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Case Report Components

- **Introduction:** State why this case is unusual or important.
- **Methods:** describe the search engine and key words used to review previously published literature on the subject
- **Case presentation:** Provide a brief summary of the pa-

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- **Intervention and outcomes:** Describe the course of treatment, including frequency and duration, and summarize the patient's clinical outcomes, using recognized outcome measures if possible. Include whether informed consent was obtained and if there were any adverse events reported.

- **Discussion:** Succinctly state the important aspects of the case, in terms of its implications for patient care in general, or for specific patient populations or conditions. You may also compare/contrast the case to other cases in the published literature. Be cautious about overstating the importance/implications of your case.

Evidence-based Case Report Instructions

An Evidence-based Case Report (EBCR) is NOT the same as a traditional case report. The EBCR focuses on an answerable clinical question, how it was explored in the search, appraising the results and how it applies to the case, along with the integration of this information with the patient interaction. The final stage in this process is to audit the results.

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- Explain your search for evidence (key words, databases used, number of articles retrieved): 50-100 words
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- Evaluate your performance: 50-100 words

1. Heneghan C, Badenoch D. *Evidence-based Medicine Toolkit*, 2nd ed. Oxford, UK: Blackwell Publishing, 2006.

<http://onlinelibrary.wiley.com/doi/10.1002/9780470750605.index/summary> (download pdf of "all chapters" for free copy of the publication)

2. Jones-Harris AR. The evidence-based case report: a resource pack for chiropractors. *Clin Chiropr* 2003;6 73-84. (download for free from www.chiro.org/cases/FULL/Evidence-based_Case_Report.pdf)

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Review an example of an EBCR at:

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Iran J Pediatr. 2010 Sep; 20(3): 261—268. Evidence Based Medicine in Pediatric Practice: Brief Review

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J Can Chiropr Assoc. 2014 March; 58(1): 6—7. **Evidence-based case reports**

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<http://ebm.bmj.com/content/7/3/68>

“Chiropractic Spinal Manipulation of Children under 12”: Safer Care Victoria’s independent review

By Cheryl Hawk, DC, PhD, CHES, Editor and Sharon A. Vallone, DC, DICCP, FICCP, Editor

In August of 2018, the Minister of Health for the State of Victoria in Australia commissioned an independent review of spinal manipulation in children. This commission was the result of video footage of a chiropractor treating an infant that appeared in social media. The review, “Chiropractic Spinal Manipulation of Children under 12: Independent Review” was published in October 2019 and is available at <http://bit.ly/SCVpaediatric>. The World Federation of Chiropractic (WFC) published a report November 1, 2019, that summarized the review and is available at the WFC [website](#).

The review’s findings were based on a systematic review of the evidence on both safety and effectiveness by Cochrane Australia and online interviews with parents and practitioners.

Spinal manipulation was defined, for this review, as “any technique delivered by any health professional that involves a high velocity, low amplitude thrust beyond the physiological range of motion, impacting the spine, within the limits of anatomical integrity.”^{1,p.2}

Safety

The review reported that its “extensive search identified very little evidence of patient harm occurring in Australia. In particular, there were no patient complaints or practitioner notifications that arose from significant harm to a child following spinal manipulation.”^{1,p.3}

The scarcity of any evidence of harm was attributed to the fact that chiropractors rarely use spinal manipulation, as defined for the review, for children younger than two years and modify their manipulative techniques to avoid high-velocity, low-amplitude thrust techniques.

Effectiveness

The Cochrane review included 13 studies which addressed chiropractic treatment of children with these conditions: colic, enuresis, back/neck pain, headache, asthma, otitis media, cerebral palsy, hyperactivity and torticollis. The conclusion was that there was little evidence for spinal manipulation for any of these conditions, although there was unclear but favorable evidence for spinal manipulation possibly decreasing crying time (colic) and wet nights (enuresis).

Public opinion

In contrast to the conclusions of the Cochrane review, which

only considers the highest quality evidence—and in this case was restricted to a very short list of studies—99.7% of the 21,824 general public parents who had used chiropractic care for children reported that their experience was positive, with 98% reporting that symptoms had improved. The 0.3% whose experience was negative experience listed the main reasons for this as cost, excessive x-ray use, perceived pressure to avoid medications or other health professionals. Parents strongly expressed their right to choose their children’s care. They most commonly reported seeking care for their children for:

- Posture
- Colic
- Neck pain
- Breastfeeding issues
- Back pain
- Headache

Chiropractic practitioners

Of the 2315 Australian DCs who responded to the online interviews, 80% treat infants aged 0-3 months and 88% children aged 0-24 months.

With respect to outcomes of care, it is noteworthy that the DC respondents did not express outcomes in terms of condition resolution (“cure”). Instead, they reported functional improvement, with the most commonly reported positive outcomes in child patients being (in order of frequency): *pain relief, improved sleep quality, more relaxation, better feeding/latching, and improved mobility.*

Take-home messages

Everyone agrees that chiropractic care is low risk.

This is a welcome message to the public and to any practitioners who care for children! In this, there is no dissonance among public, practitioner and research opinions and conclusions. Of course, *low risk* is not *no risk*, and so risks and benefits must be weighed. It appears that the public weighs the benefits higher than the risks, but the public health experts do not—and therefore recommend against wellness care for children.

There is a gap between the findings of the Cochrane review and the perceptions of chiropractic patients and practitioners in terms of effectiveness.

The reason for this gap may be in large part due to the reality of the chiropractic clinical encounter, which is not exclusively spinal manipulation. Chiropractors also

provide positive support to parents and children; diet, exercise and lifestyle advice; a high-touch approach (which is therapeutic in its own right)—along with various types of spinal manipulation and mobilization. We don't know whether one of these factors is effective on its own; it may be that the unique combination is what “works.” On the other hand, randomized controlled trials, the “gold standard” of research, require that an “active” intervention be isolated as much as possible from every other aspect of the clinical encounter—which is quite likely why patients and parents experiencing real-life chiropractic practice report much more positive outcomes than are found in highly controlled and highly artificial research settings.

Another factor may be that a very basic premise of chiropractic practice differs from that of biomedicine: chiropractic focuses on a *patient* whose function is suboptimal, rather than on curing a *disease*. Thus an infant who has colic or a child with asthma would not be treated for a disease; the practitioner would assess him or her for musculoskeletal restrictions and use manual techniques to correct them. Consequently, the treatment might be different for different children. Again, this makes it difficult to conduct a highly controlled experimental study in which

all patients must have the same treatment.

Conclusion

We as chiropractors should endeavor to continue providing the highest standard of safety to all our patients, including children, and follow “best practices,” which include attention to the best available scientific evidence, to do so.²⁻⁵ We should also be honest and cautious in making claims about “treating” specific diseases or conditions and “curing” them. Science hasn't advanced enough to determine exactly which elements of the clinical encounter are most important in helping infants and children function more optimally—and it's quite likely that it is a combination of many of these elements. Until it does, we need to continue to guard young patients' safety above all else, and continue to provide high-touch manual care to improve their ability to achieve optimal function.

Our responsibilities are to our young patients, to follow the tenets of integrating best evidence with best clinical practices and continuing to support those in our field who are designing and developing research protocols and data collection to help support our outcomes with an evidence base.

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Is there an effect of positional plagiocephaly on neurodevelopmental delay in infants and toddlers?

By Mike Marinus MSc (Paeds) (M.Tech Chiro)

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ABSTRACT

Objective: Since the Back to Sleep campaign in 1992, the incidence of positional plagiocephaly continues to increase substantially. A body of work is emerging linking positional plagiocephaly to neurodevelopmental delay, including data that reveals a physical shift in brain parenchyma in response to skull asymmetry. This review assesses the nature of the relationship between these neurodevelopmental delays and positional plagiocephaly. **Method:** A literature search was required to answer the clinical question. Pubmed, Medline and The Cochrane Library were searched using the mesh terms: 'plagiocephaly, nonsynostotic' and 'growth and development' in conjunction with the terms: 'neurodevelopmental delay', 'development' and 'delay'. After the relevant inclusion and exclusion criteria were applied, 12 studies were reviewed. **Results:** Positional plagiocephaly has shown a defined link to neurodevelopmental delay in infants. The effect is seen more prominently in motor skills during infancy and the delay has been noted to extend into preschool age children. Plagiocephaly patients are more likely to have altered muscle tone. No correlation was seen between the severity of the skull asymmetry and the level of neurodevelopmental delay experienced by the child. **Conclusion:** The data suggest correlation but not necessarily causation. It is also possible that pre-existing neurodevelopmental delay may be the cause of positional plagiocephaly. In most cases it is likely to be a combination of the risk factors of supine sleep, lack of prone awake time, variable muscle tone, low activity levels, male gender and neck muscle dysfunction that attributes to the delays that have been recognized in these infants.

Key words: Positional Plagiocephaly, neurodevelopmental delay, Chiropractic, Pediatric.

Introduction

Chiropractors are involved in the diagnosis and treatment of neuromusculoskeletal disorders affecting the pediatric population, and as such may note varying degrees of skull deformity in infants during the physical examination. There are anecdotal findings which suggest this is widespread and that it generally responds well to conservative care. However, apart from the more obvious cosmetic concerns, many parents and practitioners are becoming concerned about the developmental challenges these children may face in their future.

A case in point was a mother who reported to the chiropractor that her 8-week old infant would only look to his right hand side when placed supine. She presented photographs she had taken of her child's head shape over the preceding weeks and explained that she was worried that the progressive flattening was escalating. From the physical examination as well as the photographic evidence, it was clear that her child was developing a unilateral flattening of the right occipital bone with associated right sided frontal bossing and facial asymmetry.

Although the cosmetic effect was discussed, being an occupational therapist herself, the mother's concern lay chiefly

with possible developmental delay associated with this condition and if the severity of the deformation related to the level of delay her child may face.

The clinical question became: "Is positional plagiocephaly associated with neurodevelopmental delay in infants and toddlers?"

Background

The term plagiocephaly derives from the Greek words 'Plagios' meaning oblique and 'Kephale' meaning head.¹ The literature divides plagiocephaly into two distinct subgroups: synostotic and non-synostotic.^{2,3,4}

Synostosis, a congenital condition involving the premature fusion of one or more cranial sutures, has an incidence of 3.5 -4.5 per 10 000 live births world-wide.⁵ Although the pathogenesis is not well understood, it is believed to be related to abnormalities of the osteoprogenitor cells within the cranial sutures themselves.⁶

Non-synostotic skull asymmetry is a subgroup in which the infant skull shape and symmetry are measurably abnormal yet their cranial sutures are apparent, normal and exhibit no early signs of fusion as in the synostotic group.⁷ The in-

cidence of this group has been measured as slightly under 20% within the population, it peaks at four months and decreases to around 3.3% at two years of age.⁸ The hallmark of non-synostotic skull asymmetries is that they develop as a result of uneven mechanical pressures being applied to the cranial bones of the infant skull.⁹

Flexible sutures and malleable cranial bones are required during birth to allow the human head to navigate the birth canal and also through the first seven months of life as it is during this rapid growth period that the infant's cerebellar volume doubles.¹⁰ However, it is this same mobility and plasticity within the structures of the infant cranium that allow for deformation if compressed, for instance, against mother's pelvic rim or lumbosacral spine during the last months of intrauterine life.¹¹ The cranium may also be affected by uneven pressures associated with the birthing process or positional stress in the postnatal period.⁷ However, asymmetries occurring during the intrauterine period, or perinatally tend to reduce spontaneously in children without impaired motor delay¹² and so the diagnosis of positional plagiocephaly (PP) can only be applied from the sixth week of life.^{10,12}

The typical presentation of infant PP includes unilateral occipital flattening with associated anterior translation of the ipsilateral ear, cheek and ipsilateral frontal bossing resulting in a parallelogram shape, with the head shifted forward on the side of occipital compression.¹³ Other presentations of skull asymmetries include brachycephaly, a bilaterally flattened occiput resulting in a short skull anterior to posterior¹⁰ and scaphocephaly, with a head shape resembling an inverted boat with a keel elongated anterior to posterior.¹⁴

PP has become the most frequent condition presenting to craniofacial clinics¹⁵ and is counted as the leading cause of skull asymmetries in infants.¹⁶ A major causative factor, has been the enforced supine sleep protocol prescribed by the Back to Sleep campaign initiated in 1992 by the American Association of Pediatricians in a relatively successful bid to curb cases of sudden infant death syndrome.^{15,17} An unintended consequence of the campaign has been unremitting, constant pressure on the occiputs of sleeping children leading to a six-fold increase of PP cases with almost 50% of western infants observed to have some degree of skull deformity.¹

Previous authors have labelled PP as purely cosmetic,⁷ yet a growing body of work suggests the possibility of neurodevelopmental impact on these infants.^{9,11,18} There is limited information however as to the effect the severity of the PP plays in these delays.¹⁹ Evidence does exist to suggest that cortical structures can 'shift' in response to PP deformities⁹ revealing findings of a shortened corpus callosum and a greater height and height-width ratio of the cerebellar ver-

mis seen in PP cases. Although these cortical aberrations have been observed, it is not understood if they would have any functional effects on the neurodevelopment of these infants.

Method

The electronic databases Pubmed, Medline and The Cochrane Library were searched. The two Mesh terms: 'plagiocephaly, nonsynostotic' and 'growth and development' were searched with the Boolean operator 'AND'. The following searches cross referenced 'plagiocephaly, nonsynostotic' with 'neurodevelopmental delay', 'development' and 'delay'. Studies were included if they were conducted in English and involved human subjects only. Studies were excluded if they involved cases of synostosis, other congenital anomalies or involved otherwise ill infants. Studies conducted prior to 1992 were disregarded as those subjects would not have been under the influence of the Back to Sleep campaign. To be of sufficient quality to be included in the review, studies had to make use of a validated scale when assessing developmental delay. As there is no one validated measure of head circumference, all types of reliable measurement were included. Case studies were not included and trials had to involve more than 20 subjects. The initial database search yielded 40 articles with five others obtained through hand searches. Duplicates were removed and records were screened for their content leaving a remainder of 23. These articles had their full text assessed leading to resulting in 12 studies being included for review. See Figure 1.

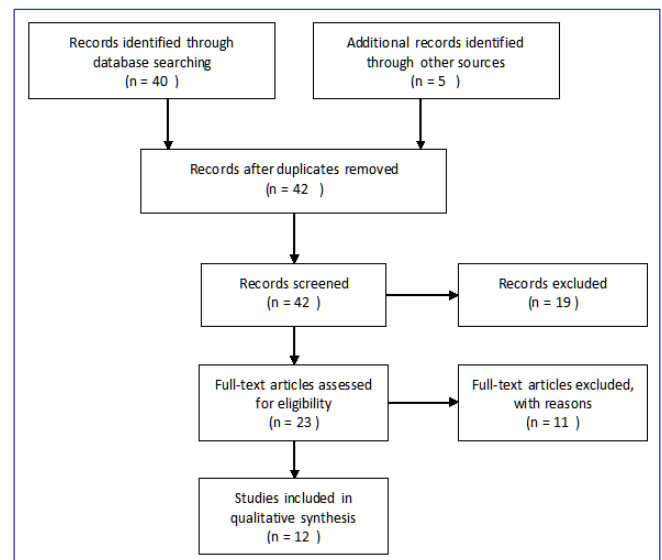


Figure 1: Flow chart of article identification process.

