

International peer-reviewed chiropractic pediatric history and examination forms for the infant, child, and adolescent

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ABSTRACT

The assessment of the pediatric patient is a specialized area of chiropractic practice, requiring additional knowledge and skills. In recognition of this, European Academy of Chiropractors' special interest group for pediatrics together with an international group of pediatric musculoskeletal experts have expanded on the previously published basic history and examination forms for infants, children and adolescents. The aim of these forms is to further assist the chiropractor in identifying red flags and differentially diagnosing problems in musculoskeletal and mental health as they present throughout growth and development. The process of development of the forms is outlined, and the three forms are presented in this article.

Key Words: chiropractic pediatric, pediatric history form, pediatric examination form, pediatric red flags, pediatric musculoskeletal health.

Introduction

Chiropractic education typically includes a cursory level of education within pediatrics,¹ which varies from institution to institution. Practitioners interested in pediatrics can pursue additional education through continuing professional development courses, a diplomate, a Master's degree or a PhD through a range of providers. Surveys show that the majority of practitioners see children of all ages but feel they have inadequate skills in assessment and treatment.¹

Triaging musculoskeletal and non-musculoskeletal complaints is of the highest priority for the chiropractor.² This is a vital skill and knowledge base for those seeing the pediatric patients to develop, as differential diagnosis and treatment are significantly different than in the adult patient.³ Children, and particularly infants, are not miniature adults. There are specific and different concerns for each age group which must be addressed with an appropriate history and examination. Basic forms for the infant, child and adolescent have been published to establish a minimum competency for chiropractors who lack advanced education in this area.⁴ These forms address skills specifically in musculoskeletal differential diagnosis as well as recognizing for referral the ill child ensuring safe care of this population. Additional exam forms addressing specific pediatric complaints commonly presenting to chiropractors were initiated and intended to complement the basic forms. As these were being drawn up there seemed to be unnecessary repetition so this idea was abandoned. More comprehensive history and exam forms were deemed more appropriate and are presented in this article. They address more age-specific

issues in musculoskeletal health, sensory issues, and psychosocial health. For the purposes of safety, the forms include a review of systems, a neurological examination, and red flags. The infant forms include, besides history, a review of the mothers' health and the perinatal period.

AIMS

The European Academy of Chiropractic (EAC) is working to provide cost-free postgraduate education for practitioners. One of the EAC special interest groups (SIG) is pediatrics, where members are working to advance education specific to pediatric practice. The SIG team in pediatrics published in 2021 basic history and exam forms for the infant, child and adolescent.⁴ The work since publication of these forms has been to draw up regional forms covering specific conditions within pediatric musculoskeletal health. Due to unnecessary repetition, we decided to enhance and expand the original forms to include these areas along with mental health and wellbeing in the different age groups. Psychosocial health was deemed important as it has become such a burden for some children with an increased risk for suicide in adolescents. Pediatric headache history, exam and questionnaire have been recently published separately,⁵ so this will be referenced for use in the comprehensive form. An outcome assessment for suboptimal breastfeeding with a musculoskeletal origin has been published recently⁶ and is referred to in these forms. Malignancies in children, though rare are different than those presenting in adults.⁷ Clinicians should remain abreast of current prevalence statistics and include in the differential diagnosis when appropriate. They are listed in Table 1.

Leukemia
Brain and spinal cord tumors
Neuroblastoma
Wilms tumor
Lymphoma (including both Hodgkin and non-Hodgkin)
Rhabdomyosarcoma
Retinoblastoma
Bone cancer (including osteosarcoma and Ewing sarcoma)

Table 1. Malignancies presenting in childhood

The SIG team engaged the participation of several other chiropractors, most with advanced academic education within pediatrics (Masters or PhD) to review these forms. We intentionally invited practitioners from several different countries to participate to make this an international peer-reviewed pediatric project. A long-term goal is to have these forms implemented internationally to be able to collect data for use in future research projects. The forms are also intended for use as an outline for an academic musculoskeletal pediatric post-graduate education.

The three forms presented with this article are more comprehensive than those published in 2021.⁴ They have been designed to organize the pediatric history and examination, giving it consistency, aiding the practitioner in undertaking a thorough assessment. The age groups have been changed to reflect that the period of infancy and toddlerhood were better suited together (0-2 years) than toddler with the young child (Table 2, pages 1961–1968).^{6,8,9,10}

The second group is two years to six years, the young child (Table 3, pages 1968–1976)^{5,9,10} and the third is 6-16 years which covers the child and the adolescent (Table 4, pages 1976–1983).^{5,9,10} The primary focus of the forms is on triaging common MSK and non-MSK presentations in the three pediatric age groups, and on identifying red flags for referral.¹²⁻¹⁵ In highlighting non-MSK and red flag presentations, there is an emphasis on safety, particularly identifying and referring the ill child for medical assessment and care.

These forms are intended to address musculoskeletal problems which typically present during the different stages of growth and development. These forms also address more thoroughly issues of mental health, sensory issues, and neurodevelopment in all age groups. They may be helpful not only in reaching the correct diagnosis or diagnoses in order that proper management can be recommended in a timely manner, but that children who need co-management are recognized early in the process.

Process

The pediatric history, examination and red flag forms have been reviewed by 24 different chiropractors, representing 10 different countries: Australia, Belgium, Canada, Cyprus, Denmark, Germany, Malaysia, Norway, South Africa, Sweden, Switzerland, the UK and the United States. The UK was over-represented with nine chiropractors participating. Six participants have a DC degree of which two have a diplomate, fifteen of the participants have MSc in advanced pediatric musculoskeletal health, and three have a PhD with focus in pediatrics. Twenty-three participants work clinically with patients, two of which have graduated less than five years ago.

