Chapter 5

Chiropractic in the cranial field

Frank O Pederick

CHAPTER CONTENTS

Do not seek to follow in the footsteps of the men of old: seek what they sought. (Basho, in Schiller 1994, p. 107)

We are like dwarfs on the shoulders of giants, so that we can see more than they, and things at a greater distance, not by virtue of any sharpness of sight on our part, or any physical distinction, but because we are carried high and raised up by their giant size. (Bernard of Chartres (d.c.1130) in Palmer BJ 1981)

The shell must be cracked apart if what is in it is to come out, for if you want the kernel you must break the shell. And therefore, if you want to discover nature's nakedness, you must destroy its symbols and the further you get in the nearer you come to its essence. … (Meister Johannes Eckhart (1260–c.1328) in Schiller 1994, p. 32)

INTRODUCTION

These three quotations encapsulate some of the author's experience as a chiropractor in the cranial field. When first undertaking studies in this area, instruction seemed doctrinaire with little explanation offered of the mechanisms involved. As Pick (1999) has noted (in the preface to Howat 1999, p. xiv), recent graduates, with a better understanding of the underlying physiological mechanisms, now demand fuller explanations.

In every field of human endeavor there are major revolutionary breakthroughs by 'giants'

which change thinking profoundly. But most subsequent advance relies on the 'dwarfs' for the slow accretion of knowledge, based on what has gone before or made possible by advances in other fields. The work of some of the major chiropractic 'giants' who have influenced chiropractic cranial methodology is outlined in this chapter.

In order to assess chiropractic work in the cranial field a standardized method of evaluation, devised by Kaminski et al (1987), has been applied. This and other assessment issues are discussed in Box 5.1.

A BRIEF HISTORY OF THE CHIROPRACTIC CONTRIBUTION TO THE CRANIAL FIELD

There are records of manipulation in most cultures and folk medicine forms of cranial manipulation probably exist. However, Calvin Cottam (Cottam & MacGillivray Smith 1981) quotes Ligeros (1937) who had researched the history of spinal manipulation in Europe back to 1250 BC and had found no indication that cranial manipulation was practiced. If cranial methods were used, little has filtered through to the present. For example, some therapists offer a form of Indian head massage and shiatsu uses predetermined application of pressure and spreading of sutures, in a set way, for general symptoms.

Modern forms of chiropractic cranial manipulation stem from the work of Nephi Cottam and W G Sutherland (as discussed in Ch. 1). Harrington's review (1992) offers a good starting point for an investigation of chiropractic's contribution to this area of manipulative therapy.

Nephi Cottam: craniopathy

Cottam's technique is the earliest (1928) verifiable chiropractic cranial approach. He produced the first text, *The story of craniopathy*, in 1936. The modern revised version, *Craniopathy for you* (Cottam & Rasmussen 1975a), and *Craniopathy for others* (Cottam & Rasmussen 1975b) were produced by Nephi's son Calvin. Cottam's procedures are presented as a series of 10 lessons, for both self-manipulation and by a practitioner, and cover extremities and viscera, as well as the cranium. The material is self-printed, on roneoed sheets. Calvin Cottam (1988) has more recently produced a revised 22-lesson version for professionals.

Although Nephi Cottam was aware that motion of the cranial bones is palpable, his procedures relied on observation of cranial landmarks, asymmetries and symptoms to provide indications for the need to manipulate particular cranial bones. In Cottam's approach, firm direct manual pressure is applied, although he also recommended

Box 5.1 Evaluation of techniques

There are difficulties in evaluating techniques. A formal consensus approach has been undertaken in the USA by the Association of Chiropractic Colleges Technique Consortium (Cooperstein 1997) to assess the efficacy and appropriateness of various techniques for instructional purposes. Research is a necessary background for any such valid appraisal. Blum (2001) has commented on the fraught relationship between those involved in research and those concerned with technique development.

All research findings are essentially 'good' and studies that do not 'prove' the legitimacy of a specific chiropractic technique can still be of value by illustrating:

1. *Problems in study design;*
2. *Problems with the tester or testee;*
3. *Alternate interpretations and definitions of the research;*
4. *That a reason for a specific chiropractic result my be due to an entirely different mode of action;*
5. *That the positive outcome to therapy may be due to another indirect aspect of the care, and*
6. *That a diagnostic or treatment protocol of a chiropractic technique may be ineffective.*

As Bergmann (1993) pointed out to the chiropractic profession over 10 years ago, 'It has not been established that any adjective or evaluative procedure is more or less effective than any other, for any condition. Studies comparing the effectiveness and efficiency of technique systems are long overdue'.