Results

The results are tabulated in Table 1. Regarding exposure measures, anthropometric (manual) two dimensional mea-

Author	Participants	Cranial Measures	Developmental Measures	Outcomes
Kordestani et al. 2006	110	Radiographically confirmed (RC)	BSID-2	PP show significant delays in mental and psychomotor development
Fowler et al. 2008	49 pairs	RC	Hammersmith Infant Neurologic Assessment (HINA), ASQ	PP have statistically different overall neurological scores. Predominantly in tone
Kennedy et al. 2009	27 pairs	Non-specific measurements. (NSM)	Alberta Infant Motor Scale (AIMS), Peabody Developmental Motor Scale (PDMS)	PP motor scores mirrored non PP patients.
Hutchison et al. 2009	287	Head Circumference, Neck Range of Motion, Headsup! Method using photography to assess CI	Ages and Stages Questionnaire (ASQ)	PP frequently seen with neck muscle dysfunction. Significantly higher rate of delay with PP compared to ASQ average. Neither severity nor type of head abnormality associated with delays.
Speltz et al. 2010	235 case 237 control	Three dimensional head photographs(TDHP)	BSID-3	PP associated with Neurodevelopmental delay, most evident in motor function. Degree of delay and severity of PP were not shown to correlate.
Hutchison et al. 2011	129	Used Headsup! To measure CI, Oblique Cranial Length Ratio (OCLR)	ASQ-3	Follow up at 3-4 years of age. Developmental delays in infancy associated to PP improve dramatically at 3 to 4 years of age.
Hutchison et al. 2012	126	Used Headsup! To measure CI, Oblique Cranial Length Ratio (OCLR)	ASQ-3	PP shows marked delay in early infancy, largely gross motor issues. But reduce as they approach 12 months
Collett et al. 2013	224 case 231 control	TDPH	BSID-3	Preschool children (36 months) with history of PP have lower developmental scores than controls.
Knight et al. 2013	21	Argenta	BSID-2	PP showed weaker motor skills than average.
Fontana et al. 2016	27	Cranial Vault Asymmetry (CVA)	BSID-3	Delay in motor and language. Severity of PP did not correlate to level of delay
Martiniuk et al. 2017	19 articles in systematic review	various	various	PP is a marker of elevated risk of developmental delays.
Hussein et al. 2018	155	Anthropometric values of Cranial Index (CI), Cranial Vault Asymmetry Index (CVAI)	Bayley Scales of Infant Development 2. (BSID-2)	Statistically significant neurodevelopmental delay in PP. No definitive relationship between severity of PP and degree of developmental delay.

Table 1. Results.

surements, as used by Hussein et al.¹⁹ and Fontana et al.²¹ are the oldest objective measure of PP.¹² They are often difficult to perform especially with fussy infants and have poor reproducibility.²² Speltz et al. and Collett et al. both used 3D imaging to diagnose PP.^{9,24} Although this method generates good data, it is difficult to use in day to day practice because of expense.²⁵ However, Nahles et al. showed no discernible differences when the two aforementioned methods were compared for accuracy and both methods were well accepted.¹²

The Headsup! Methodology used by Hutchison^{3,18,26} made use of oblique cranial length ratio, which is a recommended measure of PP.²⁷ Knight et al. used the Argenta classification²⁰ which has been shown to have highly reproducible and reliable results.^{15,28} A drawback of the Argenta classification system is that severity of the individual abnormalities is not reflected.¹⁰ Kennedy et al., Kordestani et al. and Fowler et al. explained that PP was radiographically diagnosed but did not explain which measurements were taken.^{2,4,29} There is no standardization for head shape measurement³ but the fact that all measures used are reliable increases validity. The heterogeneity of measurement types does however create a certain amount of limitation in terms of comparing the data.

Regarding outcomes measures, only four of the 11 included trials involved control groups. The remaining studies compared PP infant's developmental outcomes against normative data supplied by the various developmental tests. The issue with using normative values is the possibility of demographic bias, as normative values of specific tests may not represent infants in the sample group of the particular study, leading to incorrect outcomes.^{23,30} Normative data may be subject to the 'cohort effect'.

All included studies, apart from one², noted developmental delay in children suffering PP. When looking at subgroups within developmental delay, three studies noted the motor component to be the most affected,^{20,23,26} with one study finding over 50% of cases to be associated with torticollis.³ One study found language development to be delayed but not cognitive function.²¹ Going forward it was seen that developmental delay associated with PP reduced as children approached 12 months²⁶ and at follow up at three to four years of age, developmental delay associated with PP was seen to improve dramatically.¹⁸ Four separate studies reached the similar conclusion that the degree of developmental delay and the severity of PP were not seen to correlate.

Discussion

The goal of this study was to investigate the published literature to determine any association of positional plagiocephaly (PP) with neurodevelopmental delay. Studies predominately showed an association between the two conditions.

Four of the twelve studies found none. Interestingly, four of the studies suffered from small population size. Small sample sizes are known to have reduced capacity to identify relationships between neurodevelopmental outcome and predictive factors.²⁰ With this in mind, the data from these studies was weighed accordingly. Small sampling could be behind the contrary findings of no significant developmental difference between PP and non-PP infants.²

In terms of this review, the cohort effect relates to the effect the Back to Sleep campaign has on motor development as it is known that prone sleepers attain motor milestones faster than supine sleepers.³¹ Interestingly, Kennedy et al. found lack of prone awake time to be the hallmark of delay in both PP and non PP groups.² The ASQ²⁹, PDMS² and BSID-2⁴ tests all suffer from the fact that they were developed before 1992 predating the time when widespread supine sleep protocols were the norm.³ ASQ-3, AIMS and BSID-3 were developed after Back to Sleep²⁶ meaning these studies were potentially prone to less demographic bias. In conjunction with ASQ, Fowler et al. used the HINA assessment but did not explain if the examiner was trained in this type of assessment.²⁹ Most studies fell short in one or other aforementioned areas. However the standard of methodology across most studies was deemed to be of moderate to high level.³⁰

Special mention must be made of torticollis, as it is often associated with PP² and may be a major predisposing factor in PP, excluding brachycephaly.¹⁹ Torticollis is present in 20% of children with PP but only 0.1-2% of children with normal skull shape.³² Whilst it may impair motor development, however, Speltz et al. found that torticollis was not linked to neurodevelopmental delay in and of itself.²³

The theoretical idea that the resulting shift in the shape of brain parenchyma in response to PP skull asymmetry affects neurodevelopmental delay, does not correlate with the findings that PP severity is not linked to level of delay in infants.^{19,20} Severity of PP cannot, therefore, be used as a useful indicator of level of neurodevelopmental functioning.

While there is majority consensus that PP infants are more likely to suffer developmental delay, it is not a given that the cause itself is the skull asymmetry.¹² Collett et al. postulated from their data that PP may be the end result of the combination of positional practices and neurodevelopmental vulnerability.²⁴ Their findings also included previously undiagnosed PP children mistakenly placed in their control group as also scoring lower on the BSID-3 which strengthens the link whilst minimizing possible bias. The Fowler et al. findings of abnormal muscle tone, making it more difficult for these children to reposition themselves and so more likely to develop deformations, is consistent with this premise.²⁹

The evidence-based outlook on PP according to the available data should be to treat PP as an early marker of developmental risk that is evidenced before delay fully manifests and is testable.^{24,30} The Collett et al. finding that neurodevelopmental delay is still evident up to 36 months of age in PP children adds further weight to the need for early screening and prevention.²⁴

Conclusion

The data consistently shows an association between positional plagiocephaly and neurodevelopmental delay in infants which manifests in delayed early motor skills. How-

ever, when viewed in context, the link seems to be more a correlation than a causation. It is also possible that the causative relationship is reversed in many cases where pre-existing delayed development makes infants vulnerable to PP owing to their lack of mobility. In most cases it is likely to be a combination of supine sleep, lack of prone playtime, variable tone, low activity levels, male gender and neck muscle dysfunction that results in the delays that are seen on testing in PP infants.

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Resolution of unilateral breast-feeding preference and reflux in a 14-week-old infant with a preferred head position following chiropractic care: a case report

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ABSTRACT

Objective: Joint misalignment or hypomobility, termed subluxation in the chiropractic profession, can affect even the pediatric patient. Subluxations may present as a multitude of symptoms in this population such as breast-feeding dysfunction, reflux, and a preferred head position, among others. **Presenting Concern:** A 14-week-old infant presented to a chiropractic office with breast-feeding dysfunction, reflux, and a left lateral head tilt. Breast-feeding dysfunction began around four weeks of age and the onset of reflux was nine weeks of age, gradually worsening with time. The infant's left lateral head tilt was noticed by mom, but she is uncertain of time of onset. **Interventions:** A course of chiropractic care was recommended: four visits over the course of three weeks. Modified chiropractic adjustments were administered to restriction of subluxation palpated in the pediatric spine. **Outcomes:** Complete resolution of breast-feeding dysfunction occurred following the first adjustment. Complete resolution of reflux and positional head preference occurred after the second adjustment. No outside referrals were warranted. **Conclusions:** Subluxation in the occipital cervical (C0C1) region which may present as a preferred head position is suggested to influence and produce symptoms such as breast-feeding dysfunction and reflux in the pediatric patient. As positive results were obtained in this case report, it is suggested that chiropractic care may be efficient and effective in evaluating and treating these complaints.

Key words: breast-feeding dysfunction, reflux, preferred head position, head tilt, chiropractic, pediatric.

Introduction

The World Health Organization (WHO) defines the term subluxation as "a lesion or dysfunction in a joint or motion segment in which alignment, movement integrity and/or physiological function are altered, although contact between joint surfaces remains intact. It is essentially a functional entity, which may influence biomechanical and neural integrity".¹ Evaluation of the pediatric patient in the chiropractic office includes examining the infant for subluxations or motion restrictions and then performing an adjustment, manipulation, or mobilization to improve these palpatory findings. In a study performed by Waddington et.al, occipital condylar compression was demonstrated in 95% of healthy newborns that were evaluated 6-72 hours post-delivery. In the same study, motion restriction of at least one cervical vertebra was found in 91% of these same newborns.²

Dysfunction of the occipitoatlantal joint (C0C1) may present in the chiropractic office as a head tilt, preferred head or neck position, torticollis, reduced range of motion, or a unilateral breast preference during breast-feeding.³ A subluxation of C0C1 may also affect cranial nerves (CN) IX, X, XI, and XII due to the proximity of the jugular foramen and hypoglossal canal to the occipital condyles.⁴ In the pediatric patient these cranial nerves play a role in breast-feeding as

they innervate the soft palate, pharynx, tongue, and additional structures associated with the suck-swallow-breath synchrony. Vagal tone may also be impacted and visceral symptoms such as alterations in heart rate, sphincter tone, and gut motility, as well as colic-like symptoms,⁴ vomiting and/or regurgitation may result. This case will report on a pediatric patient with reflux, unilateral breast-feeding dysfunction, and a preferred head position that resolved with a course of chiropractic care.

Case Report

A 14-week-old female presented to a chiropractic office by her mother with the chief complaint of "having a lot of spit up." Upon further questioning during the history, it was also gathered that the infant had preference for the left breast while breast-feeding, refusing to latch onto the right breast, as well as a left sided head preference.

The mother had a healthy and uneventful pregnancy with no traumas or hospitalizations reported. Mom underwent 3-4 ultrasound procedures during the pregnancy and was prescribed Zofran to help prevent nausea during the first trimester. The child was born vaginally, at 40.1 weeks gestation in a hospital setting. The mother had been induced and given an epidural. Total labor duration was 8 hours, with the second stage of labor lasting 15 minutes. There was no

birth trauma to the newborn reported.

The infant was exclusively breast fed for approximately one month before mom began supplementing with formula due to mild lactation difficulties and because the infant would not latch onto the right breast. Mom stated the onset of her newborns reflux was gradual but had been occurring more frequently in the past month. Reflux was described as constant vomiting that occurred for 30 minutes after each feeding and milk would be curdled.

Physical examination revealed a calm, alert, and apparently healthy 14-week-old infant. A left lateral tilt of the occiput on C1 was noted where the right occipital condyle was translated laterally. The infant's vitals including height, weight, head and chest circumference were within normal limits (WNL) for this age group. Primitive reflexes including plantar/palmar grasp, asymmetric tonic neck reflex, Moro, Babinski, Galant, Allis, Ortolani's, stepping, and placing were WNL for this age group with the exception of the rooting reflex which was absent. However, the infant had just been fed prior to examination and it was concluded to be a normal variant. Cervical range of motion (ROM) was reduced in right lateral flexion. Right temporomandibular joint (TMJ) ROM was reduced upon opening. Suckling was determined to be shallow and a posterior ankyloglossia (tongue tie) was also noted. No functional testing was performed to assess if the tongue tie was restricting tongue mobility and interfering with latch. Assessment of the gluteal cleft revealed a right deviation. Cranial motion restrictions were noted in bilateral sphenoid and left occiput. Spinal motion restrictions were noted at T5, T7, L1, the sacrum, and left lateralization of C1. There was a withdrawal reflex noted upon palpating the right thoracic paraspinals along the scapula as well as the musculature overlying the left transverse process of C1. The working diagnosis was craniocervical syndrome.

The first treatment was performed to restore motion to restrictions found in the cranial and spinal regions noted above. In the cranium and cervical spine, a light manual fingertip contact was taken at specific contact points on vertebral segments felt to have decreased motion. The correction was made in the direction needed to restore this loss of motion with a sustained, gentle, and vibratory stimulation. The Activator adjustment tool was utilized on the lightest setting to the thoracic, lumbar, and sacral spinal restrictions. Abdominal "I Love U" massage was also performed in the office.

Abdominal "I Love U" massage is manual stimulation of the abdomen performed with pressure from two to three fingers, beginning at the infants right lower quadrant and working to the left lower quadrant; following the direction

of the large intestine. First, the performer massages the letter "I" by working upwards from the right lower quadrant to the right upper quadrant. Beginning at the right lower quadrant again, the performer massages the letter "L" by massaging upwards to the right upper quadrant then across the abdomen to the left upper quadrant. Lastly, beginning at the right lower quadrant, the performer traces the "L" and ends in the left lower quadrant to form an "U"

It was recommended that mom perform the "I Love U" massage at least twice daily. Mom was also instructed to consult with a local pediatric dentist to perform a functional assessment of the tongue to evaluate if the posterior tongue tie was hindering the infants latch. The recommended chiropractic treatment plan was once a week for two weeks.

At the next follow-up appointment (visit #2), a week after initial examination and treatment, mom reported a potential adverse reaction to treatment: the infant had been fussy for approximately three days following the first adjustment. However, the vomiting had reduced from occurring for 30 consecutive minutes post feeding to occurring for 10 consecutive minutes post feeds. The infant also began latching onto the right breast fully with no difficulties.