This process started on December 13, 2022. Thirty-two chiropractors were contacted of which eight chiropractors either did not respond or did not want to participate. One of these chiropractors had a conflict of interest as she is preparing pediatric history and exam forms for financial gain. Emails, tele-conferences, and telephone calls have been made monthly since then to ask for participation, to disperse and discuss each of the forms and to remind participants about the forms. Twenty-three participants who agreed to evaluate the forms reviewed and commented on all three forms, one participant commented on just the child form. Changes were made based on comments and the final iteration was then shared with educators within the field for their final comments. Recent graduates were asked to review the final forms for their completeness and practicality. All participants were asked for their permission to publish their names with educational degrees or diplomate.

Recommendations for chiropractors

It is recommended that chiropractors and other practitioners using manual therapy who are working with pediatrics regardless of their specialty education review these comprehensive forms to enhance their skills. Those without advanced education in pediatrics are encouraged to adopt these more comprehensive forms for clinical practice. Due to the comprehensive nature of the forms, it is understood that the practitioner should focus on the area of complaint and get more detailed information in areas that are problematic. The infant form differs in that it guides the practitioner through a detailed history before the primary complaint. The information gathered gives more clues to the origin of the problem and direction for the exam. Although the forms may be a bit cumbersome for the seasoned practitioner, they guide the newer and less experienced practitioners through a thorough process. These forms address psychosocial health, sensory and neurodevelopmental issues which may be new for the more experienced chiropractor and serve as a good reference in this area. Just as these forms reflect the fact that the child is growing and developing, treatment is also adjusted based on age and development.

A series of recorded lectures to accompany these forms are in progress, discussing key aspects of the history and examination of the pediatric patient. These will be soon available through the European Chiropractic Union home page, European Academy of Chiropractic (EAC) and the EAC Academy.

Conclusion

These forms represent a more comprehensive musculoskeletal assessment of pediatric patients from infancy through adolescence with a goal to ensure safe and effective management. The implementation of these forms should not only raise competence of practitioners, but with widespread use, enable data collection on a large scale for

future research. The forms are also to serve as an outline for a postgraduate pediatric education in musculoskeletal health. The work to provide these clinical exam forms is to elevate the safety and quality of care provided by chiropractors to infants, children, and their families.

Limitations

The age groups presented cover more than one area of development. Ideally the pediatric forms should be more specific to distinctive periods of growth and development. Future work in this area would be to further breakdown the age groups and have forms for the neonate, infant, preschooler, child, pre-adolescent, and adolescent.

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Pediatric History:		
Patient information and consent		
Patient name		
Patient date of birth		
Parent/guardian names, ages, nationality		
Legal relationship to child		
Family situation		
General practitioner/pediatrician		
Consent to contact other healthcare practitioners		
Consent to exam and care		
Date		
Consent to use anonymized data confidentially for research		
Antenatal health		
Perinatal mental health		
Maternal Stress		
Depression ⁷		
Maternal prenatal health		
Biomechanical status		
Mode of conception		
Medications, supplements		
Migraine headaches		
Previous pregnancies		
Birth		
Duration of pregnancy (gestation)	_____ weeks	_____ days
Fetal health in pregnancy	_____ 1st stage	_____ hours
Active fetus	_____ 2nd stage	_____ hours
Onset of labor	_____ 3rd stage	_____ how long after birth, complications?
Duration of labor		
Ease of birth		
Fetal presentation		
Fetal distress		
Intervention during labor/birth Emergency C-section		
Medication perinatally analgesia (mother, infant) Antibiotics, drugs, alcohol		
Antibiotics, drugs, alcohol		
Delivery: hospital, home		
Injury or stress to neonate after birth (e.g. facial bruising, cephalohaematoma), meconium, jaundice		
Infant medical conditions at birth		
Congenital anomalies		

Table 2. Chiropractic pediatric history and exam form ages 0-2 years

Pediatric History, continued:	
Baby's health after birth (APGAR) Delayed cord clamping Postnatal skin to skin Neonatal care Duration NICU Intervention for mother	
Feeding⁶	
How soon after birth breastfed	
Did baby successfully breastfeed directly after delivery	
How/what is baby primarily fed?	
Breast, bottle, other	Type of bottle /nipple
Feeding equally from both sides	
Good latch, efficient feeding	
Concern about tongue-tie 6	
Painful to breastfeed	
Reflux	
Feeding frequency	
Age of introduction solid foods? Interest in food Signs of allergy or intolerance?	
Weight gain and growth Following growth chart	
Any difficulty with or concerns about feeding?	
Crying	
Number of hours crying/day	
Pitch/ intensity	
Timing/ frequency	
Consolability	
Associated symptoms/ behaviors (e.g. pulling ears, scratching eyes)	
Sleeping	
Time and duration (24 hrs)	
Positioning (supine or other)	
Quality of sleep	
Ease of settling, falling and staying asleep Sleeping with mouth open?	
Grinding teeth or night terrors	
Grunting	

Table 2 Continuation. Chiropractic pediatric history and exam form ages 0-2 years