Box 5.1 Evaluation of techniques—*continued*

Hestoek (Hestoek & Leboeuf-Yde 2000) has more recently concluded:

> *The detection of the manipulative lesion in the lumbo-pelvic spine depends on valid and reliable tests. Because such tests have not been established, the presence of the manipulative lesion remains hypothetical. Great effort is needed to develop, establish and enforce valid and reliable test procedures.*

Gatterman et al (2001), using a consensus method, concluded:

> *The ratings for the effectiveness of chiropractic technique procedures for the treatment of common low back conditions are not equal. Those procedures rated highest are supported by the highest quality of literature. Much more evidence is necessary for chiropractors to understand which procedures maximally benefit patients for which conditions.*

No such studies can be found specifically for chiropractic cranial procedures.

Gleberzon (2002), who examined the literature on 'named techniques' of chiropractic, concluded that research into these methods was still in its infancy. He considered that intra- and interrater reliability of major diagnostic procedures needed to be established, as well as their clinical applicability and relevance.

Most technique systems rely on the subjective assessments performed by practitioners and are influenced by their interactions with patients. Realistically, in defence of the chiropractic profession, they are not the only ones in the healing professions with this problem and it may be difficult to establish parameters for efficacy, efficiency and appropriateness and to measure these consistently. Two books to be released in the near future, by Ebrall (2004) and by Cooperstein & Gleberzon (2004), promise to address these issues more thoroughly. Another problem arises because, in the author's experience, very few chiropractors practice techniques by precisely following the procedures developed by the originator or as taught. In the cranial field there is a paucity of well-documented studies on the effects of particular procedures, let alone comparative studies, so that nobody can realistically show that one method is better than another.

There has been a considerable focus on experimentation and clinical research involving the spine, undertaken by different professions, over many decades and yet Leach (1994) notes:

> *Evaluation of the chiropractic lesion(s) remains perhaps the greatest frustration and challenge facing researchers and S/Ps [scientist/practitioners] alike. Quantification and qualitative definition of the phases of the VSC [vertebral subluxation complex], SDF [segmental dysfunction] and RDF [regional dysfunction], are needed and no operational definition of even the most generic 'manipulable lesion' is available at this time.*

Although major advances have been made in the description of cranial restrictions, for example by Pick (1999), the nature of cranial faults or subluxations remains more complex and less explored than those involving the spine. For some authorities (Ferre 1991, Fiepel et al 2003, Hartman & Norton 2002, Herniou 1998, 1999), the basic concepts that support the use of cranial manipulation are seen to be invalid. It is of course possible that these writers have not considered all the available information and evidence. Although many practitioners believe that they can detect differences and changes in cranial motion, resulting in positive responses by patients when motion is improved, the difficulty of proving the cranial hypotheses remains.

Consequently, statements regarding the cranial field frequently represent subjective opinion on the relevance of scientific data, colored by personal experience. Such observation of course also applies to the writings of this author.

Kaminski analysis of chiropractic in the cranial field The analysis of chiropractic technique systems, devised by Kaminski et al (1987), involves several investigative steps, with decision steps between them (see Fig. 5.1). It is not clear whether this procedure has been applied to any major chiropractic technique system. Most chiropractic techniques have been developed over a period of time with patient welfare, rather than evaluation of the procedures, in the forefront of the mind of the innovating practitioners. The only known application of Kaminski's approach in the peer-reviewed literature was made by the author (Pederick 1997) for cranial procedures based on traditional osteopathic methods, including Upledger's (1983), modified by procedures from SOT and Kotheimer's writings, other chiropractic techniques and some original thoughts of the author.

Aspects of Kaminski analysis will be applied to the evidence available relating to SOT, AK and Kotheimer's work and will be summarized later in the chapter.

