

# Manual Therapy in Children

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*To do science is to search for repeated patterns, not simply to accumulate facts*<sup>2</sup>.

## Introduction

The essence of manual medicine is the restoration of impaired function, albeit in the framework of a pre-existing form.

This 'form' has two components:

- the morphology, individually expressed on the base of our genetic patterns and their interaction with the environment during growth.
- the cybernetic patterns that are morphologically fixed on a micro-histological level in the central nervous system and as important a base for (mal-)function as the macro-morphology.

In a grown-up the balance between function and form is far on the side of the latter. In adolescents, children and especially in babies and newborn the reverse is true. Here function (and mal-function) determines the developing form in the two facets mentioned above. This is the essential difference. Manual therapy in children (MTC) bears only scant resemblance to the much less dramatic and today well-known effects we see in adults. There we are only too aware that we often 'repair' without being able to heal, thus condemning therapist and patient to repeat this exercise sooner or later. In schoolchildren and babies one adjustment can stop incessant weeklong crying, can turn a hyperactive little nerve-racker into the darling of the family, can relieve a schoolchild of disabling headaches – and permanently so. Not all of these problem- children profit of MTC, but many more than the average paediatrician or general practitioner might concede spontaneously.

MTC is *not* a scaled-down version of the procedure for adults. It is quite understandable for somebody only busy treating adults to regard any non-adult as "a child" and thus belonging to a group mainly defined by this one quality of not yet having reached the status of a grown-up. Like most conceptual assumptions this lofty idea withers upon close scrutiny. Since the idea of "punctured equilibria" was introduced into evolution by Gould<sup>[32]</sup> we have a better insight into to dynamics of the phylogenetical development.

On the ontogenetic level the same principles apply. Relatively stable periods alternate with rather short transition phases which are inevitably more sensitive to disturbances than the rest periods. Disequilibrium of a given level of organisation to attain a higher complexity implies on one hand a dangerous period of vulnerability – but a unique chance for far- reaching therapeutic effects, too.

The development of a child is not a continuous process of accretion of body mass. As every parent knows growth happens in leaps and bounds. The beloved offspring can wear the same shoes for several months over the winter — but by the following spring, the parents have to buy a new pair of jeans every third week because they are quicker outgrown than paid for. This variable growth rate is but the most basic and easiest to notice of these discontinuities. Other phenomena are less easily isolated but the results are the same. Everybody just *knows* that "she was just a baby last year and now she's a little girl" – or – "how quickly he changed from carefree kindergarten kid to the serious schoolboy he's now".

We are aware of the changes after they have happened, and we can categorise the "before and after" more or less precisely at hindsight. But the transition itself is elusive. These changes are important vis à vis our way of interaction with the young and therefore the average adult knows about them. But the complexity of the process observed, i.e. the transition from one stage in their development to the next prevents us from using clearcut and measurable criteria. An annoying situation for all those who want to find sharp and enforceable boundaries for our therapeutic activities, lest they are not submittable to a rigid quality control.

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## ***A multi-dimensional process***

Something as simple as a light ray needs several models of explanation (wave *and* photon) to come to grips with the results of experiments. From the viewpoint of physicist it is almost endearing to see how the biomedical sciences struggle to get their field into line with a "structured and well-designed protocol". Reductionism still seems to reign supreme — but "the ability to reduce everything to simple fundamental laws does not imply the ability to start from those laws and reconstruct the universe"<sup>[93]</sup>.

As the developing child chooses (mostly unconsciously) its individual path out of the myriad of possibilities offered by its genetics, environment and education there is such a thing as a "butterfly effect" of a minor stumbling block at the wayside altering the entire biography. But the sheer complexity of the web of influences makes it impossible to attribute simple and straight interconnections. Expelled from "the paradise of linear equations"<sup>[69]</sup> we have lost the comfort of a world where every possible development can be mechanically predicted if one knows the initial constellation well enough<sup>[4]</sup>.

The new qualities emerging when complex structures are assembled from simpler basic blocks and which are the essential ingredients for any form of life, prevent the application of rigid boundaries once you come sufficiently close to the subject of your observation. This knowledge gives us the basis to live happily with fuzzy edges wherever we deal with a quickly changing and ever more complex situation. The emergence of new qualities is the essence of growing up. As much as the phylogenetic restraints of gene and culture define a 'corridor of possibilities' our individual use of them depends on a series of accidents in the true sense of the word, and if these happen at a crucial point in time their influence on the later development can hardly be overestimated.

There are two ways to present MTC to those without prior knowledge: at first look one might concentrate on the usual phalanx of statistics, preferably with a diagnostic score and a 'significant' outcome study — best double blinded. One might thus avoid many points of friction; but this would not do justice to this incredibly exciting topic and only reproduce a methodical bias far too often applied to manual medicine in general, thus treating it as a mere technique.

But, as Lewit put it, "it is not enough to master the various techniques which are effective in orthopaedic medicine; it is as important to understand dysfunction"<sup>[53]</sup>. So I shall try to describe the *Gestalt* of MTC, manual medicine in children. Whenever statistics are useful they will be presented, but as means to an end. One cannot grasp the beauty of a painting by listing the colours it contains. This 'open' approach is meant as a base of discussion. There is a lot we learned about the possibilities of manual therapy in small children during the last twenty years — and the broad lines presented here proved themselves during the examination and treatment of thousands of babies.

## ***Determining the stages***

The developmental steps of children are usually defined according to the viewpoint of the examiner. An endocrinologist will look for different transition points than somebody dealing with the pulmonary system or - as in our case - researchers and/or therapists interested in the sensorimotor development. From our viewpoint anything which changes the way in which we interact with the world is of interest and has to be examined with the question in mind: "is there a fundamentally different situation *before and after* ?

Luckily the limitations of space exert a welcome pressure to stay concise, so we shall concentrate on three transitions which have a profound impact on the individual development:

- Birth
- Verticalisation
- Cessation of growth

At first sight one might consider birth as an exactly localisable point in time. But even this first and indispensable prerequisite of all the following events is not that easy to define. Is it the appearance of the head, the first breath, the cutting of the umbilical cord? As always in complex situations it helps to step back and choose a slightly coarser unit of measurement: the hour of birth or even the birth-day.