Pediatric History, continued:
Presenting complaint
Parent/guardian concerns Date /mode of onset associated symptoms, timing/course, aggravating and relieving factors
Character, severity, course
Previous episodes
Investigations/outcome
Additional complaints
General health
Diagnosed conditions
Suspected conditions
Medications for mother or baby: Prescribed and over-the-counter What, why, outcome, any side effects
Supplements, D vitamin
Hospital visits, diagnostic testing, imaging When, why, outcome
Other healthcare practitioners seen
Vaccinations — normal schedule followed? Adverse reactions
Family medical history Allergies, migraines, gastrointestinal problems, autoimmune disease
Review of systems
Cardio-respiratory Recurrent coughs, RS virus, wheeze, intervention
Skin Urticaria, eczema, diaper rash
Ears: malformation, hearing Eyes: eye contact, sight Nose: breathing through nose or mouth
Throat
Gastrointestinal Gas, dyschesia, constipation, Poop: consistency and color, Mucous or blood in stool or vomit
Output Number of wet and dirty diapers in 24 hours
Musculoskeletal Positional or postural preference Asymmetry of head or trunk, upright vs. supine

Table 2 Continuation. Chiropractic pediatric history and exam form ages 0-2 years

Pediatric History, continued:	
Injuries or falls	
Development Does the baby move and interact like other babies the same age? Arms, legs equally active, motor milestones for age?	
Any other thoughts or concerns not covered?	
Sensory: avoidance or seeking it	
Bright light or certain noises	
Texture or fit of clothing	
Difficulty with brushing hair, teeth or cutting nails	
Interoception	
Do they know when they become hot, cold, thirsty, hungry, full, tired, excited or ill?	
Do they react strongly to certain smells or tastes, will they avoid some foods because of the texture?	
Red Flags (indications for referral)	
Age group	Sign/symptom
Any age	Labored breathing
	Rib retractions
	Fever: 38°C or over in neonate
	Fewer than 4 heavy wet diapers in 24 hours, signs of dehydration
	Slow or halted growth (weight, length, head circumference)
	Halted or regression of development, loss of skills
	Fractures in non-ambulatory child, unexplained bruising
	From 1 -10 how problematic do you find baby's crying
Scissored or crossed legs when suspended	
Development: 1-3 months	Not responding to loud noises, no eye contact by 6 weeks Not following objects with eyes by 2-3 months
Development: 3-4 months	Not supporting head well Not weightbearing on feet when held upright Persistent flexed positioning of extremity or hand
Development: 4-7 months	Stiff or contracted muscles of extremities, extremity Hypotonia or floppiness of neck or extremities Head not held when pulled from supine to sitting by arms
Development: 8-12 months	Not crawling by 12 months Asymmetry in crawling, e.g. dragging one leg Not standing when supported Not sitting steadily by 10 months

Table 2 Continuation. Chiropractic pediatric history and exam form ages 0-2 years

Pediatric History, continued:	
Red Flags (indications for referral)	
1 year-old	Constant toe walking
red flags	Lack of reciprocal movement in crawling or walking
	Little awareness of hands, not gesturing with hands
	Not babbling or saying mamma
	Frequent falling or bumping into things
Examination	
Observations and vital signs	
General appearance symmetrical movement pattern, tonicity, postural deviations, birthmarks, unusually soft skin, skin color	
Signs of dehydration sunken fontanelle, skin turgor, dry mouth, lack of tearing	
Head, face, eyes, ears, nose Marks, bruising, swelling, discharge, rash, mucous, asymmetry	
Cardiovascular and respiratory Chest wall deformities, respiratory effort, mottling skin, capillary filling	
Abdomen Distention, rigidity, painful behavior	
Vital signs	Weight: _____ kg Length: _____ cm Head circumference: _____ cm Heart rate: _____ bpm Respiratory rate: _____ rpm Capillary refill: _____ sec Temperature: _____ °C
Musculoskeletal examination	
Hip screening	
Abduction symmetrical	Clicking in hip with abduction
Supine leg length	Galeazzi sign
Asymmetrical thigh creases or leg positioning	
Tone while suspended	
Hypermobility ⁸	
ROM feet, knees	
Upper limb/shoulder girdle	
Range of motion/tone	
Scarf sign	

Table 2 Continuation. Chiropractic pediatric history and exam form ages 0-2 years

Pediatric History, continued:	
Musculoskeletal examination, continued	
Signs of asymmetry (biomechanical assessment)	
Fixed positioning	
Asymmetrical movements	
Torticollis: SCM nodule, thickness BL	
Plagiocephaly: unilateral occipital flattening, anterior displacement of frontal or maxillary bones	
Asymmetrical size of eyes or placement of ears, mouth	
Unilateral microcephaly	
Infantile scoliosis	
Palpation	Findings
Static palpation for regional restriction, tension in associated musculature Palpatory hypersensitivity	Cervical: Thoracic: Lumbar: Pelvic: Ribs: Upper extremity: Lower extremity: TMJ: Occiput :
Passive range of motion Joint restriction, muscle tension as indicated	Cervical: Rotation lateral flexion flexion extension: Thoracic: Lumbar: Pelvic: Upper extremity: Lower extremity: Occiput:
Palpation for skull deformity, e.g. open fontanell, cranial synostosis, sutures	
Cranial measurements: Diagonals; Bitemporal; Fronto-occipital	
Neurological examination	
Reflexes: Biceps R__L__ ; Brachioradialis R__L__ ; Triceps R__L__ ; Achilles R__L__ ; Patellar R__L__	
Sensation: reacts to touch along appropriated dermatome	
Primitive Reflexes	
Moro reflex (0-4 months)	
Rooting (0-4 months)	
Palmar grasp (0-4 months)	
Galant (0-2/3 months)	
ATNR BL (asymmetrical tonic neck reflex) (6 wks)	
Babinski (0-walking)	
STNR (symmetrical tonic neck reflex)	
Parachute 8+ months	

