Forces of Commonly Used Chiropractic Techniques for Children: A Review of the Literature

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Abstract

Objective: The purpose of this study is to review the available literature that describes forces of the most commonly used chiropractic techniques for children.

Methods: Review of the English-language literature using search terms Chiropract* and technique, protocol, or approach in databases PubMed, Cumulative Index to Nursing and Allied Health Literature, Allied and Complementary Medicine, and Index to Chiropractic Literature and direct contact with authors of articles and book chapters.

Results: Eleven articles that discussed the 7 most commonly used pediatric chiropractic techniques and the forces applied were identified. Chiropractic techniques reviewed described forces that were modified based on the age of the patient. Force data for mechanically assisted devices were varied, with the minimum force settings for some devices outside the age-specific safe range recommended in the literature when not modified in some way.

Conclusion: This review found that technique selection and application by chiropractors treating infants and young children are typically modified in force and speed to suit the age and development of the child. (J Manipulative Physiol Ther 2016;xx:1-10)

Key Indexing Terms: *Chiropractic Manipulation; Children; Review of Literature*

Introduction

More than 30 million child visits to doctors of chiropractic occur in the United States every year.[1] It is estimated that more than 19.1 million chiropractic visits occur in Australia annually[2] and other studies estimate that 8.6% of all visits are from children.[3] By combining these two studies findings, we can estimate that in excess of 1.6 million child visits occur in Australia every year. Given this estimate, the published cases of serious adverse events in infants and children receiving chiropractic or other types of manual therapy are exceedingly rare,[4–6] and there have been no cases of death associated with chiropractic care of children reported in the academic literature to date.[4–6] Nonetheless, studies of the amount of force used on children for safety purposes should still be considered.

In Australia and the United States, chiropractic students undertake extensive theoretical and practical training at the university level, including study of and experience with the pediatric population.[7] Chiropractors are trained to perform a thorough history and examination to determine whether chiropractic care is appropriate and identify a suitable technique, given the age and neurologic presentation of the child. Chiropractors have a range of techniques available to them and can modify these to suit the age and condition of the patient. The process of selecting one type of chiropractic technique over another is based on many factors, including the techniques the practitioner is clinically experienced in applying and the perceived effectiveness of each, as well as the practitioner's understanding of the biological plausibility of using a particular therapy and the associated research evidence base.[8] It should be noted that health professionals of all types face the same considerations when determining appropriate treatment approaches.[9–11]

Data from the National Board of Chiropractic Examiners identified that three-quarters of chiropractors use traditional styles of chiropractic spinal manipulation (diversified or Gonstead technique) and more than half use an Activator instrument or the sacro-occcipital technique (SOT).[12] Although these data are not age specific, a 2010 cross-sectional

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survey of 135 chiropractors with pediatric diplomate qualifications in the United States[13] revealed that reduced-force diversified technique (spinal manipulative technique that has been modified to be lower force and amplitude) was used by 59% of pediatric chiropractors; 63% reported using an Activator instrument, 59% a drop-section table, and 77% cranial therapy. In addition, this study found that cranial and Activator techniques were used mainly for children 5 years and younger, and that modified diversified, Activator, and drop-section table adjustments were used on older children. The Activator instrument, SOT, toggle, touch and hold, and modified spinal manipulative therapy (SMT) were typically used by chiropractors for restoring joint and neurologic function,[14] and particularly in children to reduce neck pain, back pain, and joint stiffness.[13]

Given the diversity of styles of chiropractic manipulation, there are currently no peer-reviewed articles that review the amount of force used in commonly used pediatric manipulation techniques. Therefore, the purpose of this study is to review the available literature that describes forces of the most commonly used chiropractic techniques for children.

Methods

The academic literature was initially searched in PubMed, Cumulative Index to Nursing and Allied Health Literature, Allied and Complementary Medicine, and Index to Chiropractic Literature with a broad strategy, using the term *chiropract** combined with the terms (*technique* OR *protocol* OR *approach*) in a "full-text" or "all-fields" search. All records published in English were screened for information about the force used in the application of any manual therapy technique. After initial removal of duplicates, practice guidelines, and non–peer-reviewed items (eg, commentaries and letters), there were further exclusions, including case reports and articles where neither the title nor abstract indicated specific discussion of technique application.

A second round of technique-specific searches was also conducted. The terms (*force* OR *thrust*) were combined in individual full-text or all-fields searches with each of "*spinal manipulation*," "*adjusting instrument*," ("*sacro-occipital technique*," OR "*craniosacral therapy*"), "*toggle*," "*touch and hold*," and ("*Thompson technique*" OR "*drop piece*"). Records were screened as for the initial search (Fig 1).

A manual review of the reference lists of included articles was undertaken along with contact with authors to identify articles that were more recent.

Results

The initial search captured 1796 potential articles, of which 54 full-text articles were reviewed. This search identified 2 articles by Marchand,[15,16] which when references were hand searched yielded 3 more articles, by Koch et al[17,18] and Snodgrass et al.[19] Searching of the literature using technique-specific search terms resulted in the inclusion of a further 4 studies[16,20–22] and 1 textbook source,[23] with an additional in-press journal article yielding direct contact with the author[24] (Table 1).

Spinal Manipulative Therapy

Spinal manipulation has been defined as the application of a precisely controlled high-velocity, low-amplitude (HVLA) thrust to a joint, causing tissue deformation of the spine and surrounding tissue. The thrust is designed to restore motion in the targeted joint by applying force to the area of segmental restricted motion.[15,26]

Chiropractors in Europe were surveyed about their practice techniques for children,[25] resulting in the following guidelines for pediatric chiropractic, identifying 4 grades of therapeutic input for the application of pediatric SMT for different age groups[15]:

Grade 1: neonates and infants aged 0 to 2 months (low force, low speed) at 10% of estimated force for adults (equivalent to 11.2 N)
Grade 2: infants and toddlers aged 3 to 23 months (low force, low speed) at 30% of estimated force for adults (equivalent to 33.6 N)
Grade 3: young children aged 2 years to 8 years or younger (moderate force, moderate speed) at 50% of estimated adult force (equivalent to 56 N)
Grade 4: older children and young adults aged 8 to 18 years (moderate force, high speed) at 80% of estimated adult force (equivalent to 89.6 N)

A similar set of guidelines for different age groups has been developed by Marchand,[15] drawing on findings from an extensive study of tensile strength and osteoligamentous failure rates in pediatric spines as well as a report of transient bradycardia and apnea events that occurred with thrusts of 50 N to 70 N in infants younger than 3 months.[18] Marchand[15] has recommended that SMT be applied at a maximum cervical loading of 20 N for neonates, 50 N for children aged 2 to 23 months, 85 N for children aged 2 to 8 years, 135 N for 8- to 18-year-olds, and 155 N for adults to prevent possible adverse physiological reactions caused by any inappropriate level of force. The report of transient events occurring in infants as a result of thrusts in the 50 N to 70 N range comes from research measured by Koch and Girnus.[27] The measurements involved resting the force plate on the inside of the investigator's thigh (Fig 2c) in an attempt to simulate a manipulation on an infant, with the thrusts repeated 50 times. The range of forces was between 50 N and 70 N, with 1 outlier thrust of 30 N. No infants were involved in the measurement of these thrusts. The