The second item in the list needs further clarification. What does verticalisation mean? Well, it's the conquest of the third dimension, the step from being fixed in a basically two-dimensional area to a three-dimensional space. Normally this happens during a few weeks. The toddler pulls itself up and is amazed by the experience of standing on one's own feet; shortly afterwards the first steps can be ob-

served. Here, too, we have to choose the right unit of measurement to get a meaningful information: Whereas it is most certainly meaningless to be precise to a day we can in most cases fix the month of verticalisation — for girls between the 10<sup>th</sup> and the 13<sup>th</sup> month, for boys one to three months later but still considered normal till the 18<sup>th</sup> month<sup>[1, 51]</sup>.

The third item – cessation of growth – is even less precisely locatable in time, and mostly only afterwards: “She stopped growing at 15” is in most cases the best level of precision available — and sufficient for all practical uses.

These three steps are of vital interest for those busy with MTC, the first as one main origin of traumatic lesions of the spinal poles, the second and third as important points in time where changes in the function of the spine have wide-ranging consequences for the way we can interact therapeutically.

## ***The trauma of birth***

“The birth channel is one of the most dangerous passages we have to traverse in our whole life” — this quote is attributed to various authors, mostly obstetricians. We tend to forget how dangerous these few centimetres are. General anaesthesia and modern pharmacology provide us with powerful tools to overcome most of the problems mother and child can face during birth. But one should not forget that the older obstetric literature was filled with gruesome procedures to dismember the foetus in utero if the normal birth had not succeeded.

The use and abuse of caesarean sections is controversially discussed. There is no need to re-iterate the arguments here, suffice it to say that from our viewpoint as specialists of functional disorders of the vertebral spine the advantages of a broad indication for a caesarean seem obvious. In all our studies babies born by caesarean section are under-represented, and even more so if one excludes the oblique position from this group.

Phylogenetically there are two main problems regarding the delivery mechanism of the foetus. Firstly the bipedal gait necessitates a profound alteration of the pelvis. Its function in quadrupeds implies an open and oval construction, connecting the hind member with the vertebral spine at an angle of about 90°; this leaves ample space for the delivery of the foetus. With the upright posture of the trunk the pelvis had to be closed as much as possible to carry the intra-abdominal structures and the ilium had to be bent outward to make room for the gluteal group. These muscles have a different working angle once the trunk sits on top of the hind leg and not in front of it<sup>[34, 73, 74]</sup>. The birth channel is in direct contradiction to these constructive principles as the foetus has to pass through this now much smaller aperture. This is one of the reasons why the sexual dimorphism of the pelvis is bigger in humans than in any other mammal group<sup>[83]</sup>.

Another constructive problem adds to this dilemma: the acquisition of the upright posture has as consequence that the femuro-spinal angle of roughly 90° has to be enlarged to almost 180° and beyond. This is achieved by re-designing the lumbo-sacral junction and it leads to the almost angular promotorium<sup>[26]</sup> which is a uniquely human achievement and another obstacle for the foetus. No other region of the human musculo-skeletal system has such a big inter-individual variability as the sacrum and its neighbouring structures<sup>[40]</sup>. Obstetricians were among the first to analyse the pelvic architecture and its consequences for e.g. low back pain<sup>[59]</sup>.

The re-design of the pelvis to suit it for its role in bipedal posture is one problem aggravating the situation of the foetus on its way out into the world. The second aspect is almost as important and in some ways similar to the constructive dilemma at the caudal pole of the vertebral spine.

In quadrupeds the orientation of the skull — i.e. visual axis — is grosso modo an extension of the vertebral axis. The vertical positioning of the trunk makes it necessary to align the visual axis with the horizon. In most animals who assume a vertical position only for a limited period this is achieved by a lordosis of the cervical spine (e.g. bears, prairie dogs etc.<sup>[83]</sup>) and no further adaptation of the cranial structures ensues.

The evolution of humans took a different path. Here the re-alignment of the visual field with the horizon was accomplished by an angulation between the upper cervical spine and the craniofacial region. The result of this complicated development was a wider base for the neocranium and an angle of ± 90° between the orientation of the vertebral spine and the visual axis. One of the side-effects of this new relationship between head and spine was the change of the birth mechanism: whereas in

most mammals the facial part of the skull is delivered first in humans the dome of the skull is the first structure to go through the birth canal<sup>[95]</sup>.

The main diameter of the head lies in the sagittal plane, that of the trunk in a frontal orientation. The two re-designs of the vertebral poles interact to produce a complicated birth mechanism. The construction of the lower pelvis leads to a semi-circular trajectory for the foetus. As the main diameters of head and trunk have to be aligned during delivery, a 90° angle between the two is established while traversing the lower pelvis. This leads to a necessarily asymmetrical positioning of the occipito-cervical junction which cannot be reversed during the entire delivery.

Studies of the intra-cranial structures of apparently healthy newborns showed a high percentage of signs of microtrauma of brain stem tissues in the periventricular areas in the NMR<sup>[87]</sup>. It seems probable that the exposed structures of the occipito-cervical (OC) junction suffer at least as much as the cranium<sup>[55]</sup>. Wischnik et al.<sup>[96]</sup> have shown this in experimental studies of the biomechanics of delivery (see also <sup>[33]</sup>). The injury of the intra-cranial and sub-cranial structures is thus the rule, not the exception. The ability of most newborns to overcome and repair these lesions shows the enormous capacity of the not yet fully developed brain to cope with trauma at this stage.

Taking into account that the optimal development of the brain – which lasts at least till the 12<sup>th</sup> year<sup>[30]</sup> – depends on consistent sensory inputs, the importance of proprioceptive dysbalances for the efficient repair of cerebral lesions becomes evident.