Table 2 Continuation. Chiropractic pediatric history and exam form ages 0-2 years

Pediatric History, continued:**Neurological examination, continued****Postural reflexes from 3 months**

Head righting bilaterally

Pull to sit without head lag or asymmetry

Supports weight on feet

Ventral suspension

Vertical suspension

Cranial nerve screening	Normal/abnormal response
CN II: pupillary light reflex	
CNs III, IV, VI: extra-ocular movements	
CN V: facial sensation, mastication	
CN VII: root response (motor), blink response BL, facial expression	
CN VIII: eyes look to sound	
CN IX, X: suck/swallow/speech	
CN XI: active head rotation	
CN XII: active tongue movement	

Age	Fine Motor	Gross Motor	Adaptive	Social	Communications
4 weeks		Good head control when held erect	Occasional eye following	Recognizes facial form	Guttural sounds
8 weeks		Head up when prone	Follows	Smiles	Early cooing
12 weeks	Opens hands, grasps all objects, hand-hand, hand-mouth, foot-foot	Balances body weight on lower arms when prone	Regularly looks at objects in hand	Reaches for familiar objects	Laughs
18 weeks		Can shift body weight to one side, lift opp hand to grasp			
6 months	Uses hand in raking motion	Rolling over, both sides	Transfers from hand to hand	Plays with hands	Speech is unclear
9 months	Picks up objects using fingers and thumb	Sits unsupported	Feeds from a cup unassisted	Plays with feet, clearly shows joy / displeasure	Ma-ma, da-da, one or two recognizable words
12 months	Well-developed pincer grip, simultaneously turns 2-3 pages of a book	Crawling established	Holds bottle unassisted	Finger feeds, plays peekaboo	Gestures, jargon
18 months	Turns a page one at a time	Stands unsupported, walks with minimum assistance, runs well, walks upstairs	Builds tower of 2 cubes, feeds self with utensils, scribbles	Understands yes and no, pulls a wheeled toy	4-6 meaningful words, begins two word phrases

Table 2 Continuation. Chiropractic pediatric history and exam form ages 0-2 years

Pediatric History, continued:

Neurodevelopmental⁹

Is your child interested in playing with other children?

Do you have eye contact

When you say a word or wave your hand, will your child try to copy you?

Does your child look if you point to something across the room?

Does your child look at you when you call his or her name?

How does your child usually show you something he or she wants?

Does your child bring things to you to show them to you?

Table 2 Continuation. Chiropractic pediatric history and exam form ages 0-2 years

Pediatric History:
Patient information and consent
Patient name
Patient date of birth
Parent/guardian names
Legal relationship to child
Family situation
General practitioner/pediatrician
Consent to contact other practitioners
Consent to care
Date
Consent to use anonymized data confidentially for research
Primary complaint
Description (ask parent/guardian & child)
Date/mode of onset
Character, course since onset
Possible causes contributing factors
Severity
Injuries or falls
Aggravating factors
Relieving factors
Behavioral changes
Activities affected
Associated symptoms
Previous episodes management
Pre-school attendance, engagement
Teachers or parents' concerns
Additional complaints
Other medical conditions
General health
Diagnosed conditions When diagnosed?
Suspected conditions
Medications
Nutritional supplements

Table 3. Chiropractic pediatric history and exam form for ages 2-6

Pediatric History, continued:
Birth history
Other healthcare professionals consulted
Surgeries, diagnostic testing Interventions: what and why?
Antibiotics
Infections/tick bite
Vaccinations – normal schedule followed? Adverse reactions
Family medical history: allergy, autoimmune, GI, migraine
Review of systems
Respiratory recurrent coughs, mucous, wheeze
Skin urticaria, eczema, rough or discolored patches, bull's eye rash, ring worm, discrete discolored spots (molluscum contagiosum), ecchymosis
Gastrointestinal – pain, vomiting, gas
Output describe odor, color (urine/stool) and texture/form (stool), constipation, dry nights?
Musculoskeletal positional or postural preference asymmetry of head, trunk, or limbs abnormal range of motion head, trunk or limbs
Development moves like other children the same age? symmetry of movement meeting their expected motor milestones?
Nutrition
Diagnosed or suspected allergies/intolerances
Usual diet and any restrictions Feeding behavior
Sleep
Sleep patterns
Ease of falling asleep
Any concerns about sleep
Snoring, night terrors, apnea,
Sleeping with mouth open?

Table 3 continuation. Chiropractic pediatric history and exam form for ages 2-6

Pediatric History, continued:	
Activity levels	
Physical activity What, how long, how often Total time	
Sedentary time	
Screen time	
Activities	
Neurodevelopment	
Hyperactivity/ attention	
Cognitive/ intellectual development	
Emotional and mental health: parental concerns	
Behavioral problems	
Obsession/compulsion	
Tics	
Friends	
Crisis	
Anxiety/depression	
Learning issues	
Age-appropriate speech and language	
Sensory: avoidance or seeking it?	
Certain noises or brighter lights?	
Bothered by wearing particular clothes	
Do they often put non-edible things in their mouth, chew clothes or hair, bite nails?	
Are they ok with having their teeth and hair brushed, nails cut	
Interoception	
Do they know when they become hot, cold, thirsty, hungry, full, tired, excited or ill?	
Do they react strongly to certain smells or tastes, will they avoid some foods because of the texture?	
Headaches⁵ (headache form)	
Headaches	Family history headaches
Migraine headache	
Neck or spinal pain	
Recurrent illnesses	
Fatigue	