Chiropractic treatment was rendered in the same way as visit #1 where motion restrictions were found at the left occiput, C1, T5, sacrum, and right temporomandibular joint and mobilized, appropriately modified for gestational age and size.

Due to the fussiness noted after the initial treatment, it was requested that the infant follow up again at the end of the week. At this appointment (visit #3), mom reports no fussiness had occurred following treatment #2. She also stated the infant continued to breast-feed equally on the left and right breast and no reflux was occurring following feedings. Objectively, the right occipital condyle was no longer translated laterally, resolving the lateral tilt of the occiput on C1. Also, the right temporomandibular joint had equal motion when compared to the left temporomandibular joint. Chiropractic treatment was rendered again in the same way as visit #1 and #2 where motion restrictions were found at C1 and sacrum and mobilized appropriately.

Follow-up was recommended within a week, but due to a holiday weekend the next follow up was scheduled for two weeks. At that appointment (visit #4) mom reports "perfect" breast-feeding, no fussiness, no reflux, and no left sided head preference. Mom did not make an appointment with the pediatric dentist due to the resolution of breast-feeding dysfunction. Table 1 (following page) summarizes service rendered, subjective, and objective findings at each visit.

Visit #: Date	Service Rendered	Symptoms/Subjective	Objective Findings
#1: 6/18/18	Chiropractic examination and adjustment.	Reflux for 30 consecutive minutes post-feedings, left-sided breast preference and left-head preference.	Motion restrictions C1, T5, T7, L1, sacrum, L occiput, R TMJ, B sphenoid. Withdrawal reflex and hypertonicity at L suboccipital and R thoracic paraspinal. L lateral tilt of occiput on C1.
#2: 6/25/18	Chiropractic adjustment.	Reflux for 10 consecutive minutes post-feeding and latching equally on both breasts.	Motion restrictions C1, T5, sacrum, left occiput, R TMJ. Decreased hypertonicity at L suboccipital.
#3: 6/29/18	Chiropractic adjustment.	Latching equally on both breasts. No reflux.	Motion restriction C1, sacrum. L lateral tilt of occiput absent. Full cervical ROM. Full TMJ ROM.
#4: 7/10/18	Chiropractic adjustment.	Latching equally on both breasts. No reflux. No left-sided head preference.	Motion restriction C1 No withdrawal reflex noted at any spinal level.

Table 1. Summary of service rendered, subjective, and objective findings at each visit.

Discussion

The prevalence of a preferred head position is a common finding in the pediatric population. In a clinical assessment 55 (65%) out of 90 infants were found to have an abnormal supine posture for his/her age, with a preferred head or neck placement being most common (73%).⁵ A preferred head position is generally the result of an occipitoatlantal (C0C1) subluxation which was present in 70% of infants experiencing breast-feeding difficulties in a study performed by Stewart, whereas a subluxation of the atlantoaxial joint (C1C2) was found in 30% of those same infants.⁶ In another study, Fludder et. al, set out to determine whether different regions of spinal joint dysfunction were associated with different presentations of behavior in their retrospective case series. Data was collected from 195 cases. When determining regions of spinal dysfunction related to preferred head position, 43.5% of infants presented with cervical joint dysfunction only. When evaluating breast-feeding difficulty, 56.5% also demonstrated cervical joint dysfunction.⁷ Misalignment of the occipitocervical spine may lead to altered biomechanics, reduced range of motion of the C0C1 junction or cervical spine, and perhaps pain when performing these active movements. In a standard, cross cradle hold during breast-feeding, the baby's head laterally flexes away from the breast it is latching onto, i.e.: right lateral flexion of the occipitocervical spine to latch onto the right breast.³ When you consider in the instance of this case report, there was left lateralization of the C1 vertebra and reduced ability to laterally flex to the right, this could account for the refusal to latch onto the right breast and a preference to feed from the left.

When the proximity of the jugular foramen and the hypoglossal canal to the C0C1 junction is considered, it can be appreciated how a subluxation of either an occipital condyle or C1 could decrease foramen patency and alter the

associated cranial nerves. Cranial nerves IX, X, and XII play a role in breast-feeding as they innervate the soft palate, muscles of the tongue, pharynx, and esophagus. Cranial nerve X (Vagus) is part of the parasympathetic nervous system and innervates visceral organs such as the heart, stomach, and intestines. In Fludder's study, 73.9% of infants with cervical spine dysfunction demonstrated vagal nerve symptoms such as an uncoordinated suck-swallow-breath synchrony, as well as reflux, regurgitation and/or vomiting.⁷ Additional vagal symptoms include altered heart rate, sphincter tone, and gut motility.^{4,8} Parasympathetic tone decreases in the presence of noxious stimuli,⁸ such as a subluxation, whereas the sympathetic nervous system reacts, increasing its activity. In the absence of external challenges, the parasympathetic nervous system optimizes the function of the internal viscera.⁸ Alteration in vagal function and an increase in sympathetic tone due to occipitocervical subluxation can be one explanation of reflux symptoms in this case report. Waddington et. al, suggests that removal of somatic dysfunction through manipulation has been found to reduce gastrointestinal symptoms² and more specifically, Welch et. al preliminarily suggests that adjustments to the cervical spine produce a parasympathetic response.⁹ Additionally, infants receiving tactile and kinesthetic stimulation, such as massage, demonstrated significantly increased vagal activity when compared to that of control groups.¹⁰ Gut motility has also been shown to increase with infant massage.¹¹ The "I Love U" massage that was performed and prescribed in this case report may therefore have aided in producing a parasympathetic response and decreasing the reflux experienced by this patient.

Conclusion

In this case, the correction of subluxation throughout the pediatric spine, with particular attention to the occipitoatlantal junction was followed by a reduction of reflux, reso-

lution of breast preference during feeding, resolution of the lateral head tilt and preferred head position. A limitation of this case reports is that conclusions are based on the outcomes of one individual. Outcomes obtained in this case report may have been the natural progression of the condi-

tion and may have resolved without outside intervention. More research is needed to investigate the role chiropractic care may play in reducing or resolving similar symptoms in infants.

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Parent proxy report and pre-adolescent self-report of pain and trauma: A cross-sectional observational study in Sweden

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ABSTRACT

Background: The prevalence of musculoskeletal pain changes significantly between pre-adolescence and adolescence. It is unclear whether parent proxy reports and child report of pain and trauma are concordant. This study investigated the respective agreement between pre-adolescents and their parents in reporting head and/or neck trauma and recurrent neck pain and/or headache. **Methods:** This cross-sectional observational study formed part of a study carried out to ascertain the prevalence of non-specific neck pain and/or headache in 131 Swedish pre-adolescents. Information was gathered from a questionnaire completed in school, and an informed consent with additional questions for the parents. **Results:** All of the students (n=131) who were approached to participate in the study agreed to complete the questionnaire. Of these, 40% (n=52) reported that they experienced neck pain and/or headaches with 31% (n=41) reporting the frequency was “often.” The parental report differed with 6% (n=8) of parents acknowledging that their child often had neck pain and/or headache. Similarly, 61% (n=80) of children reported trauma to the head/neck while 20% (n= 26) of the parents reported that their child had experienced trauma to the head and/or neck region. **Conclusion:** Neck pain and/or headache in this group of Swedish pre-adolescents were common, as was previous trauma to the head or neck. Most of the parents were unaware that their child often had neck pain and/or headache or had suffered head or neck trauma. This discordance should be further explored to better understand the change in reporting pain from pre-adolescence to adolescence.

Introduction

Pain is the most common reason why people seek health-care.¹ The decision to seek care for the pre-adolescent in pain involves both the parent and the child. The clinical encounter involves both their perspectives of the problem including exposure to trauma, assessment of pain and the impact on daily living. Studies comparing parent proxy and child report of pain show discrepancies^{2,3} and few explore musculoskeletal pain in the pre-adolescent.^{4,5} Studies of parent proxy reports of trauma in the pre-adolescent age group have not been performed, but Sundblad et al. 2006 study of older children reported that parent-child agreement occurred consistently only in cases of severe trauma.⁶ Because pain in childhood is a predictor of pain in adulthood,⁷ gathering an understanding of the complexity of the problem from the child perspective is warranted and considered the gold-standard.^{8,9} It has been accepted that assessing pain in children is different from assessing pain in adults.¹⁰

A parent's perception that their child is experiencing pain is the main motivating factor when arranging a visit to a caregiver. Parents, particularly mothers, are relied upon by health care practitioners to provide information about their child.¹¹ Many things influence the parent's and the child's verbal response to the doctor's questions. Some of the factors which influence how the child responds are: (1) if the rating has positive or negative consequences associated with it; (2) if the response is verbal or written; and

among other things (3) if the child's previous experience with health care has been positive or negative.¹² The parental response is influenced by their own health, the relationship they have with the child, and their expectations of the child.¹ It is consistently noted in children and adolescents with chronic pain syndromes, as in low back pain and headaches that parents underestimate the amount of pain their child is experiencing.^{13,14 15,16,17}

Von Baeyer et al in 2017¹⁸ implied that some children from four years old are able to relay information in an age appropriate tool about how much pain or “hurt” they have, although authors agree that children under seven years may have difficulty using scales appropriately to relay accurate information about pain.^{18,19,20} By the age of eight years, most children have the skills of numeracy to use a numbered scale to rate their pain.^{21,22,23}

Although the gold standard for assessing health related parameters is self-report, when measuring pain retrospectively, there is a tendency for children to inflate their pain, reporting higher numbers than if they had recorded pain daily.²⁴ This is particularly true for children who have experienced significant pain or anxiety associated with the painful event.²⁵

The aim of this study was to compare the agreement of answers from pre-adolescent middle school students with

answers given by their parents on questions addressing prevalence and frequency of neck pain and headache and the occurrence of head and /or neck trauma.

Methods

This was a cross-sectional observational study included as a sub-set of a larger study carried out to ascertain the prevalence of non-specific neck pain and/or headache in Swedish pre-adolescent children. This was a group of middle school students in the 4th, 5th and 6th grades, who were 9-10 years, 11-12 years and 12-13 years old. Participants were selected from a convenience sample of students at a municipal school in a middle-class suburb outside Stockholm, Sweden. An informed consent form with additional questions for the parents (the parents were asked if the child experienced neck pain and /or headache, and how often; experienced trauma to the head or neck; and if the child had a systemic disease) was sent home in a sealed envelope. Information was gathered from students via a questionnaire which was completed in school with an informed teacher present. The inclusion criteria are listed in Table 1.

Those who were between 10-13 years
Those who agreed to participate
Those who had written consent from parents or guardians
Those who had filled out the questionnaire
Those who had the ability to communicate verbally

Table 1. Inclusion criteria for students.

The questionnaire was adapted from questionnaires found in the literature investigating characteristics of headaches and neck pain.^{26,27,28,29} The questionnaire was pilot tested on a group of 10 year olds (n=10) to ensure that the youngest students had no problems understanding the questions and the alternatives provided. The questions concerned the duration and the frequency of pain, among other questions. None of the pilot participants were included in the final study.

Categorization

The neck pain/headache group was defined as those students who answered "I have neck pain" or "I have headaches" when asked on the questionnaire if they experienced neck pain or headaches. The no-pain group consisted of students who answered "I never have neck pain or headaches, or "I only have neck pain or headaches when I am sick" when answering the same question.

Ethical Consideration

The procedures were performed with the approval of the Anglo-European University College Research Ethics Subcommittee for postgraduate research in accordance with

the Declaration of Helsinki. Ethics approval was required in Sweden and was granted by the Stockholm regional Medical Ethics Committee.

Results

The questionnaire was completed by 131 students between 10 and 13 years of age. These accounted for 100% of the students who were asked to participate. Of these, 40% (n=52) reported that they experienced neck pain and/or headache. In the fourth grade (10-11 years) there were as many boys as girls who described having neck pain and/or headaches and this was also true for the fifth graders (11-12 years). In the sixth grade (12-13 years) there were more girls than boys reporting neck pain and/or headache (Figure 1).

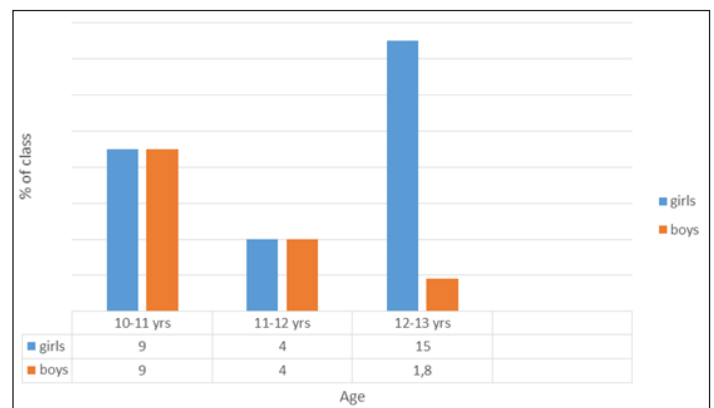


Figure 1. Gender Prevalence of neck pain and/or headache in pre-adolescent students.

In all, 31% (n=41) of the children reported in the questionnaire that they "often" had neck pain and/or headaches, while 6% (n=8) of the parents wrote that their child had neck pain and/or headaches "often." In total 61% (n= 80) of children reported trauma to the head/neck, whereas 20% of parents reported that their child had experienced trauma to the head and/or neck region (Figure 2 following page). There was no significant association found between the occurrence of trauma and the incidence of neck pain and/or headaches in the students examined when analyzed with the Chi square test (P=.102)

Discussion

The goal of this study was to compare and contrast a pre-adolescent child's perception of pain with that of their parents. As such, there was a clear difference in the report of the students versus the report of their respective parents. Pre-adolescent students were selected to better understand the changes which occur in neck pain and/or headache prevalence and gender distribution between pre-adolescence and adolescence. It is first in adolescence that neck pain and/or headache take on more adult-like characteristics with an increase in overall prevalence and a shift in

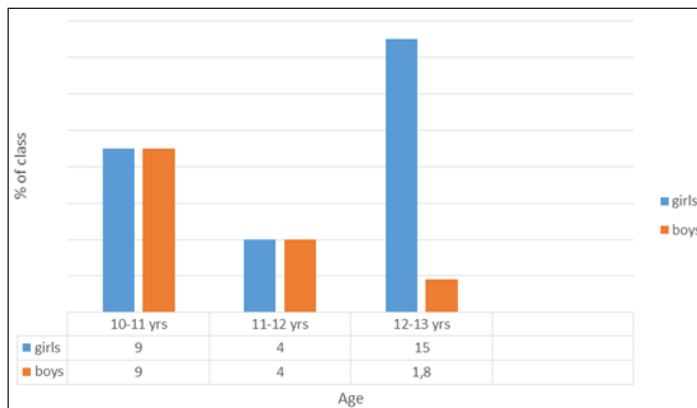


Figure 2. Parental and student report of neck pain and/or headache and trauma.

gender distribution with a female preponderance.^{30,31} It was difficult to compare the results from this study with others because prevalence rates of neck pain and/or headaches in children vary considerably depending primarily on the criteria used and how the study has been designed. Parents reported approximately five times less frequent head and neck pain than their child. These discrepancies may reflect the weakness of the questionnaires in assessing pain in pre-adolescents and highlight the need for gathering data prospectively with daily recording of symptoms as well as through interviews with parents and children. Other possible reasons for discrepancies may be lack of communication and/or the child feelings of awkwardness about their own physical state. The results otherwise support the findings of Lundqvist et al⁶ which indicated that parents not uncommonly underestimate headaches in their children.