## **Verticalisation**

All movement and therefore all sensomotor development interacts with and fights against gravity. The importance of this transition from the mainly two-dimensional 'way of life' into the third dimension are still widely underestimated. We have to consider this transition as an important expansion of the possibilities of the developing child, alas in connection with all the instabilities which accompany any newly acquired degree of freedom. Before these new options can be put to use the child has to master the instability of keeping the spine upright. To a major extent this means that the function of the spine has to be re-invented, as its habitual position in most mammals is horizontal.

The contour of the spine is the result of the intrinsic phylogenetic program<sup>[47]</sup> and the interaction with the external factors. These latter forces play a much bigger role than previously assumed. Meyer observed that the unilateral torsion of the lying baby turns into a bi-lateral scoliotic posture after verticalisation<sup>[61]</sup>. "After the child started walking the muscular reaction changes completely and we find scoliosis, lumbar hyperlordosis and hyperkyphosis of the dorsal spine (*M. Scheuermann*)". Like many successful practitioners Meyer did not publish his results systematically and we have only a few anecdotal sources<sup>[62]</sup>. But even in this limited material we find many of the observations on the determinative influence of early irritations of the cervical spine for the form and function of the adult spine.

It is very important to be aware of the different patterns of reaction before and after verticalisation in order to interpret the possibilities of corrective measures. As very often seen in developmental physiology, a certain fixation of the already acquired abilities precedes the new phase. Consequently it is easier and more efficient to treat postural imbalances before verticalisation than afterwards. In an analysis of the effectiveness of MTC we were able to prove that the incidence of re-adjustments depends on whether the first treatment was applied before or after verticalisation<sup>[13]</sup>.

It is important to keep that in mind when communicating the possibilities of manual therapy to paediatricians. Before the first birthday the success rate of the initial treatment is between 80% - 90% with about one third of these babies needing further physiotherapy afterwards<sup>[9]</sup>. After the 12<sup>th</sup> to 14<sup>th</sup> month most of the children have to be seen at least twice by a MTC specialist and about half of them need re-education in the form of physiotherapy or ergotherapy. These numbers reflect the situation of Central Europe and the work-sharing arrangements we have here. I suppose that the different structure of health care in North America shifts the percentage of the professions involved considerably, albeit without changing the underlying qualitative aspect.

## **Cessation of Growth**

Similar considerations apply to this transition phase, but to a lesser extent. After the growth of the bones is completed the adaptation of the musculo-skeletal apparatus continues at a much slower pace and often in creating changes which are classified as "degenerative", i.e. negatively connotated.

It is obvious that we have more possibilities to influence the postural patterns of a ten or eleven year old than of somebody who is already sixteen. At the age of ten we are still able to use the last growth periods to alter the course of development; the treatment of scoliosis is a good and well-documented example. Later on the acquired morphological and kybernetic form represents the limits of our therapeutic efforts. Having said that one has to add immediately that these limits are by no means fixed but the closer we get to the adult stage the more we have to accept the individual situation as being more or less stable. We can get rid of functional problems but we have to accept that the underlying morphological a/o kybernetical structures will make a re- appearance of similar complaints likely.

The dividing line between the treatment regime applicable to an adult is quite similar to that of an adolescent of 12 or 13 years of age. Their individual complaints are similar, too. The main difference lies in the fact that an adolescent (at least before the last big growth periods of 11-13 years) has the chance to alter the physical structure and thus the functional base after an adjustment.

These considerations influence more the way we inform about the long- term perspectives than the actual treatment procedures. This is the main reason why this article concentrates on the examination and treatment of small children.

### ***Torticollis neonatorum***

Asymmetry in newborn babies is a well-known problem, alas one which is often considered benign and disappearing spontaneously if left alone long enough. It is certainly true that we have to be patient in the first days and weeks. After having passed through the birth channel, a realignment of the asymmetrical cranial bones and a resorption of soft-tissue oedemas and/or haematomas takes time. An initially asymmetrical posture should be noted and observed, not more nor less.

If this asymmetry persists after 3-4 weeks or additional symptoms appear it is advisable to check if the range of movement of the head is impaired. This restricted movement is in most cases a sign for a protective immobilisation of the upper cervical spine. For a long time this was linked to a malfunction of the sternocleidomastoid muscle, leading to the common diagnosis of "muscular torticollis"<sup>[16, 25, 71, 76, 86, 90]</sup>. The most visible symptom was thought to be the cause. At least in the early phases the shortened and thick sternocleidomastoid muscle is so prominent that it's a 'natural' culprit. Late cases of infantile torticollis often show a fibrosis of the sternocleidomastoid<sup>[48, 57]</sup>. The two facts were then easily combined: early haematoma results in later fibrosis.

Our experiences lead to different conclusions. There is no direct and linear connection between the initial haematoma and a late fibrosis. Children with an initial haematoma do not have a bigger chance of developing a late fibrosis than newborn without a palpable tumour of the sternocleidomastoid. The connection between the two phenomena is much more intricate than such a linear concept suggests. The sternocleidomastoid is a co-victim of the underlying trauma to the articular structures of the cervical spine and as such it is not a good starting point for therapy or analysis. It is a far better used as an indicator of the improvement brought about by other therapeutic measures, as a correct therapy of the suboccipital joints results in an alignment of the muscular tonus of the sternocleidomastoid.

There is a controversy about how to react to a fixed or asymmetric posture in newborn babies. Some consider this a 'physiological scoliosis' and think it wears off without treatment<sup>[19, 44]</sup>. More recent papers stress the importance of asymmetries in perception and posture for the development of more severe consequences later on<sup>[45]</sup>. Buchmann has remarked „the existence of an asymmetrical range of tilt in the suboccipital Region of a child is no big deal. Only if additional signs accompany this an immediate treatment might be necessary"<sup>[22]</sup>. Asymmetry is frequently found in testing newborns<sup>[35, 77]</sup> and its clinical significance has to be carefully examined. Seifert published data of unselected groups of newborn babies where she found that more than 10% of them show signs of asymmetry of the functioning of the upper cervical spine<sup>[78]</sup>.

Nobody advocates a treatment schedule where all these initially asymmetrical babies have to be treated routinely, but these babies should be re-examined later on and treated if the functional deficit has not subsided spontaneously after 4-6 weeks. We would propose to take a large margin, especially as MTC is a low-risk procedure, quite uncomplicated and has not to be repeated more than once or twice.

