**Article Full Title**

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

**Author Names**

Femke Driehuis, Thomas J. Hoogeboom, Maria W. G. Nijhuis-van der Sanden, Rob A. de Bie, J. Bart Staal

**Reviewer Name**

Semat Adekoya, SPT

**Reviewer Affiliations**

Duke University School of Medicine, Doctor of Physical Therapy Division

**Paper 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 (&lt;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.

**NIH Risk of Bias Tool**

Quality Assessment of Systematic Reviews and Meta-Analyses

1. **Is the review based on a focused question that is adequately formulated and described?**

Cannot Determine, Not Reported, Not Applicable

1. **Were eligibility criteria for included and excluded studies predefined and specified?**

No

1. **Did the literature search strategy use a comprehensive, systematic approach?**

Yes

1. **Were titles, abstracts, and full-text articles dually and independently reviewed for inclusion and exclusion to minimize bias?**

Yes

1. **Was the quality of each included study rated independently by two or more reviewers using a standard method to appraise its internal validity?**

Yes

1. **Were the included studies listed along with important characteristics and results of each study?**

Yes

1. **Was publication bias assessed?**

Yes

1. **Was heterogeneity assessed? (This question applies only to meta-analyses.)**

Cannot Determine, Not Reported, Not Applicable

**Key Finding #1**

There is very low quality of evidence in the effectiveness of gentle, low-velocity mobilizations in infants. The evidence of HVLA manipulation in children and/or adolescents is uncertain

**Key Finding #2**

The relationship between specific treatment and the effect on spinal dysfunction is unclear.

**Key Finding #3**

HVLA manipulations in infants and young children may lead to severe harm (or can be associated with missed underlying pathology).

**Key Finding #4**

There is a great need for high quality research in order to increase certainty about SMT and its effectiveness.

**Please provide your summary of the paper**

Many of the studies and case reports shown displayed “moderate to high risk of bias”, impacting the overall quality of the evidence presented. There was also a major lack of distinction between which manual therapy techniques were performed. In infants there were “Adverse events” that took place following cervical manipulations including temporary paralysis and death. However, these events could not be directly linked to the cervical manipulations performed and rather were hypothesized to be a result of “missed underlying pathology”. Similar patterns occur in the remaining age groups. Overall, the effectiveness remains uncertain. The reports of severe harm following manipulation are limited and may be underreported. Gentle, slow mobilizations appear to be safe in infants, children, and adolescents, but caution should be taken in cervical and full spine HVLA as they may be associated with severe harms (mentioned above). The authors concluded that they were unable to draw clinically meaningful conclusions on the effectiveness of certain spinal manual therapy techniques due to the low quality of evidence. There were some shortcomings reported (e.g. rib fracture, paralysis, stiffness), but many of these things could not be concluded to be a direct result of SMT.

**Please provide your clinical interpretation of this paper. Include how this study may impact clinical practice and how the results can be implemented.**

This systematic review/meta-analysis in my opinion served as an alert that more research needs to be done in this area. The negative effects associated with SMT in this study in infants and children are concerning, however can also be attributed to missed underlying diseases. It is imperative to better understand the relationship between SMT and the developing child so clinicians are not causing unnecessary harm to our most vulnerable patients. If adverse effects are truly the result of SMT, then steps need to be taken to ensure a fully developed MSK system is present prior to the performance of SMT. An important attribute that should be included in future research is the specification about which SMT was used rather than simply terming the act as “manual therapy”.