There was also a discrepancy between parental report and child self-report in regard to the incidence of trauma to the head or neck. Despite the fact that so many students reported trauma, there was no statistical relationship between trauma and neck pain and/or headache in these students. It is feasible that children did not always tell their parents that they have hurt themselves. It is also possible that their memory of having experienced trauma is better than what their parents remember.

There was an even gender distribution among the students who reported having neck pain and/or headaches who

were between 10 and 12 years of age. This is similar to other reported data for this age group.^{4,32} Students between 12 and 13 years of age must be considered peri-adolescent and interestingly, in this group, there was an increase in prevalence of neck pain and/or headaches among both boys and girls, along with a clear shift in gender distribution with female preponderance. The increase in the prevalence of neck pain and/or headache with a female gender shift in adolescence has been noted previously in the literature.^{31,33}

The fact that trauma was not significantly related to neck pain and/or headaches in this study may be that injuries occurring in childhood may become symptomatic first in adolescence with cumulative strain associated with increase in demands of studying and screen time. To explore this theory, it would be appropriate to conduct a prospective study following students to see if those who experienced trauma early in childhood more commonly suffered neck pain and/or headaches once they reach adolescence.

Limitations

This was a pragmatic study of students in their own school setting. A pragmatic study is useful for its real world implications, but also has some weaknesses. Despite a high participation rate, the study sample was small so only trends may be observed. The study sample, a convenience sample, represents students from one school only which may introduce bias. The study sample was intended to be pre-adolescent but included a class of peri-adolescents. Further studies should clearly subgroup children into pre-adolescent, peri-adolescent and adolescent groups to investigate how neck pain and headaches evolve in this transitional period.

Conclusion

Forty percent of the pre-adolescents in this middle school setting reported recurring neck pain and/or headaches. Four out of five parents reported headaches, neck pain and trauma experienced by the child significantly less frequently than the child. This is important not only because recurrent musculoskeletal pain in this age group can have a significant impact on quality of life, but the discordance in reporting may be a factor in why report of pain changes significantly between pre-adolescence and adolescence. Because musculoskeletal pain in adolescence is a predictor for pain in adulthood, early attention in pre-adolescence could serve as a preventive measure for the long-term.

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Giving birth: a systematic review of the value of skin to skin contact in a medicalized birth

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ABSTRACT

Purpose: The musculoskeletal system sets the foundation of the infant's future growth and development. Skin-to-skin care (SSC), also referred to as kangaroo mother care, should be employed as a routine postnatal practice to enhance optimal growth and health of the newborn. Unfortunately, the benefits of this practice are underestimated by many healthcare professionals and parents are not always made aware of this beneficial alternative to conventional neonatal care. Therefore, the aim of this review is to evaluate the impact of medical interventions as well as reduced or no skin-to-skin contact on the newborn's physiology on a long-term basis. **Methods:** The literature search was conducted using Pubmed, Medline, CINAHL, Cochrane Library and Alt Health Watch to review the current evidence using the keywords skin-to-skin, breastfeeding, newborn and outcomes. In total, 31 articles met the inclusion and exclusion criteria and were eligible for this review. **Results:** The literature search concluded that skin-to-skin care (SSC) between mother and child is beneficial for the infant's tactile, auditory, sensory, motor, vestibular, parasympathetic and sympathetic development as well as their mental state. Currently, conservative healthcare professionals continue to employ conventional protocols and underestimate the importance of encouraging early mother kangaroo care. Also, more investigation should be encouraged focusing on the impact medical interventions, such as intravenous lines, extraction, etc. have on the infant's physiology and the child-mother bonding. C-section, prematurity and low birth weight may contribute to the complexity of the neonate's situation, however, with appropriate surveillance, SSC is not impossible. There is disagreement about the optimal timing and the duration that SSC should be employed. **Conclusion:** The research states that (early) skin-to-skin contact is the most simple, cost-effective and life-saving 'intervention' a child can get. There is enough supporting material showing its benefits on the child's mental and musculoskeletal health. More research is warranted to establish the most beneficial timing and duration for maternal-infant skin-to-skin care.

Introduction

In this decade, giving birth is a medicalized event rather than an intimate moment between two partners.¹ Based on human anatomy, a woman in active labor should be able to walk around as her body prepares to give birth. Unfortunately, inductions and epidural pain relief have become common practices that compromise fetal blood flow and oxygen supply leading to reduced oxytocin hormone and destabilization of the newborn's system.¹ As a consequence, an escalation in medical interventions, such as Caesarean section and forceps vacuum extraction, have become more common putting more stress on the neonate's regulating system.¹

Skin-to-skin contact (SSC), often referred to as kangaroo (mother) care, is the practice of placing a naked newborn on the mother's bare chest, and covering them with a protective blanket.² It is a practice that attempts to replicate the environment of the womb to facilitate the neonate's transition into a world full of stimuli.³ Unfortunately, many parents reported their infant being taken away immediately after birth without being informed of a medical reason. This

is in contradiction to the recommendations of the World Health Organization⁴ and the United Nations Children's Fund⁵ who recommend skin-to-skin immediately after birth for at least one hour or until a first feed was accomplished and a bond established. Currently, maternal-infant separation post-birth is an underestimated clinical stressor for the neonate knowing that mortality and morbidity rates have shown to be reduced significantly when early SSC is introduced.^{6,7}

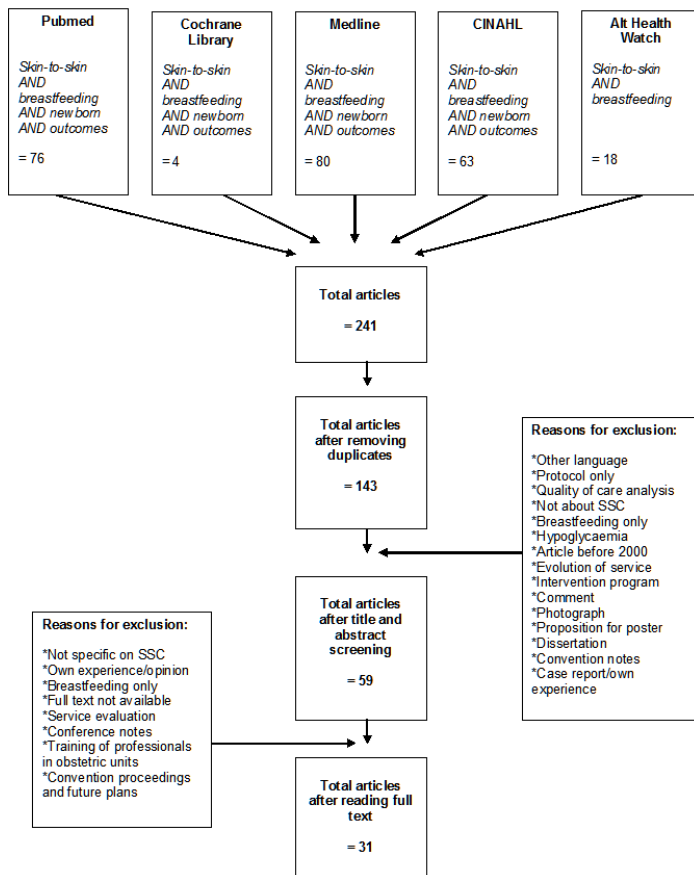
Therefore, the question arises whether it is possible to implement SSC immediately after birth by removing identified barriers. The purpose of this review is to identify the barriers interfering with immediate skin-to-skin contact and to explore the long-term benefits of this practice. The purpose of this review is to identify how the important practice of immediate skin-to-skin contact can be implemented in the medical environment without putting the neonate in danger.

Methods

A systematic search of the following online databases was

performed: PubMed, Medline, CINAHL, Cochrane Library and Alt Health Watch. Inclusion criteria required that articles were specifically about skin-to-skin contact and were in the English language. Articles published before the year 2000, dissertations, protocols, convention notes and case reports were excluded. All others were eligible for inclusion. The key terms used within the search were skin-to-skin, breastfeeding, newborn and outcomes. The Boolean command was 'AND'. In total, 241 articles were retrieved, of which 31 were eligible for this article (see Figure 1 for PRISMA flow diagram).

Figure 1: PRISMA flow diagram



Results

The literature looked at the process of giving birth and the impact identified medical interventions have on the long-term health of the neonate. In total, 31 articles were retrieved.

Skin-to-skin (SSC) is the gentle way to stimulate auditory, tactile, vestibular and thermal senses. Dani et al. found that the infant goes through several behavioral phases during SSC with its mother.⁹ Birth cry, relaxation, awakening, activity, crawling, resting, familiarization, suckling (including massaging the mother's breast) and sleeping are the

nine interactions enhancing the baby's engagement of all of its senses.⁹ Moreover, SSC promotes self-modulation of the neonate's autonomic nervous system resulting in a shift from sympathetic dominance (fight or flight) towards parasympathetic dominance (rest and digest) thus enhancing biliary tract motility and gastrointestinal activity.⁸ In addition, cardiorespiratory stability and oxygenation are eased by the vertical position in which skin-to-skin practice takes place. The upright position enhances the function of the neonatal diaphragm and it has been shown that it improves the efficiency of the pulmonary system. Improved efficiency reduces the episodes of apnea, bradycardia, respiratory stress syndrome and events of sudden oxygen desaturation, also in premature infants.^{8,10,11} Also, Sarparast and colleagues reported a higher weight gain in 10.62% of their low birth participants who had received kangaroo mother care (KMC), otherwise known as skin-to-skin contact.¹² A more recent study by Conde-Agudelo and Diaz-Rossello reported not only improved weight gain, but also significant length and head circumference gain in low birth weight infants.¹³ However, KMC infants showed no better psychomotor development compared to their controls at 12 months of corrected age.¹³ Another benefit was noted by Moore et al.¹⁴ They found that early SSC showed statistically significant better overall performance on all measures on breastfeeding status (earlier establishment of successful and efficient breastfeeding, earlier exhibition of pre-feeding behaviors, competent suckling) when compared to those receiving standard care, which meant the neonate was held swaddled in a blanket. A later study by Thukral et al. confirmed this association.¹⁵ They reported that patients in the early SSC group were more likely to exclusively breastfeed at 48 hours and continue at least six weeks post-birth.

With regards to maternal-infant synchrony, meaning the matched behavior and biological rhythms between mother and child, Johnson stated that the mother-infant touch increased the oxytocin hormone and that with every breastfeeding session, the mother-infant bonding multiplies.¹⁶ Also, this nurturing hormone let the infant feel at ease promoting regulation of emotions which may contribute to a reduction in the occurrence of chronic illnesses.¹⁶ Moreover, Moore et al. reported higher mean scores for breastfeeding effectiveness and higher blood glucose levels in the SSC group compared to standard care.¹⁷

Unfortunately, several barriers to providing SSC have been identified. Caesarean surgery for example. Redshaw et al. reported that only 67% of mothers having a C-section held their infant within five minutes post-birth and only 33% held their child for longer than twenty minutes which is statistically significant knowing that 90% of women having an unassisted vaginal birth held their infant within five minutes and 67% for longer than twenty minutes.¹⁸ Bavaro et al. explained this decrease by stating that the used anal-

gesia during this surgical intervention are responsible for a higher number of sedated mothers.¹⁹ Neuraxial anesthesia is the most used anesthetic choice for C-section both spinal and epidural and not only does this negatively influence immediate SSC but there is the question whether it has safety implications for the infant.¹⁹ Even though paternal-infant skin-to-skin time does not necessarily result in establishing exclusive breastfeeding, it is still strongly encouraged if the mother is not able or willing to do it.²⁰ It promotes development of a healthy microbiome and subsequently immunity via the familial bacteria on the skin of the father as it did not have microbial colonization via the birth canal and at the same time, it gives the father the opportunity to bond with his child.^{20,21}

Currently, premature and/or low birth infants discharged from the neonatal intensive care unit (NICU) show altered learning scaffolds for motor, tactile and multisensory explorations of the environment as well as for social-emotional interactions.²² This can be related to the repeated painful procedures they have to undergo, which alters their sensory processing to both light touch and nociception.²² Cong et al. reported that preterm infants in NICU experience at least 643 acute procedures (23 daily) and 1193 hours of chronic events (43 daily) during their first four weeks in hospital.⁶ More parental presence demonstrated improved function of the neurochemical system and it modulated stress regulation which indicated that skin-to-skin practice could be used as a pain and stress treatment.⁶ Although many pre- and full-term infants undergo painful needle-related procedures (e.g. vaccinations, blood sampling...) during their first hours to first months of life, rarely is skin-to-skin suggested as a natural self-regulator or painkiller for both infant and mother.^{23,24} Walter-Nicolet et al. reported a reduced hypothalamus pituitary-adrenal activity in response to pain with SSC.²⁵

Disagreement still exists about the optimal duration of SSC or KMC. Casper et al. recommends at least three hours a day, while Park believes at least 20 out of 24 hours should be spent skin-to-skin.^{3,11} The International Network on Kangaroo Mother Care recommends almost continuous skin-to-skin contact as the best 'intervention', emphasizing its benefits in NICU's.²⁰

Discussion

With regards to the question whether skin-to-skin has beneficial impacts for the (long-term) development of the newborn, there is no doubt. Better (exclusive) breastfeeding outcomes, improved height, weight and head circumference measurements, higher physiological and cardiorespiratory stability are amongst its benefits. SSC also engages all of the infant's senses stimulating long-term neurological and musculoskeletal development.^{8,10,11}

Unfortunately, these benefits are overshadowed by the current medicalization of giving birth pre-, peri- and post-natally.^{8,10,11} Although healthcare professionals do acknowledge the benefits of skin-to-skin care for neurologic and musculoskeletal development of the infant, they still have difficulties transitioning from the prevailing techniques and technologies. Naturally, a newborn needs to only experience skin-to-skin time with the mother to enhance all regulatory systems and to stimulate a first breastfeed taking place.¹ Unfortunately, an interview study at the post-operative ward, after C-section, confirmed that healthcare professionals working there, do not consider SSC practice important to implement.²⁶ They believe that carrying out postnatal examination procedures performed before placing the neonate in the mother's arms, will not disrupt the skin-to-skin long-term benefits.²⁶ Moreover, Moreira et al. reported that some procedures, such as giving the newborn extra oxygen and/or carrying out upper airway or gastric aspiration, are done out of habit regardless whether they are actually necessary or not.²⁷ The presence of a doula has therefore been suggested. She can act as the communication channel between parents and physicians and is able to guarantee that all interventions are in the best interest of the newborn.^{26,28}

Another promising alternative would be the presence of a transition nurse. Several nurses have reported that it is often confusing who carries the responsibility of the child when several physicians are carrying out their interventions. For example, the nurses want to check the vital signs of the infant while the midwife's role is to protect, promote and support early breastfeeding.²⁸ Both want to have access to the newborn but who is in charge when something goes wrong? A transition nurse would be the ideal solution to resolve this dilemma.^{26,28}