Box continues

Box 5.1 Evaluation of techniques—*continued*

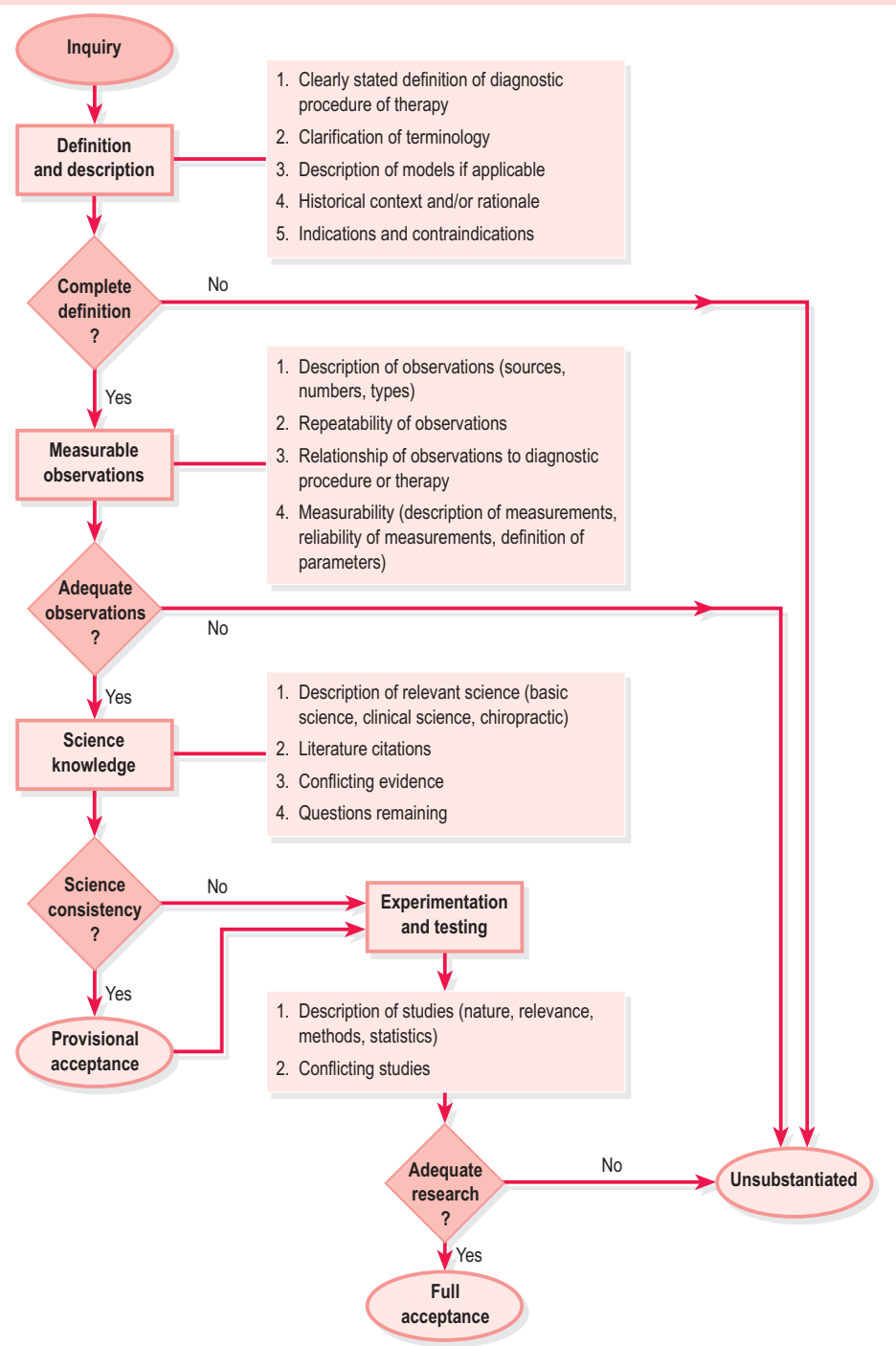

Figure 5.1 Algorithm for technique evaluation. Ovals represent inputs and outputs, rectangles indicate data entry steps (with key issues), diamonds involve a decision based upon previously gathered information and arrows delineate the flow of thought. (Reproduced from Kaminski et al 1987, with permission from Elsevier.)

a 'flipping' action of the hands and vibration, as part of the maneuver. Cottam's methods appear to lack a coherent rationale or to have a basis in research into anatomy, neurology or physiology. However, his procedures were highly regarded by his contemporaries and are still in use by some practitioners.

Calvin Cottam was keenly interested in proving his father's claim to be the first in the modern era to manipulate the cranium. He has outlined the history of his father's work in two papers (Cottam 1988, Cottam & MacGillivray Smith 1981) and in pamphlets. A number of techniques promoted by individual chiropractors, which Calvin Cottam perceived to be derivative of his father's work, are mentioned in his 1981 paper but these do not appear in the current chiropractic literature.

The principal chiropractic techniques today, which incorporate cranial procedures, are sacro- occipital technique (SOT), as developed by DeJarnette, and applied kinesiology (AK), as developed by Goodheart. In the work of both these innovators there is a direct link back to Sutherland's methods. Other cranial procedures used by chiropractors, stemming from SOT or AK, have evolved from the work of Sutherland, via other osteopaths, for example Magoun (1976) and most recently Upledger (Upledger & Vredevoogd 1983).