Keessen et al. show that the accuracy of the proprioception of the upper limb is reduced in cases with idiopathic scoliosis and spinal asymmetry<sup>[45]</sup>. As we know that the proprioception of the arms de-

depends heavily on a functioning SO- region<sup>[41]</sup>, functional deficits in this region should be corrected as soon as possible.

As is often seen in the history of medical knowledge, our frame of reference changed over time: already IN 1727 Nicolas Andry, who coined the word 'Orthopedics', had already mentioned the treatment of the torticollis as one important field of this new discipline<sup>[3]</sup>. In going back to the roots we understand that good posture in children was at the forefront of the orthopaedic diagnostics and treatment: Ortho-Paedics – "rightening the young" was so important for Andry that he used this concept as the definition of the medical procedures he published in his book. This fundamental underpinning of the new discipline was lost in later centuries and Andry's eminently functional approach had to make way for the mechanistic paradigms which have dominated orthopaedics in the last decades.

The effects of a fixed posture of the head in newborn have great breadth and depth, the former evaluated in the presentation of the KISS- syndrome, the latter being compiled as KIDD (see below).

## Colic

Infants in Western societies cry more in the first three months of life than in any other period of their life<sup>[58]</sup>. This phenomenon has its peak at six weeks and declines rapidly thereafter<sup>[81]</sup>. It is very difficult to assess the dividing line between 'normal' and 'abnormal' crying. Several definitions have been proposed to define this crying as pathological. Wessel's definition "more than 3 hours per day, more than 3 days per week for more than three weeks"<sup>[94]</sup> is widely used in publications but at least a little bit unrealistic, as it asks a stoicism of the parents which may not be found very often nowadays. "I am still to impressed by the parental feelings of hopelessness and helplessness, their anger and anxiety, their feeling that something is really wrong with their child, to leave them alone with this in nature self-limiting problem" says Lucassen<sup>[58]</sup> and one might add that although infantile colic is known to subside spontaneously there are reasons enough to try to shorten this period:

- It is very stressful for the parents and may sometimes lead to aggressive and violent behaviour of parents and/or baby-sitters<sup>3</sup>
- It may result in lasting communication problems between parents and the baby<sup>[68, 75]</sup> in the years to come
- Many functional disorders of the school-age period and even later can be traced back to these early signs<sup>[49]</sup>

A recent publication by a team of colic-specialists run the title "The enigma of infantile colic"<sup>[42]</sup>. Discussing the possible origins of this problem the authors mention that "more than half of the babies concerned showed slight to medium deficits in functional neurological tests ... the quality of spontaneous motor patterns was not normal". As many other authors this team too did not find convincing evidence of the feeding pattern on the incidence of colic<sup>[2, 20, 82]</sup>.

Can persistent crying in the first months be considered a "benign condition"<sup>[63]</sup>? The first contacts with the effect of manual therapy on colic babies came through serendipity. Quite a few newborn who were presented because of their fixed posture recovered from colic, too, after the treatment administered for the C-scoliosis or the fixed retroflexion. At that point in time there were only very few observations of functional factors contributing to colic; most authors were looking for clues related to nutrition or mother-child interaction, even something as elusive as "the temperament"<sup>[52]</sup> of the baby was considered relevant – alas difficult to influence therapeutically, one might add...

We knew already since a long time about the intricate connections between the oro-facial muscles and the upper cervical spine<sup>[6, 38, 43]</sup>. The next step was to look for factors in the individual case history which might enable us to screen babies with colic for those who profit most of an eventual manual therapy. The results of this enquiry were twofold. In the group of successfully treated cases of colic we found mostly babies with a fixed retroflexion of the head and trunk (see Fig. xx) and feeding problems. This led to a co-operation pattern with paediatricians concerning babies with incessant crying. The paediatricians check for other reasons, e.g. infections or pylorospasmus, and then for signs of an involvement of functional vertebrogenic factors. This includes the screening of the case history, checking the flexion of the head and the local irritability of the neck and neurological tests<sup>[18, 91]</sup> for asymmetry. If they have thus reason to believe that a functional problem of the upper cervical spine contributes to the problem of colic the babies are referred to a specialist in MTC.

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<sup>3</sup> Think of the recent weel-publicised trials of several au-pair-girls in the USA

The qualitative evaluation of the effectiveness of MTC in these cases still has to be demonstrated conclusively, but there its very success is the biggest obstacle: paediatricians and parents who are aware of the enormous efficiency of MTC in these cases (see table. xx) resolutely refuse to allow control groups. In an ongoing study we are discussing other criteria and shall report at a later date about the outcome.

## ***The KISS-Syndrome***

Having treated newborns and small children with postural problems for many years, a pattern began to emerge which directed our attention beyond the purely positional dimension. In a monography published in 1984<sup>[39]</sup> one chapter was dedicated to the treatment of babies and small children. At that point in time we did not yet have a clear idea about the full impact of the pathology we were about to discuss. We simply did not have the large number of cases needed to recognise the underlying patterns. In the seventies Gutmann treated one or two children every month; in 1999 we see between 50 and 100 small children every week. This increase is reflected in a much clearer clinical picture we were able to develop. Not all of the symptoms listed below can be found in every single case; most of the time some symptoms are dominant and others may be completely absent. But as a whole this list has been quite useful in the evaluation.

In 1992 we proposed the KISS-Syndrome for the first time to the Anglo- American public<sup>[8]</sup>: **K**inematic **I**mbalances due to **S**uboccipital **S**tress (1991 in German<sup>[10]</sup>). The reason for this 'new' syndrome is that its definition gives us a taxonomic frame to accommodate the pathogenetic base (irritation of the sub-occipital structures of the cervical spine) and the clinically dominant item, i.e. the asymmetry.