When considering barriers to skin-to-skin contact, prematurity or birth by C-section are two of the many challenges for early kangaroo mother care. It was raised by Penn that healthcare professionals in NICU's are often focused on short-term life-saving events.²⁹ Also, intensive care unit nurses did admit that gaining access to the mother to start postoperative monitoring was their main concern compared to the midwife's priority of establishing skin-to-skin.²⁶

In the future, educating all healthcare professionals, who are involved in pregnancy and birthing processes, what skin-to-skin is and how it can be achieved even in more challenging cases, would be beneficial. Important to mention is the influence of the anesthesiologist on skin-to-skin interactions. The review by Stevens et al. identified an article stating that C-section babies having SSC with their father started to reach the nipple sooner than when having SSC with their mother.³⁰ They attributed this finding to chlorhexidine which was applied to the mother's chest be-

fore surgery. Also, failure to establish SSC due to maternal refusal was related to the mother's feeling of drowsiness due to intrapartum epidural or other analgesia resulting in anxiety to nurture their infant.^{19,29}

However, as previously mentioned, these barriers could be overcome by the presence of a doula or transition nurse within the birth room, who prioritizes the newborn's and mother's health, implements SSC when possible and prevents them from any harm happening.^{30,31}

Another co-factor affecting early SSC is the fear of hypothermia in low birth weight or premature infants. Nevertheless, Browne found that the naturalistic environment of the mother's body can provide sufficient warmth to maintain thermoregulation.²⁴ A later study by Hubbard and Gattman looked at pre-term infants (<34 weeks and 6 days), under the condition that they were stable and monitored closely, increased physiologic stability was observed.²⁰ Reduced length of hospital stay was a consequence of KMC.^{32,33}

Unfortunately, this review identified several limitations to the included studies. First of all, not all studies were clear on the definition of skin-to-skin. Also, it was not always stated clearly whether the child was placed naked on the mother's bare chest or whether he or she was wrapped into a blanket. Thirdly, the reasons for not offering SSC were not always indicated. Whether it was a parental choice, or because the present healthcare professionals were busy carrying out their normal routines without considering the benefits of

early SSC for mother and child or out of organizational and/or psychosocial reasons as suggested by Zwedberg and colleagues.²⁶ They commented on the high workload at the postoperative ward as well as a mixed population in the maternity ward. Often, there are women present on the ward who have had a miscarriage or stillbirth. It is viewed as inappropriate to have mother's engaging in SSC and breastfeeding in close proximity.

In conclusion, the duration and timing of SSC or KMC were not always clearly defined. Does early SSC mean it was within a couple of minutes? Or hours? How long should it be maintained to be highly beneficial? Future research investigating SSC postnatally should be designed to resolve the question of optimal SSC durations and promote achieving SSC as soon as possible postnatally.

Conclusion

Care for newborns and their mother pre-, peri- and postnatally is a sensitive measure of the functionality of any health system. Under the condition that the newborn is stable, skin-to-skin is the best, most simple and cost-effective life-saving and life-prolonging practice a child can receive. There exists enough supporting documentation showing the effectiveness of kangaroo mother care on the musculoskeletal and mental health of the newborn. Healthcare professionals and the mother infant dyad would benefit from further education on the benefits of skin-to-skin immediately after birth to include practical guidelines and to implement it within the context of what they perceive as medically necessary interventions and postnatal routines.

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Why aren't chiropractic physicians treating more children with complex diagnoses? A commentary on documenting P.A.R.T. for diagnosing and treating special needs children

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ABSTRACT

According to the Centers for Medicare and Medicaid Services (CMS) guidelines, chiropractors are deemed physicians in the Medicare system and for consistency throughout the term chiropractic physician will encompass chiropractor, chiropractic doctor, doctor of chiropractic and chiropractic physician. Chiropractic physicians must document subluxation of the spine through x-ray or physical examination. The documentation of subluxation of the spine through physical examination includes the identification of two out of four criteria including: Pain/tenderness, Asymmetry/misalignment, Range of motion abnormality, Tissue tone, texture, and temperature abnormality (P.A.R.T.) with at least one of the two criteria being either A or R. Since special needs children often have difficulty expressing pain, and/or experiencing pain the way a typical child can, it is necessary to understand approaches to the special needs child that allow the doctor to evaluate and treat the child, as well as comply with insurance mandates to establish medical necessity. The purpose of this paper is to help the doctor understand approaches to document the diagnosis/diagnoses and procedures utilized for the medically necessary care of special needs children to while remaining in compliance with the billing to 3rd party payers. A case report follows to illustrate these challenges.

Keywords: Special needs children, autism, Down syndrome, insurance compliance, Medicare, medical necessity, pediatrics, chiropractic, chiropractic physician, chiropractor.

Introduction

Chiropractic philosophy and practice teach us that all dysfunction has a neurologic component.¹ By far, the greatest growth of neurologic dysfunction in children is the increasing presence of autism spectrum disorders (ASD).² ASD includes autism, ADD/ADHD, Rett's Syndrome, Asperger's Syndrome, Pervasive Developmental Delay and Childhood Disintegrative Disorder, among others.³ Commonly, these children lack communication skills, perceive pain differently than non-spectrum children, and present with uncommon signs and symptoms not frequently seen in a chiropractic office.

As chiropractic physicians, we are comfortable with back pain, neck pain and headaches, but when a patient presents with self-stimulatory behaviors, self-injurious behaviors, digestive challenges and abnormal preferred postures, the chiropractic physician may become intimidated and decline to treat these children.

The quality of life of children challenged with these issues may be enhanced by chiropractic care.⁴ Chiropractic physicians, as they often provide family care, are encouraged to expand their knowledge and practice to include these chil-

dren. By providing competent chiropractic care, we demonstrate to our patients and their families and other providers that chiropractic is not limited to pain management. At Kentuckiana Children's Center, we observe physiologic, behavioral and social improvements with the addition of chiropractic and complementary care.

This article serves to demonstrate how to comply with insurance mandates to identify Pain/tenderness, Asymmetry/misalignment, Range of motion abnormality, Tissue tone, texture, and temperature abnormality (P.A.R.T.) changes in the absence of ability to question the patient. A case report is also provided.

A common behavioral feature of autistic spectrum disorder (ASD) children is self-stimulatory activity. This activity can manifest as hand-flapping, head-banging, spinning, self-injurious behaviors, and physical attacks.⁵ All of these activities have the potential of disturbing normal biomechanical function, and therefore, can cause vertebral subluxation complex (VSC). It is evident, then, that spectrum children should be regularly evaluated and treated by a chiropractic physician. It becomes necessary for the doctor to investigate and/or re-investigate palpation and observational analysis

methods in the special needs population to effectively identify the presence of VSC and then develop the skill set to deliver an appropriate and effective adjustment.

Medicare guidelines require the presence of two of the four P.A.R.T. features to be present to demonstrate medical necessity. At least one of the features must be A and/or R.⁶ This makes the job of the chiropractic physician easier since spectrum children cannot communicate pain in the way a non-spectrum individual can.

At Kentuckiana Children's Center, the majority of our patients are ASD children. We also have a wide variety of children with genetic syndromes, like Down Syndrome, and other complex diagnoses that present with varying levels of function. Optimally, after an examination and differential diagnosis and treatment plan are in place, a patient is adjusted. This could happen on the first visit in an acute case or second office visit after a report of findings. We have observed when working with spectrum children, it may take several visits to establish trust so that hands-on work can be accomplished. The treatment environment must be soothing, as non-clinical as possible and quiet. Loud, bright environments are more likely to stimulate unwanted behaviors and make the treatment of the child impossible.

If the parent is accustomed to using them, the use of "social stories" before initial and subsequent visits may facilitate the child's willingness to be treated. Social stories are pictures, videos and discussions of the steps it takes to get through an event, procedure or a day.⁷ Use of these tools allows the child time to process a new experience. Once the child is accustomed to the experience, office visits become easier to manage.

It is also important to note that most spectrum children are unable to tolerate light touch. Activator checks, Total Body Modification (TBM) analysis and other techniques that involve analysis via brushing or lightly touching a body part could provoke an unwanted, and possibly violent, reaction. As much as possible, firm, intentional touch is preferred and can have a calming effect.

Once tolerance of the environment and hands-on contact is established, it is not difficult for a competent chiropractic physician to identify Asymmetry/misalignment, Range of motion abnormalities and Tissue tone, texture, and temperature abnormality. We commonly find a short leg (asymmetry), retracted scapula (asymmetry, tone), forward head carriage (asymmetry, tone), heel-to-buttock restrictions (asymmetry, tone) and limited spinal ranges-of-motion. Adjusting the ASD child, then, may be accomplished by any number of methods. We often find that children who are high functioning will tolerate Activator Method, but low functioning children will not allow this technique. Drop

table adjustment mechanisms are effective, but can be very alarming. The most frequently used techniques include Diversified, Gonstead and sustained deep pressure.

Documentation is a vital component of the care of the patient as well as the Centers for Medicare and Medicaid Services (CMS) and insurance compliance. In the case of the special needs child, many aspects of the examination may not be able to be accomplished and documented. A child's weight, height or blood pressure, for example, are often a part of the routine examination. If the record indicates that these examination features have been attempted, and an explanation of why they were not accomplished is noted, then the chiropractic physician should be well in compliance.

Ultimately, once the chiropractic physician has established rapport with the child, has a clear understanding of the case, establishes a treatment plan and obtains an informed consent from the child (if appropriate) and their parents/guardians, it is not difficult to comply with insurance mandates.

Table 1, below, compares analysis methods for the adult, the child and the special needs child. Note that since asymmetry, range-of-motion and tension/tone can be easily assessed without patient participation, there is little difference identifying these features regardless of the individual. Modifications of range-of-motion and tension/tone analysis refer to meeting the special needs child where they are at time of presentation. Behavior often dictates how much touch a child will allow. Usually, over time, even the most reluctant special needs child will allow touch.

Comparisons for documentation of P.A.R.T. in adults, children and special needs children				
	P	A	R	T
Adult	<ul style="list-style-type: none"> Ask Visual analogue scale Apprehension test Palpate heart rate before and after palpation. Pain should cause HR elevation 	<ul style="list-style-type: none"> Observation and Palpation for Asymmetry Observe patient posture and movements Palpation can be static, dynamic/shallow, moderate and deep 	<ul style="list-style-type: none"> ROM testing for Abnormal Motion Observe patient movements/behaviors Observe/Palpate Active, Passive, Resisted ROM's Instrument applied Active, Passive, Resisted ROM's 	<ul style="list-style-type: none"> Palpation for Tissue Tone and Tenderness Soft tissue light, moderate and deep palpation Joint tissue light, moderate and deep static and motion palpation
Child	<ul style="list-style-type: none"> Ask Visual analogue/modified visual analogue scales Apprehension test Palpate heart rate as above 	<ul style="list-style-type: none"> Observation and Palpation for Asymmetry Observe patient posture and movements Palpation can be static, dynamic/shallow, moderate and deep 	<ul style="list-style-type: none"> ROM testing for Abnormal Motion Observe patient movements/behaviors Observe/Palpate Active, Passive, Resisted ROM's Instrument applied Active, Passive, Resisted ROM's 	<ul style="list-style-type: none"> Palpation for Tissue Tone and Tenderness Soft tissue light, moderate and deep palpation Joint tissue light, moderate and deep static and motion palpation
Special Needs Child	<ul style="list-style-type: none"> Parental assistance: "I know my child." Observation of behavior Palpate heart rate as above Reflexive withdrawal Report of change in activity levels Sleep disturbances Elimination disturbances 	<ul style="list-style-type: none"> Observation and Palpation for Asymmetry Observe patient posture and movements Palpation can be static, dynamic/shallow, moderate and deep 	<ul style="list-style-type: none"> ROM testing for Abnormal Motions (modified for patient tolerance and ability) Observe/Palpate Active, Passive, Resisted ROM's Instrument applied Active, Passive, Resisted ROM's 	<ul style="list-style-type: none"> Palpation for Tissue Tone and Tenderness (modified for patient tolerance) Soft tissue firm, intentional palpation Joint tissue firm, intentional static and motion palpation

Case Report

A recent case illustrates these challenges when working with a special needs child with a complex diagnosis:

A.S. is a 15 year old boy who has both Down Syndrome and Dandy-Walker Syndrome. Both conditions present with communication challenges as well as pronounced physical manifestations.^{8,9} A.S. is high functioning (cognitive and motor), at about the level of an 8-9 year old. According to his parents, he has a very high pain tolerance. Dandy-Walker is a congenital malformation of the cerebellum with attendant hydrocephalus. Typically, individuals with Dandy-Walker Syndrome have positive cerebellar findings (inability to perform cross body activities, difficult toe walking, awkward finger-to-nose, etc.). Throughout much of his life, A.S. has suffered restless leg syndrome (RLS) to some degree, and it has been thought that this was a manifestation of Dandy-Walker. When afraid, A.S. will often sleep with his parents, and they report that his legs will wrap around them and continue to move throughout the night. He does not like to walk for long periods of time. When faced with new activities or environments, A.S. has difficulty with transitions such as moving from the waiting room to the treatment room, or from one table to another. He requires encouragement and coaching to make these transitions, but once he has become accustomed to the ritual, working with him becomes easier.

Recently, A.S. started complaining of pain in his lower back. His parents noted that his RLS increased and that he would moan in his sleep. It was believed that these experiences were simply secondary to his congenital abnormalities, but when the symptoms increased, A.S. was taken to an orthopedic surgeon recommended by his neurologist.

Because of the malformation of the brain, A.S. had had prior MRI studies of his head, neck, thoracic spine and lumbar spine, and a lumbar MRI was performed recently and compared to one obtained in 2011. A.S. had hyperlordosis of the lumbar spine. The 2011 study revealed a well-hydrated L5-S1 intervertebral disc with very minimal (less than 3mm) anterolisthesis of L5 on S1. The follow-up study performed in 2015 demonstrated no structural change except disc dehydration. The anterolisthesis was unchanged. The orthopedic surgeon recommended complex surgery that would result in fusion of the joint.

A.S. consulted with KCC and extensive orthopedic, neurologic and chiropractic analyses were performed. Findings included a positive Gillet's test, extreme tension of the lumbar paraspinal muscles, spasm of the right piriformis (no radicular signs were present or reported), diminished internal femoral rotation and subluxation at the right sacroiliac joint, L3, L4, L5 and at C7. A.S. could not walk on his toes (though heel walk was normal), cross body was very difficult and finger-to-nose was awkward. Patellar and Achille's reflexes were normal. L1-S1 myotomes were normal. Given the fact that the anterolisthesis was stable, a course of chiropractic rehabilitation was prescribed.