Upledger has been a major influence because he has made his writings and seminars readily available to virtually all comers, whereas there have, in the past, been attempts by some osteopaths to maintain an exclusive use of the methods, by restricting access to training. SOT and AK methodologies offer complex approaches to a wide variety of conditions, whereas craniosacral therapy (Upledger's approach) offers a relatively simple addition to methods already employed by many chiropractors.

The next phase of this examination of chiropractic influence on cranial treatment methodology will look at the work of DeJarnette, Goodheart and Kotheimer. In the discussions of their work, assessment will be offered, using methods devised by Kaminski et al (1987) (see Box 5.1).

M B DeJarnette: sacro-occipital technique (SOT)

DeJarnette's history has been summarized by Heese (1991) and Rosen & Blum (2003).

Following a severe work-related injury, DeJarnette discovered osteopathy and later enrolled in the Dearborn College of Osteopathy, Elgin, Illinois. While there he met and became friendly with W G Sutherland (see Ch. 1). After graduation in 1922 he returned to his home state, Nebraska, where he was influenced by the head of the Nebraska College of Chiropractic to receive chiropractic care and to enroll in the college, from which he graduated in 1924, aged 25.

Other significant influences on DeJarnette include:

- receiving a jail term in 1929 for practicing medicine in Nebraska without a license (Heese 1991)
- meeting with and studying the work of then chiropractic college heads, Drain, Carver and B J Palmer
- recognizing inadequacies in his own methods and those generally used by chiropractors at the time
- discovery of vasomotor effects, through a clinical experience, which led him to consider the effects of neural stimulation and inhibition. This led to his development of a vasomotor control technique by 1930
- clinical experience with and an extensive study of the reflex interactions between occipital fibers and the sacrum
- use of occipital fibers to control pain and a plumb line to monitor spinal muscular distortions, which led him to privately publish *Reflex pain* in 1935 and *Spinal diagnosis* in 1936. SOT ultimately developed from this work.

During the period 1930–1945, DeJarnette treated only patients who had not been helped by other chiropractic methods and who were prepared to take part in his research.

His professional development continued via collaboration with Sutherland in the cranial arena and Stone and his methods of 'bloodless surgery'. The work with Stone evolved into the chiropractic manipulative reflex technique (CMRT) part of SOT (see Box 5.2). There was also assistance from study groups of chiropractors who reported on the clinical usefulness of DeJarnette's ideas.

DeJarnette was on the staff of the Brown Osteopathic Hospital, Nebraska City, and this

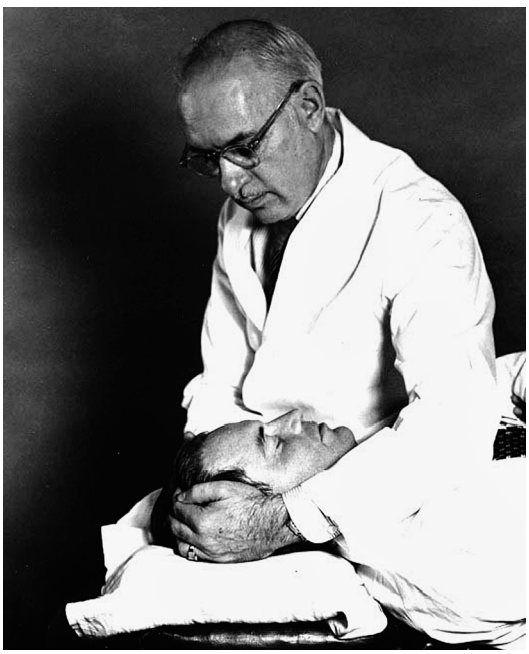

Figure 5.2 Photograph of Major B DeJarnette. (Copied with permission from Richard C Gerardo, DC, 178 Victory Blvd. #IO5, Burbank, California, USA.)

gave him access to observe surgery and autopsies and to specialists associated with the hospital. SOT was first mentioned in the title of his self-published book (1940) *Sacro-occipital technic of spinal therapy*.

Not until 1952, when he produced *Sacro-occipital technic of chiropractic*, was cranial work introduced into his writings. Harrington (1992) links this with the 1951 publication of Magoun's text *Osteopathy in the cranial field*. She also says that DeJarnette made the apparently spurious comment to Calvin Cottam that he had been using cranial technique since 1921. This was when DeJarnette was at osteopathic college and predates Sutherland's first experimentation, in about 1924.

The introduction of pelvic wedges (blocks) in 1964 was a major advance (Heese 1991). Heese says that during his osteopathic training DeJarnette observed 'a demonstration by a Dr Taplin … on the use of leverage for pelvic manipulation …'. Apparently he worked on the idea over many years and devised the pelvic blocks to enable gentle repositioning of the pelvis (see Box 5.3).