Table 3 continuation. Chiropractic pediatric history and exam form for ages 2-6

Pediatric History, continued:
Red Flags (indications for referral)
Sign/symptom
Labored breathing
Rib retractions
Fever
Slow or halted growth Weight, length, head circumference
Halted or regression of development (loss of skills)
Marked difference between left and right sides of body Strength, tone
Marked high or low tone, especially with impact on motor skills/development
Limp
Joint swelling
Is mother worried?
Cyanosis
Disoriented or confused child
Decreased levels of consciousness
Vomiting bile stained (green)
Seizures for the first time/focal seizures
Focal neurological signs
Non-blanching rash with fever
Neck stiffness
Non-weight bearing
Blood in stools or urines
Unexplained bruising
Persistent toe walking

Table 3 continuation. Chiropractic pediatric history and exam form for ages 2-6

Pediatric History, continued:

Developmental milestones

Age		
2 years	Fine motor	Stack 4 blocks, put round or square pegs into holes
	Gross motor	Climbs onto furniture and down, walks in stairs
3 years	Fine motor	Cuts with scissors, string beads, draw a face
	Gross motor	Hops, jumps, rhythmic movements, walks stairs alternating feet
4 years	Fine motor	Draws basic shapes, draws a house, uses pencil with good control
	Gross motor	Climbs ladders, navigates obstacles when running
5 years	Fine motor	Copies letters and numbers, ties shoelaces
	Gross motor	Walks narrow line, plays ball games, skips on alternate feet
6 years	Fine motor	Can write their names, dress themselves
	Gross motor	Good balance, run, jump, skip easily

Skills from 3 years
Jump in place with both feet
Climb up and go down a toddler slide
Pedal tricycle
Walk up and down stairs when one hand being held by an adult
Stand briefly on one foot when one hand being held by an adult
Walk backwards
Skills from 4-5 years
Hop on one foot
Tandem gait
Toe to heel gait
Do a somersault/ hop
Walk up and down stairs without help
Walk forward and backward easily
Stand on one foot > 9 seconds

Table 3 continuation. Chiropractic pediatric history and exam form for ages 2-6

Pediatric History, continued:	
Examination	
Observations and vital signs	
General appearance: movement pattern, handedness, postural deviations, torticollis, plagiocephaly, leg length, asymmetry	
Skin, joints ^s soft, extensible skin, obvious signs of hypermobility, birthmarks	
Head, face, eyes, ears, nose marks, bruising, swelling, discharge, rash, mucous, asymmetry	
Cardiovascular and respiratory chest wall deformities, respiratory effort, color	
Abdomen distention, rigidity, umbilicus	
Social interaction child and parents, child and practitioner	
Measurements	
	Weight: _____ kg/lbs
	Length: _____ cm/in
	Heart rate: _____ bpm
	Respiratory rate: _____ rpm
	Temperature: _____ °C
	Overweight/ obesity: _____
Neurological examination	
Cranial nerve screening	
CN II: Pupillary light reflex	
CNs III, IV, VI: extra-ocular movements	
CN V: facial sensation, tone mastication	
CN VII: symmetrical blink, Facial expression	
CN VIII: eyes look to sound	
CN IX, X: speech, swallow	
CN XI: active head rotation	
CN XII: active tongue movement	
Eye exam H	
Consensual eye movement	
Gower sign	
Heel/toe walk	
Rapid alternative movements	
Romberg: standing balance test eyes closed	
Conjugated eye tracking	
Finger to nose	
Persistent primitive reflexes	

Table 3 continuation. Chiropractic pediatric history and exam form for ages 2-6

Pediatric History, continued:		
Examination, continued		
Muscle stretch reflexes Present/absent/atypical	R	L
Biceps		
Brachioradialis		
Triceps		
Patella		
Hamstring		
Achilles		
Babinski		
Clonus		
Orthopedic/ Musculoskeletal examination		
Palpation	Findings	
Active and passive range of motion Spine, extremities as indicated	Cervical:	_____
	Occiput:	_____
	Thoracic:	_____
	Costovertebral/costosternal:	_____
	Lumbar:	_____
	Pelvic:	_____
	Upper extremity:	_____
	Lower extremity:	_____
Static and motion palpation for regional restriction, tenderness Spine, extremities — as indicated Paraspinal symmetry/hypermobility	Occiput:	_____
	Cervical:	_____
	Thoracic:	_____
	Lumbar:	_____
	Pelvic:	_____
	Upper extremity:	_____
Lower extremity:	_____	
Temporomandibular joints		
Hip: alignment/ function		
Knees: alignment/ function		
Feet/ankle: alignment/function		
Shoulder girdle: alignment/ function		
Adams test		
Leg length		
Scoliosis		
Hyper/hypo mobility		
Posture		
Muscle tonus/ symmetry/ strength		
Gait/ limp		
Leg pain: intermittent evening		

Table 3 continuation. Chiropractic pediatric history and exam form for ages 2-6

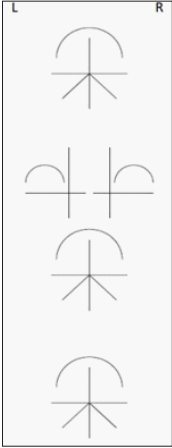
Pediatric History, continued:	
Examination, continued	
PGALs Check¹⁰	
Gait — normal heel toe	
'Touch the sky'	
'Touch your toes'	
'Hands out'	
'Fists/turn'	
'Fingers touch'	
'Jaw range of motion'	