Treatment included specific chiropractic adjusting using diversified and Gonstead methods, ultrasound therapy (3mHz, .5w/cm² at 20% output for 5 minutes), kinesiotape (star pattern). When capable, strategies were discussed to accomplish neuromuscular reeducation. Because it was a challenge getting A.S. to understand core exercises it was determined that since Biering- Sorensen's posture¹⁰ evaluates core muscle stability by challenging these muscles, we could use the posture as an exercise. A.S. was advised to perform Sorensen's at least once per day with the help of his brother. A.S. would lie face down on his bed with his upper body extended off the bed at just below the waist. His brother would sit on or hold his legs down. He would try to keep his upper body parallel to the floor with his arms folded against his chest for as long as he could with a goal of building his endurance and maintaining the horizontal position for two minutes. Rebounding on a physio ball was also advised for a minimum of 20 minutes each day to provoke imbibition of the intervertebral discs.

After the first visit, RLS was reduced. Piriformis spasm was absent though lumbar paraspinal muscle tension persisted. A.S. reported having no pain. His parents were delighted that he was walking longer distances, something he had never done in the past. A.S. never put his shoes on while standing, always preferring to sit. At the end of the second session, his mother noticed he was standing to put on shoes, something he had never done. He was not coming in to his parents' room at night with the frequency to which the family had become accustomed. By the fifth visit, A.S. required adjusting only at the level of L5 and lumbar paraspinal tension had reduced somewhat. Ultrasound was discontinued and exercise time was increased. By the ninth session, A.S. was sleeping soundly through the night. He had a slight left heel-to-buttock restriction and subluxation at L5 only. A.S. currently has no reported lower back pain. His RLS is greatly reduced and he is walking longer distances.

Discussion

A.S.'s case suggests that the frequency and intensity of his RLS combined with his dislike of walking any distance and his inability to put on his shoes while standing represented pain, which he only verbalized recently. Effects that were believed to be exclusively secondary to congenital brain malformation were also secondary to pain that A.S. could not express the way someone without these challenges would be able to do. Increased tolerance of walking and changes in dressing suggest that the way he did these things in the past was accomplished to avoid pain. Working with this kind of patient places greater responsibility on the chiropractic physician to investigate presentations that can appear to be unrelated to other pathologies.

Broadening the chiropractic physician's knowledge base can be accomplished through continuing postgraduate

education as well as the wealth of information available through special interest groups, research and government sites. The list of sites is ever expanding and additional or diagnosis specific sites as well as past and current research are easily accessed through routine search engines.

Parents are also a wealth of information when it comes to understanding the diagnosis and needs of their child as most have exhaustively researched this information themselves and talked extensively with many health care providers in many fields who are participating in their child's health care program. Interdisciplinary communication is also a source of information and support as all parties should be working towards the child's optimum health and function and understanding the role of each practitioner will ultimately be in the child's best interest. Chiropractic physicians need to be persistent in their communication to assure the safety and well being of the child especially if there are complicating factors that could alter the technique, frequency or force

of the adjustments (as in an unstable atlantoaxial junction in a child with Down Syndrome¹¹). For reasons such as this, ongoing education and communication are vital when providing chiropractic care for the special needs child.

Conclusion

It has been the clinical experience of chiropractic physicians and other health care professionals at Kentuckiana Children's Center that many of the neuromusculoskeletal manifestations of the challenged child can be well managed and functional improvement attained when delivered in conjunction with many of the other rehabilitative services (occupational therapy, physical therapy, speech therapy, feeding therapies, etc). It is imperative that chiropractic physicians understand the value of their services to this population and seek the support and education to establish a comfort level with these patients and their care. Appropriate examination and documentation procedures will also assure appropriate reimbursement for services.

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Manual Interventions for Musculoskeletal Factors in Infants With Suboptimal Breastfeeding: A Scoping Review.

Cheryl Hawk, DC, PhD, Amy Minkalis, DC, MS, Carol Webb, MA, MLIS, Olivia Hogan, and Sharon Vallone, DC.
J Evid Based Integr Med. 2018; 23: 2515690X18816971. Published online 2018 Dec 12. doi: 10.1177/2515690X18816971.

ABSTRACT

Exclusive breastfeeding for the first six months, and continuing for at least the first year of life, is strongly recommended. Suboptimal breastfeeding, which is breastfeeding that does not meet these recommendations, is a multifactorial issue. Some authorities, particularly in the nursing and lactation counseling professions, have identified musculoskeletal issues that may interfere with successful breastfeeding. The purpose of this project was to survey the literature on manual treatments to correct musculoskeletal dysfunctions in infants with suboptimal breastfeeding. Our research question, “Have manual interventions been used to correct infants’ musculoskeletal dysfunctions thought to be linked to suboptimal breastfeeding?” We searched PubMed and Index to Chiropractic Literature, from inception through July 2018, as well as relevant gray literature. We assessed quality of randomized controlled trials (RCTs) and cohort studies using modified SIGN checklists, and the overall strength of evidence using GRADE. The search yielded 461 articles, with a final inclusion of 27 articles: 7 expert commentaries, 1 high-quality RCT, 1 low-quality cohort, 1 pilot study, 2 cross-sectional surveys, 5 narrative reviews, and 10 case series or case reports. Combining the 10 case series and reports in our search with 18 discussed in narrative reviews included in our review yielded 201 infants who received manual therapy for nursing dysfunction. No serious adverse events were reported and improvement in nursing ability was observed using various outcome measures, usually maternal report. Based on the GRADE criteria, there is moderate positive evidence for the effect of manual therapy on suboptimal breastfeeding.

Keywords: spinal manipulation, breastfeeding, manual therapy, infants.

Association of Maternal Use of Folic Acid and Multivitamin Supplements in the Periods Before and During Pregnancy With the Risk of Autism Spectrum Disorder in Offspring.

Stephen Z. Levine, PhD, Arad Kodesh, MD, Alexander Viktorin, PhD, Lauren Smith, BA, Rudolf Uher, MD, PhD, Abraham Reichenberg, PhD, and Sven Sandin, PhD.

JAMA Psychiatry. 2018 Feb; 75(2): 176—184. [Published online](#) 2018 Jan 3.

ABSTRACT

Importance: The association of maternal use of folic acid and multivitamin supplements before and during pregnancy with the risk of autism spectrum disorder (ASD) in offspring is unclear. **Objective:** To examine the associations between the use of maternal folic acid and multivitamin supplements before and during pregnancy and the risk of ASD in offspring. **Design, Setting, and Participants:** A case-control cohort study of 45 300 Israeli children born between January 1, 2003, and December 31, 2007, were followed up from birth to January 26, 2015, for the risk of ASD. The cases were all children diagnosed with ASD and the controls were a random sample of 33% of all live-born children. **Exposures:** Maternal vitamin supplements were classified for folic acid (vitamin B9), multivitamin supplements (Anatomical Therapeutic Chemical A11 codes vitamins A, B, C, and D), and any combination thereof exposed in the intervals before and during pregnancy. **Main Outcomes and Measures:** The association between maternal vitamin supplementation and the risk of ASD in offspring was quantified with relative risks (RRs) and their 95% CIs fitting Cox proportional hazards regression models adjusted for confounders. Sensitivity analyses were performed to test the robustness of the results. **Results:** Of the 45 300 children in the study (22 090 girls and 23 210 boys; mean [SD] age, 10.0 [1.4] years at the end of follow-up), 572 (1.3%) received a diagnosis of ASD. Maternal exposure to folic acid and/or multivitamin supplements before pregnancy was statistically significantly associated with a lower likelihood of ASD in the offspring compared with no exposure before pregnancy (RR, 0.39; 95% CI, 0.30-0.50; $P < .001$). Maternal exposure to folic acid and/or multivitamin supplements during pregnancy was statistically significantly associated with a lower likelihood of ASD in offspring compared with no exposure during pregnancy (RR, 0.27; 95% CI, 0.22-0.33; $P < .001$). Corresponding RRs were estimated for maternal exposure to folic acid before pregnancy (RR, 0.56; 95% CI, 0.42-0.74; $P = .001$), maternal exposure to folic acid during pregnancy (RR, 0.32; 95% CI, 0.26-0.41; $P < .001$), maternal exposure to multivitamin supplements before pregnancy (RR, 0.36; 95% CI, 0.24-0.52; $P < .001$), and maternal exposure to multivitamin supplements during pregnancy (RR, 0.35; 95% CI, 0.28-0.44; $P < .001$). The results generally remained statistically significant across sensitivity analyses. **Conclusions and Relevance:** Maternal exposure to folic acid and multivitamin supplements before and during pregnancy is associated with a reduced risk of ASD in the offspring compared with the offspring of mothers without such exposure.

Early Acid Suppression Therapy Exposure and Fracture in Young Children.

Laura Malchodi, Kari Wagner, Apryl Susi, Gregory Gorman, and Elizabeth Hisle-Gorman.

Am J Phys Anthropol. 2018 Nov;167(3):628-643. doi: 10.1002/ajpa.23690. Epub 2018 Aug 29. [PubMed.gov](#)

Pediatrics July 2019, [Vol. 144 / Issue 1](#)

ABSTRACT

BACKGROUND: Acid suppression therapy (AST), including proton pump inhibitors (PPIs) and histamine H2-receptor antagonists (H2RAs), is frequently prescribed to treat symptomatic gastroesophageal reflux in otherwise healthy infants. PPI use has been associated with increased fracture risk in older adults; 2 preliminary studies in children have conflicting results. **METHODS:** A retrospective cohort of children born 2001 to 2013 who were followed for ≥ 2 years was formed. Those with osteogenesis imperfecta, cholestasis, or child maltreatment were excluded. Prescription data were used to identify AST prescription before age 1 year. International Classification of Diseases, Ninth Revision, Clinical Modification codes identified fractures after age 1 year. A Cox proportional hazard analysis assessed fracture hazard and was adjusted for sex, prematurity, low birth weight, previous fracture, anti-epileptics, and overweight or obesity. **RESULTS:** Of 851 631 included children, 97286 (11%) were prescribed AST in the first year of life; 7998 (0.9%) children were prescribed PPI, 71578 (8%) were prescribed H2RA, and 17710 (2%) were prescribed both a PPI and H2RA. Infants prescribed AST had an earlier median first fracture age (3.9 vs 4.5 years). After adjustment, increased fracture hazard was associated with PPI use (21%) and PPI and H2RA use (30%), but not H2RA use alone. Longer duration of AST treatment and earlier age of first AST use was associated with increased fracture hazard. **CONCLUSIONS:** Infant PPI use alone and together with H2RAs is associated with an increased childhood fracture hazard, which appears amplified by days of use and earlier initiation of ASTs. Use of AST in infants should be weighed carefully against possible fracture.

Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents.

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SUBCOMMITTEE ON CHILDREN AND ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVE DISORDER, *PEDIATRICS* Volume 144, number 4, October 2019. [Available online.](#)

ABSTRACT

Attention-deficit/hyperactivity disorder (ADHD) is one of the most common neurobehavioral disorders of childhood and can profoundly affect children's academic achievement, well-being, and social interactions. The American Academy of Pediatrics first published clinical recommendations for evaluation and diagnosis of pediatric ADHD in 2000; recommendations for treatment followed in 2001. The guidelines were revised in 2011 and published with an accompanying process of care algorithm (PoCA) providing discrete and manageable steps by which clinicians could fulfill the clinical guideline's recommendations. Since the release of the 2011 guideline, the Diagnostic and Statistical Manual of Mental Disorders has been revised to the fifth edition, and new ADHD-related research has been published. These publications do not support dramatic changes to the previous recommendations. Therefore, only incremental updates have been made in this guideline revision, including the addition of a key action statement related to diagnosis and treatment of comorbid conditions in children and adolescents with ADHD. The accompanying process of care algorithm has also been updated to assist in implementing the guideline recommendations. Throughout the process of revising the guideline and algorithm, numerous systemic barriers were identified that restrict and/or hamper pediatric clinicians' ability to adopt their recommendations. Therefore, the subcommittee created a companion article (available in the Supplemental Information) on systemic barriers to the care of children and adolescents with ADHD, which identifies the major systemic-level barriers and presents recommendations to address those barriers; in this article, we support the recommendations of the clinical practice guideline and accompanying process of care algorithm.

Is cesarean section delivery associated with autism spectrum disorder?

Al-Zalabani AH1, Al-Jabree AH, Zeidan ZA.

Neurosciences (Riyadh). 2019 Jan;24(1):11-15. doi: [10.17712/nsj.2019.1.20180303](https://doi.org/10.17712/nsj.2019.1.20180303).

ABSTRACT

OBJECTIVE: To investigate a correlation between birth by caesarean section and autism spectrum disorder (ASD). **METHODS:** A case-control study with a case to control ratio of 1:2 was performed in Al-Madina Al-Munawarah city, Kingdom of Saudi Arabia during the year 2016. The cases were selected according to the eligibility criteria and children attending a well-baby clinic in the same hospital, were chosen as the control group subjects. Data was collected from the medical records and an interview-based questionnaire was administered to the mothers. The chi-square test was used for bivariate analysis and logistic regression to estimate the crude and adjusted odds ratios (ORs). **RESULTS:** Eighty-seven cases of ASD and 174 control group subjects were included in the current study. Approximately 39% (n=34) of the 87 children with ASD were delivered by cesarean section compared to 21% (n=36) of the 174 children in the control group. After adjusting for potentially confounding factors, the adjusted OR was 2.9 (95% confidence interval [CI]: 1.57-5.35). **CONCLUSION:** An association between delivery by cesarean section and ASD was found in this study, in support of the findings of other studies. It is recommended that preventive measures are adopted to avoid unnecessary cesarean sections.

Association of Cesarean Delivery With Risk of Neurodevelopmental and Psychiatric Disorders in the Offspring: A Systematic Review and Meta-analysis.

Zhang T, Sidorchuk A, Sevilla-Cermeño L, Vilaplana-Pérez A, Chang Z, Larsson H, Mataix-Cols D, and Fernández de la Cruz L.

JAMA Netw Open. 2019 Aug 2;2(8):e1910236.

ABSTRACT

Importance: Birth by cesarean delivery is increasing globally, particularly cesarean deliveries without medical indication. Children born via cesarean delivery may have an increased risk of negative health outcomes, but the evidence for psychiatric disorders is incomplete. **Objective:** To evaluate the association between cesarean delivery and risk of neurodevelopmental and psychiatric disorders in the offspring. **Data Sources:** Ovid MEDLINE, Embase, Web of Science, and PsycINFO were searched from inception to December 19, 2018. Search terms included all main mental disorders in the Diagnostic and Statistical Manual of Mental Disorders (Fifth Edition). **Study Selection:** Two researchers independently selected observational studies that examined the association between cesarean delivery and neurodevelopmental and psychiatric disorders in the offspring. **Data Extraction and Synthesis:** Two researchers independently extracted data according to Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) and Meta-analysis of Observational Studies in Epidemiology (MOOSE) reporting guidelines and assessed study quality using the Newcastle-Ottawa Scale. Random-effects meta-analyses were used to pool odds ratios (ORs) with 95% CIs for each outcome. Sensitivity and influence analyses tested the robustness of the results. **Main Outcomes and Measures:** The ORs for the offspring with any neurodevelopmental or psychiatric disorder who were born via cesarean delivery compared with those were born via vaginal delivery. **Results:** A total of 6953 articles were identified, of which 61 studies comprising 67 independent samples were included, totaling 20 607 935 deliveries. Compared with offspring born by vaginal delivery, offspring born via cesarean delivery had increased odds of autism spectrum disorders (OR, 1.33; 95% CI, 1.25-1.41; I² = 69.5%) and attention-deficit/hyperactivity disorder (OR, 1.17; 95% CI, 1.07-1.26; I² = 79.2%). Estimates were less precise for intellectual disabilities (OR, 1.83; 95% CI, 0.90-3.70; I² = 88.2%), obsessive-compulsive disorder (OR, 1.49; 95% CI, 0.87-2.56; I² = 67.3%), tic disorders (OR, 1.31; 95% CI, 0.98-1.76; I² = 75.6%), and eating disorders (OR, 1.18; 95% CI, 0.96-1.47; I² = 92.7%). No significant associations were found with depression/affective psychoses or nonaffective psychoses. Estimates were comparable for emergency and elective cesarean delivery. Study quality was high for 82% of the cohort studies and 50% of the case-control studies. **Conclusions and Relevance:** The findings suggest that cesarean delivery births are associated with an increased risk of autism spectrum disorder and attention-deficit/hyperactivity disorder, irrespective of cesarean delivery modality, compared with vaginal delivery. Future studies on the mechanisms behind these associations appear to be warranted.