Strictly speaking nobody is symmetrical, but symmetry is nevertheless perceived as ideal in art and nature<sup>[24]</sup>, and might even convey evolutionary advantages to its bearer<sup>[79, 85]</sup>. A comprehensive treatment of symmetry and its evolutionary role can be found in <sup>[64]</sup><sup>4</sup>. Blickhorn<sup>[17]</sup> summed up a recent publication<sup>[29]</sup>: "... fluctuating asymmetry could account for almost all heritable sources of variability in IQ". This is but one hint to the importance of symmetry as a marker and/or cause of other more fundamental problems. The impairment of senso- motor development in KISS-children seems to point to the same conclusions. Complete symmetry is empty, dead<sup>[50]</sup>. A person or object needs a certain amount of symmetry to be considered beautiful, but the addition of a little bit of asymmetry can really make us like what we see<sup>[84]</sup>. Strong asymmetry on the other hand is seen as 'sick'<sup>[70]</sup>. Between these two extremes the ideal has to be found by intuition – or trial and error.

For structures connected to sensory input symmetry is more than an embellishment: most of the information has to be related to a three-dimensional analysis of its origin and here symmetry of the supporting structure simplifies processing. Strong asymmetry necessitates a higher level of 'input-correction' and is therefore of evolutionary disadvantage.

Asymmetry on posture is normal immediately after birth. The forces exerted on the newborn during delivery routinely lead to a temporary tilt posture in at least  $\frac{1}{3}$  of all cases<sup>[21]</sup>. Most of these babies are recovering spontaneously and if re-examined 4-6 weeks later only about 6% of all newborn still show signs of an impairment of the motion range of the head. In these cases further evaluation should be done to establish other symptoms and eventually treat these.

In the recent neuro-paediatric literature more and more importance is attributed to symmetrical posture and movement patterns. The search for asymmetry is a basic part of the diagnostics of all major examination schemes<sup>[1, 18, 28, 89]</sup>. As neurologists these authors attribute the origin of these asymmetrical patterns to a malfunctioning of the central nervous system and extensive literature exists searching – mostly in vain – for a visualisable correlate in MRI- or PET-scans. Specialists of manual medicine will need even more successfully treated children to convince the other medical professionals of the role of faulty proprioception in the sub-occipital vertebral structures in these cases; but "function (physiology) is as real as is anatomy (pathology)"<sup>[53]</sup>.

Any fixed posture of the head of a small child exerts a strong influence on the sensori- motor development. In the beginning it is hard to differentiate between any underlying pattern, the more so as most children display mixed symptoms. As there exists a different pattern of complaints and a slightly different long- term development pattern it is worthwhile to note the main forms. We distinguish between two types of KISS (see Fig. xx):

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<sup>4</sup> The authors put additional material on their website [www.oup.co.uk/MS-asymmetry](http://www.oup.co.uk/MS-asymmetry)

- Type I: fixed lateroflexion of head and trunk
- Type II: fixed retroflexion of the head with hyperextension of the thoracal a/o lumbar spine.

These two forms share many symptoms and a pain- avoiding protective immobilisation of the traumatically irritated suboccipital structures is at the base of both. This trauma may have been caused by an intra-uterine irritation through fixed oblique positioning of the foetus and/or a direct birth trauma.

Ongoing research seems to indicate that type II facilitates the development of symptoms of colic and incessant crying whereas in babies with Type I we tend to find more cases of unilateral retardation of the development of the hip joints.

Spontaneous complaints reported by the parents <sup>[9]</sup>	N = 263
Torticollis	89,3 %
Reduced range of head movements	84,7 %
Cervical hypersensitivity	76,0 %
Cranial asymmetry	40,1 %
Opisthotonos	27,9 %
Restlessness	23,7 %
Forced sleeping posture	14,5 %
Unable to control head movements	9,5 %
Uses one arm much less	7,6 %

The items mentioned in this list show that in many cases the two types of KISS overlap. One has to take into account that it is easier for a paediatrician to recognise the laterally fixed posture as pathological. The fixed retroflexion more often than not has to be actively searched for. Often it is best seen in the sleeping position of the children (see Fig. xx). Initially we did not attribute much attention to it and it was only after the parents reported spontaneously that their children slept much calmer and in a markedly more relaxed position that we became aware of the diagnostic importance of a fixed retroflexion of the head.

Through these observations of the parents we got the idea to check systematically if and how much we were able to relieve the sufferings of "cry-babies" (i.e. colic) and their families. Initially quite a few of these small children were referred to us for the treatment of postural asymmetries and the accompanying colic was not mentioned by the parents during our interviews. In the questionnaire we ask the parents to send back to us six weeks after their visit they mentioned that the babies were much calmer and slept better.

In a simple katamnestic pilot- study we found that up to 55% of those who said that incessant crying was one of the main reasons their child was presented in our consultation registered an improvement of more than  $\frac{2}{3}$  in the week after treatment (see Fig. xx). A prospective study is ongoing.

#### Results of treatment (interviews with parents)<sup>[9]</sup>

Symptom	(very) good result after				improved	no change	Total
	1 day	1 week	2 w.	3 w.			
Torticollis	78	28	33	19	40	25	223
Ophistotonos	10	6	5	7	12	5	45
Restless/Crying	26	5	6	2	6	7	52
Fixed sleeping posture	16	3	3	6	4	1	33

The basic trigger which makes paediatricians send the babies to a specialist in manual therapy is the hypersensitivity of the neck region in combination with a restricted range of movement of the head. Those who already observed the success of manual therapy in cases of colic or feeding problems are looking actively for these signs to help them decide if it is advisable to present these babies at a specialist. Others find it easier to first look for signs of asymmetry before they take manual ther-



apy as a treatment option into account. In both cases it helps to have the pattern of typical KISS-complaints present, even if not all symptoms can be found in an individual case.

### ***KIDD: KISS- induced Dyspraxy & Dysgnosy***

Since the eighties the awareness of the long- ranging consequences of pre-birth conditioning has risen considerably. British cardiologists were the first to note that children born in poor families with a high incidence of malnutrition suffer from a higher rate of heart failure decades later<sup>[5]</sup>. Similar results came from epidemiological studies in the Netherlands and in Finland<sup>[65]</sup>. It seems probable that our organism is assigned an 'operating mode' early in life according to the environmental conditions reigning during pregnancy and the first months after birth.