Table 3 continuation. Chiropractic pediatric history and exam form for ages 2-6

Pediatric History:		
Patient information and consent		
Patient name		
Patient date of birth		
Parent/guardian names, nationalities		
Legal relationship to child		
Family situation		
General practitioner/pediatrician		
Consent to contact other practitioners		
Consent to care		
Date		
Consent to use anonymized data confidentially for research		
Primary complaint		
Description (ask parent/guardian & child)		
Location of pain		
Date/mode of onset		
Course since onset		
Duration	intensity	frequency
Character/ severity of pain		
Antalgia	radiculopathy	
Possible causes/contributing factors		
History physical trauma, fall, injury		
Aggravating factors		
Relieving factors		
Associated symptoms		
Night pain	relief with medication	
Pain with movements		
Pain on impact		
Pain when sitting		
Pain changing positions		
Interference with activities		
Behavioral changes		
Previous episodes/ management		
Activities after school		
hours training	hours high impact	frequency
Competitive Sports		
Sedentary Time	hrs screens use	
Ergonomics school	home	
Family history scoliosis	bracing	

Table 4. Pediatric musculoskeletal history and exam form for ages 6-16 years

Pediatric History, continued:	
Primary complaint, continued	
Hx asymmetry	
Hip dysplasia	torticollis
Toe walking	
Coordination/motor skills	
Secondary or other complaints	
Sleep issues: (quality, snoring, apnea, night terrors)	
Headache (HA) headache questionnaire ⁵	Family history HA/migraine
Vision	
Other medical conditions	
General health	
Diagnosed conditions When diagnosed? Treatment, outcome	
Suspected conditions	
Medications Prescribed and other	
Nutritional supplements	
Hospital visits/admissions	
Other healthcare professionals consulted	
Surgeries	
Radiological history, diagnostic tests	
Infections, tick bites	
Vaccinations — normal schedule followed? adverse reactions	
Family medical history rheumatological dz, hip disorders, allergy, autoimmune, genetic conditions, gastrointestinal, connective tissue disorder	
Smoking, alcohol, drugs	
Nutrition	
Diagnosed or suspected allergies/intolerances	
Selective diet and any restrictions	
Meals per day: _____	
Snacks per day: _____	
Number of sugar portions/day: _____	
Does child eat breakfast: _____	

Table 4 continuation. Pediatric musculoskeletal history and exam form for ages 6-16 years

Pediatric History, continued:		
Review of systems		
Respiratory: asthma recurrent cough, mucous, wheeze		
Skin: urticaria, eczema, ecchymosis, bull's eye rash, rough or discolored patches, acne		
Sign of connective tissue disorder ⁸ poor posture, hypermobility Pes planus		
Gastrointestinal pain, vomiting, gas		
Output: Primary or secondary enuresis, constipation, loose stools		
Age of menarche		discomfort
Psychological		
Any history or signs of emotional trauma or abuse		bullying
Social skills		well-being
Behavioral issues	anxiety	Hyperactivity
Conduct		issue with friends or family
Bereavement	attention	concentration
Depression		harmful self behavior
School attendance, engagement		
Sensory issues: texture, taste, smell food		
Texture clothing		issues with light or noise
Neurodivergence		gender issues
Involuntary movements, tics		
Obsession: gets stuck in a particular thought process		
Compulsion: repeatedly have the same concern or anxiety		
Does not show empathy		
Has trouble sitting still for a long period of time		
Finds it hard to make friends		
Unusual fears or worries		
Extreme rigidity about routines		

Table 4 continuation. Pediatric musculoskeletal history and exam form for ages 6-16 years

Pediatric History, continued:
Red Flags (indications for referral)
Labored breathing
L thoracic curve
Slow or halted growth Growth curve/chart
Halted or regression of development (loss of skills)
Marked difference in strength between L/ R sides of body
Marked high or low tone, especially impacting motor skills/development
Persistent toe-walking
Swelling of a joint for longer than 6 weeks
Recent trauma with suspected fracture
Recent infection with suspected ongoing infection
Signs and symptoms of diabetes type I
Systemic upset (malaise, weight loss, night sweats)
Lymphadenopathy
Unremitting bone pain
Incongruence between history and physical examination
Inability to weight bear
Persistent pain and morning stiffness of more than 30-60 minutes
Pain waking the child at night
Can not hop, skip or jump
Can not dress independently

Table 4 continuation. Pediatric musculoskeletal history and exam form for ages 6-16 years

Pediatric History, continued:			
Examination			
Observations and vital signs			
General observations appearance, movement pattern, coordination, skin, handedness			
Skin Beighton 4/9, narrow palate, general or local joint laxity, soft extensible skin			
Head, face, eyes, ears, nose, throat marks, bruising, swelling, discharge, rash, mucous, asymmetry			
Eye tracking Eye Exam 'H'			
Cardiovascular and respiratory chest wall deformities, respiratory effort, cyanosis			
Musculoskeletal positional or postural preference asymmetry of head, trunk, or limbs abnormal ROM of head, trunk or limbs			
Development for age does the child move and interact like other children the same age?	Weight: _____	kg/lbs	
	Length: _____	cm/in	
	Heart rate: _____	bpm	
	Respiratory rate: _____	rpm	
	Temperature: _____	°C	
	Overweight/ obesity: _____		
Posture, symmetry including extremity positioning			
Scoliosis	Adams test	Kyphosis	Lordosis
Asymmetry: thoracic curve/ lumbar curve/ double curve/ rib hump			
Forward head posture	Torticollis	Leg length	
Standing	Sitting	Lying	
Symmetry: ilia, jaw, ribs			
Feet	Knees	Hips	
Gait	contralateral pattern during walking		
pGALS10: Functional assessment			
Heel walk	toe walk		
Spread fingers	supinate hands and make fist		
Pinch thumb to fingertips	joint swelling		
Put backs of hands together	squeeze metacarpals		
Put hands behind neck, elbows out			
Active flexion/extension of knees	internal rotation hips		
Open mouth wide and put 3 of their fingers in mouth			
Cervical lateral flexion	lateral flexion lumbar		
Forward flexion head	reach for sky, look up		