Proton Pump Inhibitors and Fracture Risk: A Review of Current Evidence and Mechanisms Involved.

Benjamin Ka Seng Thong, Soelaiman Ima-Nirwana, and Kok-Yong Chin.

Int J Environ Res Public Health. 2019 May; 16(9): 1571. [Published online](#) 2019 May 5.

ABSTRACT

The number of patients with gastroesophageal problems taking proton pump inhibitors (PPIs) is increasing. Several studies suggested a possible association between PPIs and fracture risk, especially hip fractures, but the relationship remains contentious. This review aimed to investigate the longitudinal studies published in the last five years on the relationship between PPIs and fracture risk. The mechanism underlying this relationship was also explored. Overall, PPIs were positively associated with elevated fracture risk in multiple studies ($n = 14$), although some studies reported no significant relationship ($n = 4$). Increased gastrin production and hypochlorhydria are the two main mechanisms that affect bone remodeling, mineral absorption, and muscle strength, contributing to increased fracture risk among PPI users. As a conclusion, there is a potential relationship between PPIs and fracture risks. Therefore, patients on long-term PPI treatment should pay attention to bone health status and consider prophylaxis to decrease fracture risk.

Keywords: bone, compression, omeprazole, osteoporosis, pantoprazole.

Spinal manual therapy in infants, children and adolescents: A systematic review and meta-analysis on treatment indication, technique and outcomes.

Driehuis F, Hoogeboom TJ, Nijhuis-van der Sanden MWG, de Bie RA, and Staal JB.

PLoS One. 2019 Jun 25;14(6):e0218940. [doi: 10.1371/journal.pone.0218940](#). eCollection 2019.

ABSTRACT

BACKGROUND: Studies on effectiveness and safety of specific spinal manual therapy (SMT) techniques in children, which distinguish between age groups, are lacking. **OBJECTIVE:** To conduct a systematic review of the evidence for effectiveness and harms of specific SMT techniques for infants, children and adolescents. **METHODS:** PubMed, Index to Chiropractic Literature, Embase, CINAHL and Cochrane Library were searched up to December 2017. Controlled studies, describing primary SMT treatment in infants (<1 year) and children/adolescents (1-18 years), were included to determine effectiveness. Controlled and observational studies and case reports were included to examine harms. One author screened titles and abstracts and two authors independently screened the full text of potentially eligible studies for inclusion. Two authors assessed risk of bias of included studies and quality of the body of evidence using the GRADE methodology. Data were described according to PRISMA guidelines and CONSORT and TIDieR checklists. If appropriate, random-effects meta-analysis was performed. **RESULTS:** Of the 1,236 identified studies, 26 studies were eligible. Infants and children/adolescents were treated for various (non-)musculoskeletal indications, hypothesized to be related to spinal joint dysfunction. Studies examining the same population, indication and treatment comparison were scarce. Due to very low quality evidence, it is uncertain whether gentle, low-velocity mobilizations reduce complaints in infants with colic or torticollis, and whether high-velocity, low-amplitude manipulations reduce complaints in children/adolescents with autism, asthma, nocturnal enuresis, headache or idiopathic scoliosis. Five case reports described severe harms after HVLA manipulations in four infants and one child. Mild, transient harms were reported after gentle spinal mobilizations in infants and children, and could be interpreted as side effect of treatment. **CONCLUSIONS:** Based on GRADE methodology, we found the evidence was of very low quality; this prevented us from drawing conclusions about the effectiveness of specific SMT techniques in infants, children and adolescents. Outcomes in the included studies were mostly parent or patient-reported; studies did not report on intermediate outcomes to assess the effectiveness of SMT techniques in relation to the hypothesized spinal dysfunction. Severe harms were relatively scarce, poorly described and likely to be associated with underlying missed pathology. Gentle, low-velocity spinal mobilizations seem to be a safe treatment technique in infants, children and adolescents. We encourage future research to describe effectiveness and safety of specific SMT techniques instead of SMT as a general treatment approach.

Treatment of Glenohumeral Subluxation: A Review of the Literature and Considerations for Pediatric Population.

Cole A, and Cox T.

Am J Phys Med Rehabil. 2019 Aug;98(8):706-714. [Available online](#) at PubMed.

ABSTRACT

OBJECTIVE: The aim of this review was to identify treatment strategies in the research literature to inform all health professionals on best practice strategies when addressing glenohumeral subluxation. **DESIGN:** Articles were identified by searching electronic databases. Two reviewers independently appraised the methodological quality of the selected studies. Discrepancies were resolved after corroboration of results. **RESULTS:** Research literature pertaining to five major treatment strategies was found (n = 40 peer-reviewed publications), spanning evidence levels I-V. The greatest number of studies concerned neuromuscular electrical stimulation (n = 19), five of which were level I studies, followed by manual preventive strategies, such as slings (n = 20), three of which were level I studies. **CONCLUSIONS:** These findings indicate that the most high-quality research supports using neuromuscular electrical stimulation or manual preventive studies, although no studies used direct comparison methods to ascertain relative merits of each type of intervention when compared with others. No evidence suggested that harm was done by using neuromuscular electrical stimulation or manual preventive methods. This literature review suggests that the identified treatment strategies should be considered by clinicians as the treatment of choice for GHS. No literature was identified that reviewed treatment strategies in a pediatric population; however, the authors considerations for treatment in the pediatric population were included.

Prevalence of Gastroesophageal Reflux Disease Symptoms in Infants and Children: A Systematic Review.

Singendonk M, Goudswaard E, Langendam M, van Wijk M, van Etten-Jamaludin F, Benninga M, and Tabbers M.

J Pediatr Gastroenterol Nutr. 2019 Jun;68(6):811-817. [Available online](#) at PubMed.

ABSTRACT

OBJECTIVE: Gastroesophageal reflux disease (GERD) is defined as gastroesophageal reflux causing troublesome symptoms or complications. In this study we reviewed the literature regarding the prevalence of GERD symptoms in infants and children. **METHODS:** Databases of PubMed, EMBASE, and Cochrane were systematically searched from inception to June 26, 2018. English-written studies based on birth cohort, school-based, or general population samples of ≥ 50 children aged 0 to 21 years were included. Convenience samples were excluded. **RESULTS:** In total, 3581 unique studies were found, of which 25 studies (11 in infants and 14 in children) were included with data on the prevalence of GERD symptoms comprising a total population of 487,969 children. In infants (0-18 months), GERD symptoms are present in more than a quarter of infants on a daily basis and show a steady decline in frequency with almost complete disappearance of symptoms at the age of 12 months. In children older than 18 months, GERD symptoms show large variation in prevalence between studies (range 0%-38% of study population) and overall, are present in >10% and in 25% on respectively a weekly and monthly basis. Of the risk factors assessed, higher body mass index and the use of alcohol and tobacco were associated with higher GERD symptom prevalence. **CONCLUSIONS:** This systematic review demonstrates that the reported prevalence of GERD symptoms varies considerably, depending on method of data collection and criteria used to define symptoms. Nevertheless, the high reported prevalence rates support better investment of resources and educational campaigns focused on prevention.

Planning Well-Balanced Vegetarian Diets in Infants, Children, and Adolescents: The VegPlate Junior.

Baroni L, Goggi S, Battino M.

J Acad Nutr Diet. 2019 Jul;119(7):1067-1074. DOI: <https://doi.org/10.1016/j.jand.2018.06.008>

ABSTRACT

Vegetarian diets, defined as being devoid of flesh foods (such as meat, poultry, wild game, seafood, and their products), are followed by a growing number of people worldwide because of ethical, health, and environmental reasons. Vegetarian diets include a variety of plant-based foods such as grains, legumes, nuts and seeds, fruits, and vegetables, and may or may not include dairy products and eggs. Vegan diets exclude all animal foods. Although for over 30 years we have known that well-planned vegetarian diets, including vegan, are nutritionally adequate and promote regular growth from the early years of human development on, some researchers still discourage parents from raising vegetarian children.

Musculoskeletal Injury Risk After Sport-Related Concussion: A Systematic Review and Meta-analysis.

McPherson AL, Nagai T, Webster KE, and Hewett TE.

Am J Sports Med. 2019 Jun;47(7):1754-1762. doi: [10.1177/0363546518785901](https://doi.org/10.1177/0363546518785901). Epub 2018 Aug 3.

ABSTRACT

BACKGROUND: Clinical management of sport-related concussion typically involves a symptom checklist, clinical examination of mental status, and neurocognitive testing. However, recent studies have identified unresolved, impaired sensorimotor function after athletes return to sport. A review and meta-analysis of all current literature regarding risk of subsequent musculoskeletal (MSK) injury after concussion has yet to be published in the medical literature. **PURPOSE/HYPOTHESIS:** To determine the odds that athletes will sustain MSK injury after concussion. It was hypothesized a priori that concussion would increase the risk for MSK injury. **STUDY DESIGN:** Systematic review and meta-analysis. **METHODS:** PubMed and Google Scholar were searched from January 2000 to November 2017. Reference lists of the included studies were manually searched. Two reviewers independently searched the literature for studies published in English that reported MSK injury after athletes returned to play following a concussion. Two independent reviewers completed data extraction using PRISMA guidelines and assessed study quality using the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies from the National Institutes of Health. Random effects meta-analyses were used to calculate odds ratio (OR) and incidence rate ratio (IRR) of MSK injury after concussion. The primary study outcome of interest was the number of athletes who sustained MSK injury after concussion. **RESULTS:** Eight studies met inclusion criteria for meta-analysis. Meta-analysis results indicated that athletes who had a concussion had 2 times greater odds of sustaining a MSK injury than athletes without concussion (OR, 2.11; 95% CI, 1.46-3.06). In addition, athletes with concussion demonstrated a higher incidence of MSK injury after return to sport compared with nonconcussed athletes (IRR, 1.67; 95% CI, 1.42-1.96). Further analysis showed that both male and female athletes with concussion were at an increased risk of MSK injury compared with their respective same-sex, nonconcussed controls (OR > 1.56, P < .01). **CONCLUSION:** Based on the evidence of higher risk of MSK injuries after concussion, standard clinical assessments for athletes with concussion should include not only physical symptoms and cognitive function before return to sport but also neuromuscular risk factors associated with increased risk for MSK injuries.

KEYWORDS: lower extremity; musculoskeletal injury risk; sport-related concussion.

A histocytological and radiological overview of the natural history of intervertebral disk: from embryonic formation to age-related degeneration.

Wang F, Zhang C, Sinkemani A, Shi R, Xie ZY, Chen L, Mao L, and Wu XT.

Eur Spine J. 2019 Apr;28(4):633-648. [Available online](#) at PubMed.

ABSTRACT

PURPOSE: To elucidate the natural history of intervertebral disk (IVD) and characterize its embryonic beginnings and age-related degeneration. **METHODS:** Coronal sections of embryonic (E13.5-neonatal) and postnatal (4-60-week-old) Sprague-Dawley rat IVD were stained by a series of histological stainings (hematoxylin and eosin, Alcian blue, Picrosirius red, Masson, Periodic acid-Schiff). Growth kinetics within embryonic IVD were evaluated by immunohistochemical staining of Ki67 and proliferating cell nuclear antigen. Postnatal maturation and degeneration of IVD were visualized on radiology by X-ray, CT, and MR imaging. **RESULTS:** During the formation of rat IVD, inner annulus fibrosus (AF) and cartilaginous endplate (CEP) shared similar cell density, extracellular matrix, and potential of growth kinetics; notochord provided increased and enlarged cytoplasmic vacuoles to generate nucleus pulposus (NP), part of which was retained within CEP. Postnatally, vacuolated notochord cells were reduced by devacuolation, while chondrocytic NP cells increased; cartilaginous layers of CEP were narrowed by vertebrae growth and secondary ossification; fibrotic portion of AF decreased as cartilaginous matrix accumulated and infiltrated outward. In aged and degenerated IVD, large longitudinal fissures were detected near the boundaries between inner and outer AF, whereas both reduced cellularity and accumulated cell clusters were evident within the dehydrated NP; only part of these histocytological changes could be reported on radiology. **CONCLUSIONS:** By showing that the natural history of IVD is orchestrated by a dynamic histocytological regulation, our study may facilitate better understanding of the developmental defects, cellular heterogeneity, age-related degenerative mechanisms, and biological regeneration of IVD. These slides can be retrieved under Electronic Supplementary Material.

KEYWORDS: Cytoplasmic Vacuole; Embryogenesis; Intervertebral Disk; Notochord; Sclerotome.

Palm Oil and Beta-palmitate in Infant Formula: A Position Paper by the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) Committee on Nutrition.

Bronsky J, Campoy C, Embleton N, Fewtrell M, Mis NF, Gerasimidis K, Hojsak I, Hulst J, Indrio F, Lapillonne A, Molgaard C, Moltu SJ, Verduci E, Vora R, Domellöf M; and the ESPGHAN Committee on Nutrition.

J Pediatr Gastroenterol Nutr. 2019 May;68(5):742-760. [Available online](#) at PubMed.

ABSTRACT

BACKGROUND: Palm oil (PO) is used in infant formulas in order to achieve palmitic acid (PA) levels similar to those in human milk. PA in PO is esterified predominantly at the SN-1,3 position of triacylglycerol (TAG), and infant formulas are now available in which a greater proportion of PA is in the SN-2 position (typical configuration in human milk). As there are some concerns about the use of PO, we aimed to review literature on health effects of PO and SN-2-palmitate in infant formulas. **METHODS:** PubMed and Cochrane Database of Systematic Reviews were systematically searched for relevant studies on possible beneficial effects or harms of either PO or SN-2-palmitate in infant formula on various health outcomes. **RESULTS:** We identified 12 relevant studies using PO and 21 studies using SN-2-palmitate. Published studies have variable methodology, subject characteristics, and some are underpowered for the key outcomes. PO is associated with harder stools and SN-2-palmitate use may lead to softer stool consistency. Bone effects seem to be short-lasting. For some outcomes (infant colic, faecal microbiota, lipid metabolism), the number of studies is very limited and summary evidence inconclusive. Growth of infants is not influenced. There are no studies published on the effect on markers of later diseases. **CONCLUSIONS:** There is insufficient evidence to suggest that PO should be avoided as a source of fat in infant formulas for health reasons. Inclusion of high SN-2-palmitate fat blend in infant formulas may have short-term effects on stool consistency but cannot be considered essential.