Box 5.2 Chiropractic Manipulative Reflex Technique (CMRT)

Howat (1999, p. 325) reports that DeJarnette developed CMRT as a soft tissue technique. Newer additions to CMRT involve a visceral component. Howat (1999, p. 52) says that muscle fibers, inserting into the occipital area, as well as trapezius and gluteal muscle fibers, 'act as indicators, showing the level of visceral and vertebral involvement. Each set of fibers, which total seven in number on either side of the spine, are specific for each category'.

Rasmussen's charts (Rasmussen et al 1992) indicate that occipital fibers are associated with Category 1; trapezius (primarily) and occipital fibers with Category 2; and gluteal fibers with Category 3. (See Box 5.4 for explanation of SOT categories.)

Occipital fibers 'The occipital fiber system consists of a muscular evaluation of the trapezius and sternocleidomastoid muscles, at their attachment across the base of the occiput' (Bathie 1996b, pp. iv-1). Detection of swelling and/or tenderness of a fiber '... indicates the functional aspects of a particular spinal segment have been affected with respect to the craniosacral respiratory mechanism', according to Bathie. She goes on to say that this affects spinal motion and the amount of CSF to the same nerve root. This is claimed to compromise nerve transmission that leads to effects in the associated organ system. Associated reflex arcs are said to disturb muscle tone in distant areas, while local arcs change the function of the spinal motor unit at that level.

Tender nodules may occur on three nuchal lines, in seven areas on each side of the centerline (area 7 being medial and area 1 lateral) (Howat 1999, p. 53). Each area is said to relate to particular spinal levels. For example, area 3 relates to cervical 3, dorsal 4.5 and lumbar 1 (Bathie 1996b, pp iv–3).

Nuchal line 1, the most superior, is said to relate to CSF–meningeal dysfunction, line 2 to vertebral–visceral and line 3 to persistent structural–vertebral problems.

Combined, the line and area of the nodule are claimed to determine specific vertebral levels between the occiput and sacrum nominated for testing and adjustment, depending on findings (Bathie 1996b, pp iv–9).

Trapezius fibers These fibers are palpated in a line extending bilaterally from alongside the spinous process of T1 (area 7) and 'the "V" between the acromial process and the spine of the scapula' (area 1). Bathie (1996b, pp iv-11–4) notes that the trapezius is innervated by the spinal accessory nerve. She says detection of a painful nodule is indicative of a specific spinal subluxation, affecting associated striated muscles. The area of the nodule determines the location of the affected segment,

Box 5.2 Chiropractic Manipulative Reflex Technique (CMRT)—*continued*

which may be at nominated levels of the cervical, thoracic or lumbar areas of the spine. The segment to be adjusted is determined by pain findings after contacting the nominated vertebrae. Adjustment is made to the vertebra with the major pain finding, which should relieve the pain. This adjustment is completed before blocking procedures are attempted.

Gluteal fibers The gluteal fibers of gluteus medius are palpated on the iliac crests (Bathie1996b, pp III–17). The L5 vertebral level is said to relate to the most medial part of the crest and T11 to the most lateral, with L4 to T12 levels distributed in between. When category 3 techniques fail to control pain, goading of the taut gluteal fibers is recommended.

Comparisons with Sutter's spondylogenic reflex syndrome (SRS) The SRS is discussed in Dvorak & Dvorak (1984). It is based on work outlined by Sutter (1975) who discovered, apparently independently, three occipital fiber lines, trapezius and gluteal fiber lines. Sutter also produced SRS charts for the major muscles attached to the shoulder girdle, the pelvis and the axial skeleton. Sutter relates a spinal fixation to reflex changes in associated muscles but makes no attempt to relate this to the viscera.

Sutter's occipital lines (Dvorak & Dvorak 1984, pp 86–87) relate to the insertions of the semispinalis capitis muscle, rather than trapezius and SCM, as in DeJarnette's method of analysis. Sutter's analysis of the trapezius (Dvorak & Dvorak 1984, pp 114–115) takes account of the descending, horizontal and ascending fibers, while DeJarnette's method evaluates only descending fibers and some horizontal. There appears to be no correlation between the two systems, except that the findings for gluteus medius are similar. Sutter has also defined SRSs for other pelvic muscles.

Box 5.3 DeJarnette blocks or pelvic wedges

The wedges used for blocking are made from a 10 × 10 × 20 cm wooden block, cut diagonally across the long dimension to form two wedges. The sloping surface is padded and the whole is covered with leather or vinyl. Handles of the same material are fixed to the flat end and rows of upholstery tacks secure the covering to the base of the wedge. These provide resistance to motion when the wedges are placed under the patient on a padded tableboard (see p. 116), on which the patient lies prone or supine, depending on category findings.