Learning about these results made it easier to come forward with observations we made with schoolchildren and young adults. In many cases (72%<sup>[14]</sup>) where we had to treat patients for headaches, postural problems or co-ordination malfunctions we were able to establish KISS- related problems in the first year of life. In order to find this connection one can rely on the checklists which are filled out regularly during the pre-determined visits at the paediatrician (see table). Another valuable source of information are the photo collections of the first year (see Fig.xx). Very often one finds the baby again and again in the same posture as it grows into a kindergarten kid. When asked about other signs we associate with a dysfunction of the occipito- cervical junction we often got affirmative answers. Due to the 'fuzziness' of these symptoms it is difficult to put this in a tight diagnostic frame.

Forthcoming research aims at establishing the effectiveness of MTC treating school problems. Prior to this prospective study which we undertake in collaboration with the pediatric department of the University of Cologne, a sample of schoolchildren in Hagen (Germany) were examined and treated. This group of children between x and x years of age came from a school specialised in pupils with learning difficulties. These children were evaluated by their teachers and an initial interview to document the case history was conducted. Two X-rays of the cervical spine were obtained and at a second session the documentation was checked, the X-ray pictures analysed and a manipulation of the cervical spine performed. Four and eight weeks later the parents and teachers were asked to evaluate the development of the children.

The results are summarised in the following table. Of the pupils taking part in the pilot phase we assembled 2 groups. Group I with those children where the case history contained items which fit a KISS-Syndrome, group II with the other half (6 / 6 children; for the points see Table xx). For the evaluation of the individual cases we relied on the internal system of the school before and after treatment which is mainly based on the SIPT<sup>[27]</sup>. A detailed report is due to be published in 2000<sup>[12]</sup>

	KISS- points	score before treatment	score after treatment
Group I	17	17	9
Group II	8	15	14

These findings reflect well our previous experience: if it is possible to establish a case history typical of KISS- children in a pupil with learning difficulties it is worthwhile to examine and treat such a child with MTC. To prove the influence of functional vertebrogenic disorders on a given sensori-motor problem it is often most effective to simply perform a test treatment and evaluate the results, as Lewit & Janda remarked already more than thirty years ago<sup>[54]</sup>. In order not to be overwhelmed by desperate parents a pre-screening by a paediatrician who is able to filter out the most promising cases is helpful. Once confronted with an individual case it is almost always better to treat one too much than to let a possible improvement slip away. It is fair to say that there is no risk involved if one limits the treatment to a single manipulation. As we were able to show in an analysis of fatal complications after manual therapy almost all these cases occurred at the second or third intervention and/or using rotational manipulation<sup>[36]</sup>.

During the first year the most important direct sign of functional problems of the occipito- cervical junction is asymmetry. The closer the child gets towards verticalisation the less pronounced these signs become. The additional information furnished by the third dimension obviously helps the child to compensate for the faulty proprioceptive patterns of C<sub>0</sub>/C<sub>2</sub>. Similar to the three-month-old who stops

crying spontaneously the problem of asymmetry seems to disappear if only we have the nerves to wait long enough. In the second and third year children enter a phase where they show little or no signs of any functional or motor disorder.

Later on – the children are between four and six years old – other symptoms appear: these children are reported as being 'clumsy' or 'slow', parents tell that they have difficulties to learn to bike or to rollerskate. "We were so astonished that she still cannot ride a bike as she was walking at 8 months already" is a remark we often hear. This is the situation where you have to enquire further: how was the delivery, how were the first months? The relevant questions are compiled in Table .xx. Those items marked with an "x" contribute to a "KISS- score" which we use to improve the accuracy of the prognosis. The definite form of this score is not yet fixed and the discussion in the EWMM<sup>5</sup> should lead to a usable standard in the near future, which shall be made publicly available via our website.

Table xx: Questionnaire for children

<i>Birth</i>	
- mother's age	
- first / second / third ... delivery	
- duration of delivery (< 1 h ; 1-3 h ; 3-6 h ; > 6 h)	x
- birth weight	
- birth length	
- oblique presentation	x
- twin	x
- forceps – vacuum	x
- caesarean (why?)	x
<i>The first months:</i>	
- bad sleeper during first months – 6 to 12 months – later	x
- did/does the child often wake up at night	x
- crying at night – how often	x
- fixed sleeping pattern	x
- problems with breast-feeding on one side	x
- signs of colic	x
- orofacial hypotonus	x
- hypersensitivity of the neck region	x
<i>Motor development: started to</i>	
- crawl	
- sit	
- pull itself up & stand	
- walk	
<i>General health</i>	
- broncho- pulmonary infections	
- headaches	x
- neurological disorders	
- mouth is often open	x
<i>Sensori- motor development slower than expected</i>	
- posture and movement	x
- language	x
- concentration	x
- social integration	x
<i>Asymmetry</i>	
- visible immediately after birth	x
- only later (when?)	x
- obstetrician / midwife saw it	
- parents observed A. first	
- localisation	
- arm	
- trunk	
- head	
- baby looks only to one side	x
- moves only one arm/leg	
- face is smaller on one side	x
- back of the head flat on one side	x
- has a bald spot on the back of the head	x

<sup>5</sup> European Workgroup for Manual Medicine (see also [www.manmed.org](http://www.manmed.org))

These questions – translated into a non-medical language – form the base of our interviews with the parents. If used judiciously this list helps to avoid being over- eager when examining potential cases. As already mentioned it does little harm to treat one child too much – but on the other hand it's not helpful to claim to be able to treat all and anything with the same method. Once we have found the typical pattern of KISS in the case history we have to ascertain that the problems who brought the children to our consultation are consistent with the 'KISS- pattern'.

## ***Differential diagnosis***

Asymmetry — at least temporarily — is very often present during the child's development. If it was the only diagnostic criterion to filter out functional problems of the vertebral spine we would be in a difficult situation. Luckily we have an entire assortment of clues to rely on for a reasonably precise diagnosis. Nevertheless it is only after having evaluated the eventual result of a manipulation that the relevance of the functional disorders of the SO- region for a given problem can be assessed. The threshold for intervention is relatively low as there are no known risks as long as the proper procedure is followed.