Practice-based interpretation of ultrasound studies leads the way to more effective clinical support and less pharmaceutical and surgical intervention for breastfeeding infants.

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Midwifery. 58 (2018) 145—155. [Available online](#).

ABSTRACT

Background: Parents resort to infant formula because of unsettled behaviour, breast and nipple pain, and growth concerns. Although 96% of Australian women want to breastfeed, by the end of three months only 39% are able to do so exclusively (Australian Institute of Health and Welfare, 2011). The most common reasons parents give for introducing infant formula are perceptions of low supply (usually because of unsettled infant behaviour), breast and nipple pain, difficulty with latching and sucking, unsettled infant behaviour, and infant weight concerns (Brown et al., 2014; Li et al., 2008; Odom et al., 2013; Redsell et al., 2010). Unsettled infant behaviour, breastfeeding difficulties, and lactation-related breast pain. **Background:** breastfeeding optimizes health outcomes for both mothers and infants. Although most women want to breastfeed, they report commencing infant formula because of nipple pain, unsettled infant behaviour, and infant growth concerns. To date, existing approaches to fit and hold ('latch and positioning') have been demonstrated not to help breastfeeding outcomes, and women report widespread dissatisfaction with the quality of support and conflicting advice they receive. Breast and nipple pain, difficulty with latching and sucking, fussing at the breast, back-arching, marathon feeds, excessively frequent feeds, poor weight gain, breast refusal, and crying due to poor satiety often signal suboptimal positional instability and impaired milk transfer, but may be misdiagnosed as medical conditions. Over the past two decades, there has been an exponential increase in numbers of infants being treated with medications, laser or scissors frenotomy, and manual therapy for unsettled behaviour and breastfeeding difficulty. New approaches to clinical breastfeeding support are urgently required. **Method and results:** we analyzed the findings of a literature search of PubMed and MEDLINE databases for ultrasound studies measuring sucking in term and preterm infants. The findings demonstrate that the Stripping Action Model of infant suck during breastfeeding, and the resultant Structural Model of infant suck dysfunction, are inaccurate. Instead, ultrasound data demonstrates the critical role of intra-oral vacuum for milk transfer. We integrate these two-dimensional ultrasound results with clinical experience of the third dimension, volume, to propose a Gestalt Model of the biomechanics of healthy infant suck during breastfeeding. The Gestalt Model hypothesizes that optimal intra-oral vacuums and breast tissue volumes are achieved when mother-infant positional stability eliminates conflicting intra-oral vectors, resulting in pain-free, effective milk transfer. **Conclusion:** the Gestalt Model of the biomechanics of healthy infant suck during breastfeeding opens up the possibility of a new clinical method which may prevent unnecessary medical treatments for breastfeeding problems and related unsettled infant behaviour in early life.

Keywords: Breastfeeding Infant suck, Tongue-tie, Nipple pain, Unsettled infant behavior, Breastfeeding problem, Infant crying, Upper lip tie.

Cognitive and Behavioral Consequences of Sleep Disordered Breathing in Children.

Irina Trosman and Samuel J. Trosman.

Med Sci (Basel). 2017 Dec; 5(4): 30. Published online 2017 Dec 1. doi: [10.3390/medsci5040030](https://doi.org/10.3390/medsci5040030).

ABSTRACT

There is now a plethora of evidence that children with sleep disordered breathing (SDB) show deficits in neurocognitive performance, behavioral impairments, and school performance. The following review will focus on the neurobehavioral impacts of SDB, pediatric sleep investigation challenges, potential mechanisms of behavioral and cognitive deficits in children with SDB, and the impact of SDB treatment.

Keywords: sleep disordered breathing, obstructive sleep apnea, children, attention, learning, behavior.

Altered Regional Brain Cortical Thickness in Pediatric Obstructive Sleep Apnea.

Paul M. Macey, Leila Kheirandish-Gozal, Janani P. Prasad, Richard A. Ma, Rajesh Kumar, Mona F. Philby, and David Gozal.

Front Neurol. 2018; 9: 4. Published online 2018 Jan 22. doi: [10.3389/fneur.2018.00004](https://doi.org/10.3389/fneur.2018.00004).

ABSTRACT

Rationale: Obstructive sleep apnea (OSA) affects 2–5% of all children and is associated with cognitive and behavioral deficits, resulting in poor school performance. These psychological deficits may arise from brain injury, as seen in preliminary findings of lower gray matter volume among pediatric OSA patients. However, the psychological deficits in OSA are closely related to functions in the cortex, and such brain areas have not been specifically assessed. The objective was to determine whether cortical thickness, a marker of possible brain injury, is altered in children with OSA. **Methods:** We examined regional brain cortical thicknesses using high-resolution T1-weighted magnetic resonance images in 16 pediatric OSA patients (8 males; mean age \pm SD = 8.4 \pm 1.2 years; mean apnea/hypopnea index \pm SD = 11 \pm 6 events/h) and 138 controls (8.3 \pm 1.1 years; 62 male; 138 subjects from the NIH Pediatric MRI database) to identify cortical thickness differences in pediatric OSA subjects. **Results:** Cortical thinning occurred in multiple regions including the superior frontal, ventral medial prefrontal, and superior parietal cortices. The left side showed greater thinning in the superior frontal cortex. Cortical thickening was observed in bilateral precentral gyrus, mid-to-posterior insular cortices, and left central gyrus, as well as right anterior insula cortex. **Conclusion:** Changes in cortical thickness are present in children with OSA and likely indicate disruption to neural developmental processes, including maturational patterns of cortical volume increases and synaptic pruning. Regions with thicker cortices may reflect inflammation or astrocyte activation. Both the thinning and thickening associated with OSA in children may contribute to the cognitive and behavioral dysfunction frequently found in the condition.

Keywords: sleep disordered breathing, cortex, intermittent hypoxia, atrophy, obstructive sleep apnea, cognitive deficits.

Obstructive Sleep-Disordered Breathing in Children: Impact on the Developing Brain.

Walter LM, C Horne RS.

Pediatr Respirol Crit Care Med. 2018;2:58-64. [Available online](#).

ABSTRACT

Obstructive sleep-disordered breathing (SDB) affects up to 11% of children and forms a continuum of severity ranging from primary snoring to obstructive sleep apnea. Children with SDB exhibit significant neurocognitive and cardiovascular dysfunction, which is associated with repetitive hypoxia and sleep fragmentation that characterize the condition. We reviewed the recent literature pertaining to the effect of SDB on the brain in children. These include studies that utilized near-infrared spectroscopy to determine cerebral oxygenation and structural and functional magnetic resonance imaging (MRI) of the brain. Studies have identified that the effect of SDB on cerebral oxygenation in children is minimal and not clinically significant. There are conflicting reports on the association between the measures of cerebral oxygenation and peripheral arterial oxygen saturation (SpO₂), and further research needs to be conducted to elucidate the relationship between peripheral SpO₂, cerebral oxygenation, and SDB in children. MRI studies have reported significant structural and functional changes to the brains of children with SDB, in brain regions associated with neurocognition, behavior, and autonomic function. These include reduced white and gray matter and structural changes to a multitude of brain areas including, but not limited to, the hippocampus, cortex, amygdala, insula, thalamus, cerebellum, and basal ganglia. These studies utilize a variety of MRI techniques to address different research questions, but contribute to the gradually developing picture of the adverse effects of SDB on the brain in children.

Keywords: Cerebral oxygenation, MRI, obstructive sleep apnea, pediatric .

Decreased Fecal Bacterial Diversity and Altered Microbiome in Children Colonized With *Clostridium difficile*.

Chen LA, Hourigan SK, Grigoryan Z, Gao Z, Clemente JC, Rideout JR, Chirumamilla S, Rabidazeh S, Saeed S8, Elson CO, Oliva-Hemker M, Blaser MJ, and Sears CL.

J Pediatr Gastroenterol Nutr. 2019 Apr;68(4):502-508. [Available online](#) at PubMed.

ABSTRACT

OBJECTIVES: The gut microbiome is believed to play a role in the susceptibility to and treatment of *Clostridium difficile* infections (CDIs). It is, however, unknown whether the gut microbiome is also affected by asymptomatic *C difficile* colonization. Our study aimed to evaluate the fecal microbiome of children based on *C difficile* colonization, and CDI risk factors, including antibiotic use and comorbid inflammatory bowel disease (IBD). **METHODS:** Subjects with IBD and non-IBD controls were prospectively enrolled from pediatric clinics for a biobanking project (n=113). A fecal sample was collected from each subject for research purposes only and was evaluated for asymptomatic toxigenic *C difficile* colonization. Fecal microbiome composition was determined by 16S rRNA sequencing. **RESULTS:** We found reduced bacterial diversity and altered microbiome composition in subjects with *C difficile* colonization, concurrent antibiotic use, and/or concomitant IBD (all $P < 0.05$). Accounting for antibiotic use and IBD status, children colonized with *C difficile* had significant enrichment in taxa from the genera *Ruminococcus*, *Eggerthella*, and *Clostridium*. Children without *C difficile* had increased relative abundances of *Faecalibacterium* and *Rikenellaceae*. Imputed metagenomic functions of those colonized were enriched for genes in oxidative phosphorylation and beta-lactam resistance, whereas in the subjects without *C difficile*, several functions in translation and metabolism were over-represented. **CONCLUSIONS:** In children, *C difficile* colonization, or factors that predispose to colonization such as antibiotic use and IBD status were associated with decreased gut bacterial diversity and altered microbiome composition. Averting such microbiome alterations may be a method to prevent or treat CDI.

24-Hour Movement Behaviors and Impulsivity.

Michelle D. Guerrero, Joel D. Barnes, Jeremy J. Walsh, Jean-Philippe Chaput, Mark S. Tremblay and Gary S. Goldfield.

Pediatrics September 2019, 144 (3) e20190187; DOI: <https://doi.org/10.1542/peds.2019-0187>.

ABSTRACT

BACKGROUND: The objective of this study was to examine individual and concurrent associations between meeting the Canadian 24-Hour Movement Guidelines for Children and Youth (9–11 hours of sleep per night, ≤ 2 hours of recreational screen time (ST) per day, and at least 60 minutes of moderate to vigorous physical activity per day) and dimensions of impulsivity. **METHODS:** Data from this cross-sectional observational study were part of the first annual curated release of the Adolescent Brain Cognitive Development Study. Participants included 4524 children between the ages of 8 and 11 years. **RESULTS:** In analyses, it was shown that adherence to individual movement behavior recommendations as well as combinations of adherence to movement behavior recommendations were associated with each dimension of impulsivity. Meeting all 3 movement behavior recommendations was associated with lower positive urgency (95% confidence interval [CI]: -0.12 to -0.05), negative urgency (95% CI: -0.04 to -0.08), Behavioral Inhibition System (95% CI: -0.08 to -0.01), greater perseverance (95% CI: 0.09 to 0.15), and better scores on delay-discounting (95% CI: 0.57 to 0.94). Meeting the ST and sleep recommendations was associated with less impulsive behaviors on all dimensions of impulsivity: negative urgency (95% CI: -0.20 to -0.10), positive urgency (95% CI: -0.16 to -0.08), perseverance (95% CI: 0.06 to 0.15), Behavioral Inhibition System (95% CI: -0.15 to -0.03), Behavioral Activation System (BAS) reward responsiveness (95% CI: -0.04 to -0.05), BAS drive (95% CI: -0.14 to -0.06), BAS fun-seeking (95% CI: -0.15 to -0.17), and delay-discounting task (95% CI: 0.68 to 0.97). **CONCLUSIONS:** Findings support efforts to determine if limiting recreational ST while promoting adequate sleep enhances the treatment and prevention of impulsivity-related disorders.

Early Subthreshold Aerobic Exercise for Sport-Related Concussion: A Randomized Clinical Trial.

John J. Leddy, MD; Mohammad N. Haider, MD; Michael J. Ellis, MD et al; Rebekah Mannix, MD; Scott R. Darling, MD; Michael S. Freitas, MD; Heidi N. Suffoletto, MD; Jeff Leiter, PhD; Dean M. Cordingley, MSc; and Barry Willer, PhD.

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ABSTRACT

Question: What is the effectiveness of subsymptom threshold aerobic exercise vs a placebo-like stretching program prescribed to adolescents in the short term after sport-related concussion? **Findings:** In this randomized clinical trial of 103 adolescents, those assigned to aerobic exercise recovered faster (13 days) than those assigned to placebo-like stretching (17 days), a significant difference. **Meaning:** Early subthreshold aerobic exercise appears to be an effective treatment for adolescents after sport-related concussion. **Abstract:** Importance Sport-related concussion (SRC) is a significant public health problem without an effective treatment. **Objective:** To assess the effectiveness of subsymptom threshold aerobic exercise vs a placebo-like stretching program prescribed to adolescents in the acute phase of recovery from SRC. **Design, Setting, and Participants:** This multicenter prospective randomized clinical trial was conducted at university concussion centers. Male and female adolescent athletes (age 13-18 years) presenting within 10 days of SRC were randomly assigned to aerobic exercise or a placebo-like stretching regimen. **Interventions:** After systematic determination of treadmill exercise tolerance on the first visit, participants were randomly assigned to a progressive subsymptom threshold aerobic exercise or a progressive placebo-like stretching program (that would not substantially elevate heart rate). Both forms of exercise were performed approximately 20 minutes per day, and participants reported daily symptoms and compliance with exercise prescription via a website. **Main Outcomes and Measures:** Days from injury to recovery; recovery was defined as being asymptomatic, having recovery confirmed through an assessment by a physician blinded to treatment group, and returning to normal exercise tolerance on treadmill testing. Participants were also classified as having normal (<30 days) or delayed (≥30 days) recovery. **Results:** A total of 103 participants were included (aerobic exercise: n = 52; 24 female [46%]; stretching, n = 51; 24 female [47%]). Participants in the aerobic exercise group were seen a mean (SD) of 4.9 (2.2) days after the SRC, and those in the stretching group were seen a mean (SD) of 4.8 (2.4) days after the SRC. There were no differences in age, sex, previous concussions, time from injury, initial symptom severity score, or initial exercise treadmill test and physical examination results. Aerobic exercise participants recovered in a median of 13 (interquartile range [IQR], 10-18.5) days, whereas stretching participants recovered in 17 (IQR, 13-23) days (P = .009 by Mann-Whitney test). There was a nonsignificant lower incidence of delayed recovery in the aerobic exercise group (2 participants [4%] in the aerobic group vs 7 [14%] in the placebo group; P = .08). **Conclusions and Relevance:** This is, to our knowledge, the first RCT to show that individualized subsymptom threshold aerobic exercise treatment prescribed to adolescents with concussion symptoms during the first week after SRC speeds recovery and may reduce the incidence of delayed recovery.