The author has noted that wedges made from high-density foam rubber seem to be just as effective and enhance patient comfort.

He usually blocks with the patient in the prone position. The supine position is used if clinically indicated, e.g. pregnancy. Sometimes the blocks need to be repositioned when an underlying condition is revealed.

Bathie (1996b) reports the following, relative to Category 1 blocking:

> *The short leg block is angled at 45° upward [i.e. toward the head], through the acetabulum, with the centre of the block being under the hip joint. The long leg block is angled at 45° downward [i.e. toward the feet] at the level of the PSIS, with the centre of the block under the ilium. The blocks are angled to face each other while in position and, if the positions are correct, the pelvis is balanced from side to side and from inferior to superior.'*
>
> *After three full respiratory cycles the short leg should appear to be approaching the length of the long leg . If not the blocks are removed and the patient is reassessed.*
>
> *With the blocking determined to be correct: The blocks remain in position for 5 to 6 minutes to allow for adaptation and a response from the muscular system. The correct position is enhanced by the patient breathing deeply, inhaling fully, holding as long as possible then exhaling deeply as long as possible ...*
>
> *During this time [the practitioner] will check for dollar signs [neurological indicator] and crest signs [myological indicator] to ensure there is no decrease in muscle tone. This would indicate that the patient cannot tolerate the correction. The dollar sign is affected by all direct and indirect cord level failures, since it monitors all neurological indicators. A positive sign consists of resistance or tension but may be overridden by pain. These areas must be correctly balanced in order to maintain the pelvic positions that the blocks have established.*

The 'dollar sign' is so named because it occupies an area about the size of a US silver dollar, bilaterally at the crossover point of the piriformis and gluteal muscles and is checked for tension and pain findings. The 'crest sign' relates to the erector spinae muscles, about 7.5 cm lateral from the L4 spinous process. Altered proprioceptive reaction due to changes caused by body imbalances, primarily muscular, is said to result in strengthening on one side of the erector spinae and weakening on the other. The crest is tested for pain and tension findings.

In a 1985 interview with Heese (1991), DeJarnette said, '… the tableboard finally provided the foundation for the blocks, so that when the patient breathes this energy can be transmitted to motion for correction of the subluxation'.

The next important SOT evolution was the establishment of the category system of assessment and treatment (see Box 5.4) in the 1970s.

DeJarnette's definitive works are considered to be the 1984 *Sacro-occipital technique manual* and the 1979–80 *Cranial technique manual*. The cranial component of SOT is intimately connected with category findings and the general objective follows that of Sutherland, in that he saw the need for resolution of dysfunctional patterns such as interacting reflexes relating to the spine, axial

Box 5.4 SOT categories

In the SORSI SOT Manual, Bathie (1996b, pp i–1) states:

> *The sacrum is the basis of the corrective procedures in SOT. Problems develop in the sacrum due to stress and as the foundation of the spine begins to shift all systems have to compensate. As dural system torques, cord level dysfunction develops and vertebrae shift to regain and maintain postural balance. These changes cause foraminal alterations. The shifting sacrum in relation to the innominates is responsible for the production of one of three distinct disease/trauma categories which displaces normal function. These systems are interrelated and yet separate, each being treated in a certain manner.*

Category 1 (Fig. 5.3) Bathie (1996b, pp i–13) describes Category 1 as:

> *... a system which involves the craniosacral mechanism. This comprises the structures of the axial skeleton and their involvement in the mechanism which pumps the cerebrospinal fluid throughout the central nervous system. The Category 1 system is comprised of the respiratory portion of the sacroiliac (SI) joint (the boot) as well as the respiratory system of the vertebral and cranial bones. Also involved is the entire meningeal system which requires a balanced tension in the pelvis. Distortion of the SI boot results in an altered relationship between the sacral and iliac surfaces within the articulation. Irritation of the meninges at the intervertebral foramen is considered to be a primary cause of nerve irritation at the nerve root level. The central nervous system is disturbed through more complex distortions.*

Howat (1999, pp 31–37) illustrates these effects and indicates that the major muscle groups involved are erector spinae, semispinalis and quadratus lumborum. He also gives a description of the evolution of a Category 1 lesion and the observable clinical effects and findings.

The 'sacral boot ' or 'sacroiliac auricular boot' is DeJarnette's name for the part of the SI joint which is described as boot shaped on the iliac side and ear shaped on the other. Howat (1999, p. 38) shows this diagrammatically and says: 'there are two parts to the sacro-iliac joint. The moveable moist synovial auricular section which is the Category 1 part of the sacro-iliac joint and the dry hyaline weight-bearing Category 2 part of the sacro-iliac articulation'. Howat describes how an uncorrected Category 1 lesion may develop into a Category 2, weight-bearing, SI joint lesion.