Table 4 continuation. Pediatric musculoskeletal history and exam form for ages 6-16 years

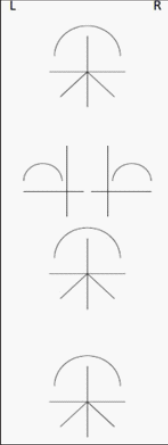
Orthopedic examination	
Palpation : skin, muscles and joints	Findings
Active and passive range of motion symmetry as indicated	Cervical: _____ Occiput: _____ Thoracic: _____ Lumbar: _____ Pelvic: _____ Upper extremity: _____ Lower extremity: _____
Static and motion palpation for regional restriction, tenderness range of motion as indicated <div style="text-align: center;">  </div>	Cervical: _____ Occiput: _____ Thoracic: _____ Lumbar: _____ Pelvic: _____ Upper extremity: _____ Lower extremity: _____
Regional exam: Attention to size, bulk and tone of muscles	
Normal/abnormal findings	
Hip	
Shoulder	
Knee	
Feet/ankle	
TMJ	
Hypersensitivity to pain	
Valsalva	
SLR	

Table 4 continuation. Pediatric musculoskeletal history and exam form for ages 6-16 years

Neurological examination	
Walk heel-toe with good balance	
Stand steadily with feet together, eyes closed	
Stand steadily on one leg, eyes open	
Stand steadily on one leg with eyes closed	
Heel-toe walk	
Finger-to-nose	
Rapid alternating movements	
Cranial nerve screening	Normal/abnormal response
CN I	
CN II: Pupillary light reflex	
CNs III, IV, VI: extra-ocular movements	
CN V: facial sensation, masseter/temporalis motor	
CN VII: blink response, facial expression	
CN VIII: hearing screen	
CN IX, X: speech, swallowing	
CN XI: active head rotation	
CN XII: active tongue movement	
Muscle stretch reflexes	Normal/abnormal response R / L
Biceps	
Brachioradialis	
Triceps	
Patella	
Hamstring	
Achilles	
Babinski flexor response	
Sensation	
Strength	
Clonus	
Retained primitive reflexes	
Persistent toe walking	

Table 4 continuation. Pediatric musculoskeletal history and exam form for ages 6-16 years

Chiropractic management of non-synostotic deformational plagiocephaly in the Netherlands: a cross-sectional study

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ABSTRACT

Background: Non-synostotic deformational plagiocephaly (NDP) is a common condition affecting 48% of infants. It is frequently cited as a reason for presentation to a chiropractor, however little is currently known about chiropractic management of NDP. This cross-sectional study aims to begin to address this literature gap. **Objectives:** 1) To determine the characteristics of chiropractic management of non-synostotic deformational plagiocephaly (NDP) in the Netherlands and; 2) To investigate the type and number of treatments chiropractors expected for full resolution of the head turning preference. **Methods:** Cross-sectional survey of registered chiropractors in the Netherlands. **Results:** Seventy-eight chiropractors completed the survey, of which 86% (N=67) treated pediatric patients, and of which 73% (N=38) treated infants with NDP. The most common presentation was head turning preference (with or without NDP) (75%, N=39) for 0-11-month-olds and the most common treatment technique was 'touch and hold' (65%, N=33). Participating chiropractors reported 'no side effects' (39%, n=20) more commonly than any specific side effects. On average, participating chiropractors expected 4 treatments for full resolution of the head turning preference. **Conclusion:** Chiropractors in the Netherlands who treat children frequently manage cases of NDP. In line with current evidence, participating chiropractors often attributed NDP to a head turning preference. There is currently limited clinical evidence on the effectiveness of management techniques for head turning preference and NDP, this should be the focus of future research.

Key Words: Non-synostotic deformational plagiocephaly, plagiocephaly, head turning preference, chiropractic, the Netherlands.

Introduction

Chiropractic is:

"a health profession concerned with diagnosis, treatment and prevention of mechanical disorders of the musculoskeletal system, and the effects of these disorders on the function of the nervous system and general health"¹ and is categorised as complementary and alternative medicine (CAM).^{2,3}

Approximately 5-17% of global chiropractic practice are represented by pediatric patients.⁴ A recent international demographic chiropractic study, based on 1,498 respondents from 17 countries over 6 continents, showed that 90% of chiropractors accepted pediatric patients.⁵ Despite its widespread use, there is debate over the appropriateness of pediatric chiropractic care, with concerns relating to safety, effectiveness, presentations/complaints⁶ and a paucity of high-quality research.^{4,6} In terms of safety, studies have shown that mild side effects, which are self-limiting, following pediatric chiropractic care comprise the majority of side effects with an incidence of 1% in patients under three.⁷ Systematic reviews demonstrate no deaths

reported, and that in the rare cases of serious adverse events (requiring hospitalization), underlying pre-existing pathology preceded.^{8,9}

