary) was resolved. The timing of the posttreatment psychometric testing also correlated in every case with substantial improvements in the applied kinesiology (AK) examination findings for those factors believed to be causing the DDS in the child. At posttreatment, the identical battery of psychometric tests were given to the child. Eight different neuropsychologic and neurophysiologic tests were used in this study, which were derived from screening instruments that have been shown to identify DDS in children of various ages.[23-33] These psychometric tests assess a total of 20 different cognitive functions that will be described. Each of the tests used have normative values for given populations of a certain age, and the values for the children in this study pre- and posttreatment are compared. The child and the parents were asked to provide detailed diaries to the logopedist on the posttreatment examination and to describe any specific improvements in the child's behavior, school, and family functions.

Psychometric Tests

A number of other reports from diverse fields studying children with DDS (hyperactivity, ADHD, dyslexia, dyspraxia, and learning disabilities) have used psychometric testing of motor coordination such as balancing, copying, writing, maze tracing, and pursuit tracking and shown that these children have more difficulties with these tests.[34-36] The full battery of tests requires approximately 1 hour to complete.

Psychometric tests were originally devised as methods for assessing complex functions of intellect and behavior.[34] They aid in the differential diagnosis of different kinds of mental and behavioral disturbances. These 8 tests evaluate the child's ability to adequately perceive, organize, and act upon sensory stimuli (spatial organization and orientation, right-left perception, visual and auditory perception, graphoperceptive organization, and temporal orientation).

1. *Complex figure of Rey test.* Visual perception and memory, spatial orientation and organization, and the time required for copying a complex geometric figure were assessed using the complex figure of Rey test.[23-25] This test is a commonly used neuropsychologic measure that assesses visual learning and memory. Normative data for different age groups have been compiled.[25] When assessing an individual suspected of neurologic dysfunction, useful comparisons include the extent to which the patient deviates from healthy peers and how closely the subject's performance matches those with known brain injury.
2. *Borel-Maisonny test (logatomes).* Phonological analysis and memorization, and auditory-verbal perception were assessed using the Borel-Maisonny language test. The test involves repeating a series of words without particular meaning or significance.[26]
3. *Porteus maze test.* Motor and graphic planning was assessed using the Porteus maze test. Graphomotricity helps children achieve the basic movements that are a part of letter writing. This test evaluates graphomotricity by asking the child to follow labyrinths of