Category 2 (Fig. 5.4) Bathie (1996b, pp i–17) says Category 2 '... is represented by the weight-bearing, gravitational articulations of the body'. She makes a similar statement to that made by Howat, above, regarding the SI joint in a Category 2 lesion but adds that it '... also involves the articulations of the entire skeleton'. She notes that with this lesion:

> *Lateral stability is important to dural tensions. Category 2 involves the temporomandibular joint and the extremities, plus all mechanical vertebral conditions. The musculoskeletal and fascial planes of the body have distorted planes of movement, horizontally (fascial primarily) and vertically (muscles primarily). The proprioceptive mechanism of the pelvis affects all other proprioceptive responses of the body. The sutural system of the cranium is also a Category 2 component.*

Howat (1999, p. 40) indicates that the muscle dystonias associated with this category affect temporalis, SCM, trapezius, latissimus dorsi, sartorius, gracilis, the iliotibial tract and 'separation of the interosseous ligaments' at the SI joint. He also describes (1999, p. 43) the observable clinical findings associated with Category 2.

Box 5.4 SOT categories—*continued*

Category 1

- Sacroiliac fixation (sidebending rotation)
- Bilateral extension of muscle tension on 1st ribs
- Dural meningeal (endosteal) respiratory fixation
- Anteroposterior sway
- AP heel tension

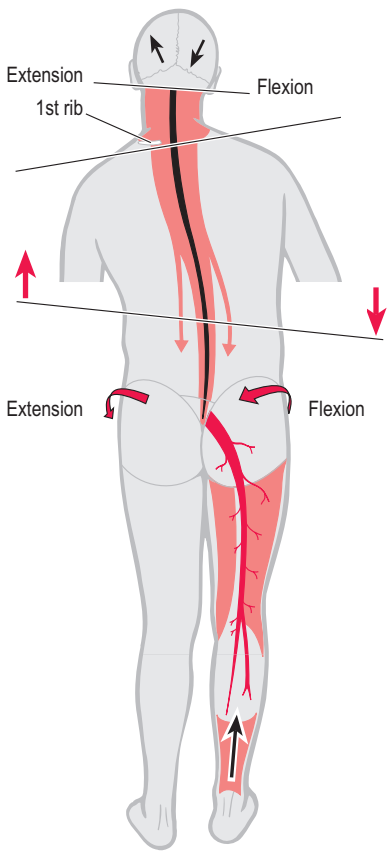

Figure 5.3 Effects of a Category 1 lesion. (Redrawn with permission from Howat 1999.)

Category 3 (Fig. 5.5) According to Bathie (1996b, pp i–21):

> *Category 3 involves the cartilaginous joints of the entire skeleton, in particular the intervertebral discs and the facet joints. Often, this situation results from a long standing Category 1 or 2 situation. When the normal pelvic mechanics are disturbed, the lumbar spine will become hypermobile to compensate for the motion decrease. The ligamentous and cartilaginous structures are not designed for a continual movement adaptation such as this and the breakdown of the tissues is inevitable. The supportive structures have sacrificed tension strength to allow movement. The neurological structures are involved through compression and/or traction forces.*

Both Bathie and Howat (1999, pp 47–50) describe the observable features and clinical findings of Category 3 lesions . Howat provides illustrations of these and details the effects of discogenic degeneration associated with this category.

All three categories have autonomic nervous system effects and cranial effects. Bathie (1996b, pp i–1) mentions that 'Mixed categories can exist and it is your duty to determine the prevalent situation for correction. The proper application of each system's techniques will not provoke an insult reaction ... the goal is to promote healing, not to uncover an underlying condition'. She also mentions the need to check the indications at each visit to ensure a new major complaint will not take precedence over procedures used during previous visits.