Controversy around chiropractic care for infants is also driven by the variety of musculoskeletal and non-musculoskeletal complaints which are treated in chiropractic practices.¹⁶ Research claims about beneficial effects of chiropractic on commonly treated non-musculoskeletal conditions include sleep issues, asthma, otitis media, and even jet lag.¹¹ However, evidence supporting treatment of non-musculoskeletal conditions are typically of low scientific value, consisting of clinical experience and case studies.¹¹ Most pediatric patients are presented for chiropractic care with musculoskeletal problems, the frequency of which increases with age, from 23-33% in preschool children and 75-84% in teenagers.^{12,13}

One of the most common orthopedic conditions in infants is non-synostotic deformational plagiocephaly (NDP), with prevalence estimates of 48% of infants.¹⁴ NDP is defined as cranial asymmetry manifesting in flattening

of the skull secondary to external forces without fusion of the skull sutures (synostosis).^{15,16} The incidence of NDP has increased five-fold since the 'Back to Sleep' campaign and the American Academy of Pediatrics' recommendation for healthy new-borns to sleep supine to reduce the risk of sudden infant death syndrome.¹⁷⁻¹⁹ NDP is associated with cosmetic consequences and has been associated with neurodevelopmental delay, although no causal relationship has been demonstrated.²⁰⁻²² There is some evidence that infants with NDP but no neurodevelopmental delay may later develop delay in childhood, resulting in language disorders, attention deficits and learning disabilities.²³ While evidence around NDP and developmental delay is still emerging, it could be argued that the cosmetic element alone is worth preventing.

According to a cross-sectional study by Roby et al. (2012)²⁴ 38% of infants with NDP and/or brachycephaly had abnormal facial characteristics and have a 2% chance of having those facial deformities persist into adolescence when left untreated. Two other studies in preschool-aged children demonstrated a prevalence of remaining deformity of 3.3% at two years of age^{26,27} and 2.4%-4% at three years of age.^{26,28} Robinson and Proctor (2009) estimate that 0.5-1% of children will show obvious cranial deformities when entering school.²⁵ Hence, in a small proportion of infants with NDP, facial and cranial deformities persist into childhood. The craniofacial deformity and possibly consequential teasing, bullying or embarrassment is one of the most reported parental concerns relating to their child's NDP²⁹ which might be valid because it has been shown that facial "attractiveness" significantly influences the behaviors of caregivers,³⁰ social interactions with peers³¹⁻³³ and teachers' expectations about intelligence and popularity of the child.³⁴ Two very recent studies also showed that persons with craniofacial deformities are susceptible to (cyber)bullying³⁵ and are at higher risk of psychosocial problems.³⁶

Sleeping supine with head preference predisposes to NDP.³⁶⁻³⁸ This is why head positional preference is discussed in this study. There is currently limited research exploring pediatric chiropractic in the Netherlands. Whilst four studies have been conducted³⁹⁻⁴¹ none have investigated the clinical characteristics of pediatric chiropractic care and the treatment of NDP in infants.

There are many different chiropractic treatment techniques used with pediatric patients, and chiropractors adapt force and speed used in manual therapy to match the child's age and development.⁴² Due to the wide range of treatment techniques, this study investigates association between treatment techniques and the total number of treatments expected for full resolution of the head turning preference, as well as determining the characteristics of

how chiropractors manage NDP, all providing new insight into chiropractic management of NDP in the Netherlands.

Given that NDP and head turning preference are reported by parents as reasons for presenting their infant to the chiropractor, and the limited evidence for chiropractic management of NDP, this paper sets out to describe chiropractors' experiences and perceptions of this common problem and may serve as a starting point for future research into this condition. This paper does not provide evidence of effectiveness but does highlight the frequency of the condition, treatment types and side effects.

Methods

The research design was a cross-sectional study of practicing chiropractors in the Netherlands. Ethical approval (E142/03/2021) was obtained from AECC University College and Nederlandse Chiropractoren Associatie's Science Committee.

Sample

The inclusion criteria were practicing chiropractors in the Netherlands who were registered with one of the Dutch chiropractic associations: Dutch Chiropractic Federation (DCF), Christelijke Chiropractoren Associatie (CCA) or Nederlandse Chiropractoren Associatie (NCA). Participating chiropractors also had to comprehend written English.

According to Fincham (2008), the response rate should approach 60% to enable appropriate generalization.⁴³ In previous cross-sectional surveys about pediatric chiropractic care, Lee et al. (2000) achieved a response rate of 60% (90 respondents),⁴⁴ and Durant et al. (2001) achieved a response rate of 57% (77 respondents).⁴⁵ A previous demographic survey study in the Netherlands about chiropractic achieved a response rate of 78% (94 respondents).⁴¹ Based on these previous similar studies and the scientific quality provided by response rates of >60%, this was the recruitment goal for this study (60%, n=296).

Data collection

Data were collected via a one-time online anonymous questionnaire. The questionnaire was hosted on Jisc Online Surveys.

Face and content validity of the questionnaire was established using a panel of three experts: a Lecturer in Research Methods at AECC UC, a Dutch chiropractor with knowledge of advanced research methods, and the Course Lead for the MSc APP Pediatric Musculoskeletal Health at AECC UC. These experts were asked for feedback and minor modifications were made based on this, including wording, content, and English language.

This study is part of a larger study. The overall questionnaire