One of the most important diagnostic problems is the detection of spinal tumours. The severity of these cases and the need for timely intervention attributes much more importance to their detection than the rarity of their occurrence might suggest (5/100.000, of these 10%-20% in children <sup>[67]</sup>). Some of the signs are quite specific, e.g. a protrusion of the papilla N.opt. or impairment of the pyramidal tract. Others are far less specific and can easily be confounded with functional problems. Even specialists note that a wrong initial diagnosis is the rule and not the exception<sup>[60]</sup>.

Quite often the first symptoms which attract the attention are secondary problems due to functional disorders, i.e. a torticollis<sup>[23, 80, 88]</sup>. These symptoms are identical to those caused by primary vertebrogenic causes and may even improve at first. Gutmann published such a case of a young boy he treated — initially successfully — for headaches and neck pain<sup>[37]</sup>. After a complete remission the problems re-appeared, seemingly after a minor trauma, as happens quite frequently. When the boy came back a third time – again after some minor knock on the head – Gutmann insisted, nevertheless, on an MRI, which resulted in the diagnosis of a tumour.

One caveat is a crescendo of symptoms: most functional disorders show a flat curve of development and are often traceable back to an initial trauma. If the pain pattern or the amount of dysfunction show a rapid increase, further diagnostic measures are necessary. As much as conventional x-ray plates of the cervical spine are essential for the evaluation of functional disorders of the spine they do not furnish the necessary information to diagnose intra- medullar tumours. MRI scans are by far the best method. As soon as we discover details in the case history or in the clinical examination which point towards an origin of the problems beyond the functional level, a neuro-paediatrician should be consulted.

In a recent publication we summarised the items necessitating further diagnostics as follows<sup>[15]</sup>:

- inadequate trauma
- late onset of symptoms
- multiple treatments before first presentation
- crescendo of complaints
- 'wrong' palpatory findings

This last item is by far the most important and in those cases where I had to diagnose a tumour it was this 'wrong' feeling which alerted me. This impression is difficult to describe; one has to examine many necks to calibrate one's hands finely enough in order to filter out these cases. In two of them the main area of pain sensitivity was unusually low, in another case the sensitivity was so extreme that even after trying to palpate gently a long time the hyperaesthesia persisted. These three children were referred to a neuro- paediatrician and the pre-operative diagnosis was mainly based on MRI.

In 1997/8 we asked for MRI- scans in 12 cases (of a total of 2316 children examined). In two cases a tumour was found (1 haemangioma, 1 astrocytoma). It has to be added that most of the children we see have already been examined by a paediatrician first and the normal waiting period for an appointment is 2-4 weeks. This filters out all those cases where the rapid deterioration necessitates immediate action.

In our aim to find the few cases with a serious background we cannot rely on an initial trauma as an exclusion criterion against tumour. In several of these cases where we had to diagnose a tumour in

the end an 'appropriate' trauma was reported. The young girl whose cervical spine figures in fig. xx complained first about pain in the neck and arm after a dive into a pool, allegedly having touched bottom. In the end we found a haemangioma of Proc.spin C<sub>6</sub>; this was one of the rare cases where a conventional X-ray plate showed enough to alert the examiner.

## **Clinical examination**

The base of the clinical examination can be 'borrowed' from neuro-paediatric manuals, e.g. [1, 56, 72]. The evaluation of those findings vary between a purely neurological approach and one which includes the vertebral function. Asymmetry of posture and movement are the first warning signs that the suboccipital structures should be closely checked. Hypersensitivity and restricted range of movement in this area ideally triggers a referral to a specialist.

Once the child has arrived in our consultation we routinely repeat the paediatric test scheme based on Vojtas proposals<sup>[91]</sup>. These tests are complemented by a segmental examination of the entire spine and a test of the passive range of movements of the joints of the extremities, thereby comparing the two sides.

For older children the situation becomes much more complex. Here the basic pattern of complaints directs the examination towards different focal points. To test the senso-motor development one scheme frequently used is the Sensory Integration and Praxis Tests (SIPT, Ayres; see [27]). For the functional analysis of the spine a few co-ordination test suffice: one-leg stand on the floor or on a soft support, walking on a line, Finger-Nose Test (with open and closed eyes), tiptoeing and walking on the heels are our standard tests, optionally complemented by additional procedures. In most cases these rather simple tests supply a solid base of the functional evaluation.

All these tests are important and a base for the evaluation. But at least as important as these tests is a sensitivity for the surrounding details: How does the child react, how tense is it, how is the base of communication, etc.? These 'non-classifiable' items have to be taken into account and they finally form the bedrock on which we have to rely to grasp the *gestalt* of a clinical problem.

## **Radiological examination**

There are different opinions about the need to take X-rays before treating the cervical spine — to put it euphemistically. Many therapists active in the field reckon it is safe and sufficient to rely on the palpatory findings and the clinical interview. They consider the classic 2-plane radiography a superfluous exercise. Anybody with daily experience of the difficulties one encounters in trying to convince our little patients to co-operate is only too willing to accept any excuse to get rid of this time-consuming part of the examination. But – alas – the information obtained by the functional and morphological analysis of these pictures renders the effort worthwhile. An in depth- analysis of the functional radiology of the cervical spine would cover more space than the entire book provides, let alone one article. So we have to content ourselves with a few examples of the interaction between functional and morphological analysis of the 'classic' x-ray plates of the cervical spine.

The X-ray picture complements and verifies the clinical findings. If the de-symmetrisation of the occipito- cervical junction follows the established pattern (see Fig. xx) the direction of the impulse is confirmed. This is the case in more than 80% of the newborn and small children<sup>[13, 14]</sup>. In these cases there would be no difference between what happens with and without radiography.

But it is the other 20% which interest us. We have not yet been able to find conclusive tests which might enable us to sort out the one-fifth of our patients who need to have X-ray plates before actually having examined them. If that was possible we might indeed first test for these criteria and take X-ray pictures only in those cases which fulfil these – non-existing – criteria. But as long as we do not have them at our disposal it is by far the lesser evil to screen systematically.

The risk of the use of ionising radiation often triggers highly emotional arguments. Quite frequently a nebulous 'cancer risk' is quoted to justify avoiding a standard radiological examination. "It is true that fetuses and children are about twice as radiosensitive as adults, but not much more than that."<sup>[66]</sup> "It is time to scientifically challenge the old tenet stating that cancer risk is always proportional to dose, no matter how small"<sup>[31]</sup>. If we add to that the fact that the energy density used for plates of the cervical spine of small children is one of the lowest dosages used in conventional radi-

ology it should be obvious that a risk – benefit analysis clearly favours the standard procedure of taking X-ray plates before *any* treatment of the cervical spine regardless of the age of the patient.

The findings of only the conventional X-ray studies of the cervical spine would easily fill an entire book. Wackenheim's monography is still the most comprehensive account<sup>[92]</sup>. By far the most common finding is the fusion of two vertebrae. Its relevance depends mostly on the levels involved and if the symmetry is preserved. A fusion of e.g. C<sub>3</sub>/C<sub>4</sub> is much less relevant for the individual biography than a fusion of C<sub>2</sub>/C<sub>3</sub> which impairs the anteflexion of the head considerably.

A second quite frequent finding is a hypoplasia of the dorsal arc of C<sub>1</sub>. As this structure does not have a direct static role these variants remain often unnoticed. Statistical evaluation of our material indicates a strong correlation between a hypoplastic arcus dorsalis C<sub>1</sub> and asymmetries of the lumbosacral region on one hand and unilateral hypoplasia of one hip joint.

Once a non-standard form of the atlas is noticed it seems at least advisable to check for clinical signs of asymmetry of the pelvic girdle and functional deficits of one of the hip joints. If there are signs of asymmetry found there one can continue the examination with conventional X-ray plates or CT-scans.

The plates presented in fig. xx ff. show some of these aspects. Once one learned to overcome the difficulties of obtaining correct projections it is astonishing how much detail information can be extracted. But it takes time and constant training to get to a satisfactory quality level.

## **Manipulative Techniques**

Manual Therapy is one of the oldest forms of healing we know. It is a craft, an inter-personal action involving direct bodily contact. Whenever we try to put this into a conceptual frame we have to concentrate on one or a few of the many dimensions involved in such a complex interaction. Is it absolutely legitimate and necessary to do for example experimental studies focusing on the amount of force used in the treatment of children and adults<sup>[46]</sup>, but in discussing these findings we have to keep in mind that it needs more than the right amount of force to make a manipulation successful.

This is one reason why it is next to impossible to separate the effect of a given method from the person who applies the treatment. We can teach the anatomical basics, the pathophysiological processes involved and the state of the art regarding the techniques applicable. But we cannot turn an eminently personal interaction between two individuals into an industrial product. Publications like the one in front of you now are as good and as bad as a cookbook: If one knows something about the topic at hand, the lecture of such a book may be of advantage. For the non-initiated it provides frustrating reading or it provokes plain refusal.

After everything said until now, it should be evident that the main point is to recognise the pattern and intervene timely. The choice of the optimal method depends to a big degree on constitutional factors of the therapist. In treating children and adolescents the age of the little patient is at least as important. As soon as we reach the age range of schoolchildren, the techniques used are more and more similar to these of adults. Clinically, too, we find comparable patterns of complaints as in adults, but with a special 'tilt'.

In most cases the direction of the manipulation is determined by the radiological findings (85%). In the other cases the orientation of the restricted movement, the palpation of segmental dysfunction or the local pain reaction help to find the best approach<sup>[11]</sup>. The manipulation itself consists of a short thrust of the proximal phalanx of the medial edge of the second finger (see Fig. xx). It is mostly lateral; in some cases the rotational component can be taken into account but in small children this is the exception. In cases where KISS-type II is pre-eminent and the fixed retroflexion is the main component the manipulation can be applied via the proc. transversus of C<sub>1</sub> in a sagittal direction.

We believe that the selection of the specific technique without functional analysis of the radiography of the cervical spine lessens the effectiveness of this treatment. Apart from the improved treatment technique a correct analysis reveals morphological problems in 6–8% of the cases <sup>[7, 15, 80]</sup>. Standard x-rays – during the first 18 months an a.p.-plate of the cervical spine inc. the SO-region suffices – have to be of optimal quality and no manipulation in the SO-region should be done without them.

The technique itself needs subtlety and long years of experience in the manual treatment of the upper cervical spine of adults and schoolchildren. In the hands of the experienced the risk is minimal; we have not yet encountered any serious complications (see also <sup>[61]</sup>). The forces used during the manipulation were tested with a calibrated pressure-gauge; they do not exceed the force used to push a bell-button energetically<sup>[46]</sup>. Most children cry for a moment, but stop as soon as they are in their mother's arms. In five cases (of ± 8.000 infants) the children vomited after the treatment; this had no negative effect on the outcome, and there were at least as many babies vomiting already during the test routine determining their neurological status.

### **Outlook: the fourth dimension**

The most fascinating thing about MTC is its far reach. It determines many different details of a baby's well-being on one side and the development of such an individual on the other. This long-distance influence into a fourth dimension (time) distinguishes functional disorders of this biographical period from those encountered later on. The importance of early trauma for the individual development in adult life was already mentioned more than hundred years ago by Palmer and Still, alas without defining exactly which signs to look for.

Such a general conjecture renders this statement almost useless, as everybody encounters more or less violent accidents while growing up. Only when we are able to look for specific signs in the case history it will be possible to advance our understanding of the impact of the birth trauma on the clinical pattern of complaints of our patients.

The concept of KISS and KIDD should be seen as a tool to come to grasps with *one* aspect of this wonderfully multidimensional endeavour the readers of these lines mastered already: growing up.

Which is why I dedicate this article to our children and grandchildren. Let's hope MTC can remove a few stones from their rocky road to adulthood.

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