She stresses the need to follow the flow charts (Rasmussen et al 1992) when applying procedures. These

Box continues

Box 5.4 SOT categories—*continued*

Category 2

- Sacroiliac subluxation (torsion and sidebending rotation)
- Unilateral body drop
- Dural sutural (periosteal) subluxation
- Temporomandibular maxillary subluxation
- Lateral sway
- Medial and lateral knee tension
- Medial and lateral heel tension

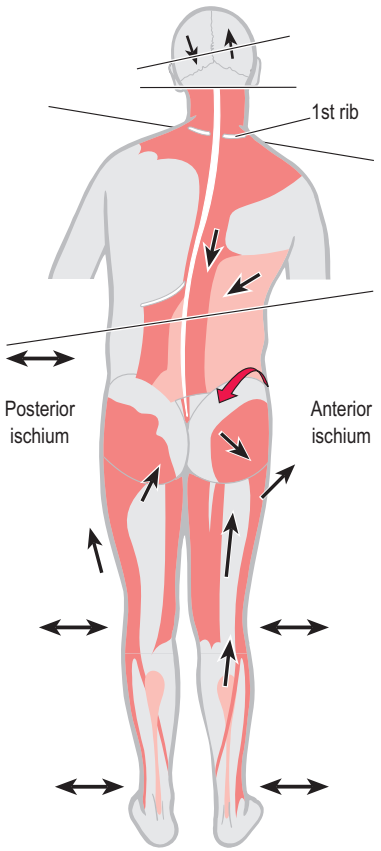

Figure 5.4 Effects of a Category 2 lesion. (Redrawn with permission from Howat 1999.)

flow charts show six checks to establish the category and 18 checks or action steps, to complete an uncomplicated Category 1 treatment with 12 more steps in a situation where dural tension is involved which may lead to cranial adjusting.

Category 2 requires up to seven preliminary checks to establish the category, with 13 more steps in an uncomplicated case or up to eight more checks or action steps, if complicated.

Cases assessed as 'healing Category 2' require eight more action steps. Cranial adjustments are included in the Category 2 procedure.

Category 3 requires a minimum of 11 checks or action steps and, depending on findings, may require 16 checks or action steps. Cranial adjusting is included as a pain control procedure (Bathie 1996a, pp iii–8).

Howat (1999, pp 37,42, 51) illustrates the cranial areas affected in each category.

Bathie (1996a, pp ii–27) lists the types of cranial procedures for each category. There are five types of procedures used with Category 1, six with Category 2 and one with Category 3. 'Certain procedures are used only with a specific category situation and are contraindicated in other categories.'

Without making an exhaustive study of the procedures, the detailed approach to the neuromusculoskeletal system is obvious. However, it is difficult for a student to readily comprehend.

Box 5.4 SOT categories—*continued*

Getzoff (1996) has developed a simplified approach to the SOT methods of cranial adjusting. He states: '... the cranial techniques illustrated in this book can be used with other chiropractic techniques, provided other structural problems are addressed prior to adjusting the cranium'.

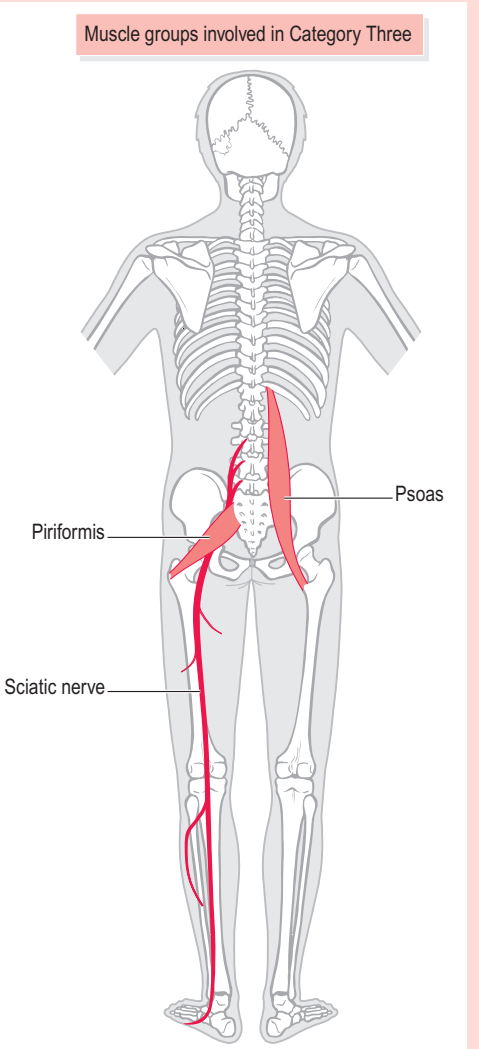

Figure 5.5 Muscle groups involved in Category 3 lesion. (Redrawn with permission from Howat 1999.)

skeleton, extremities, soft tissues and cranium, before commencing specific cranial procedures.

During his lifetime DeJarnette investigated many reflex phenomena. He authored over 125 publications and produced a monthly newsletter between 1933 and 1991. By today's standards these self-published works may appear crude, with many naïve, hand-drawn illustrations. Nevertheless, they contain a wealth of observation and information, obtained from patient care, experimentation and correlation with other sources, over a period of 60 years, much of which had not, and still has not, been investigated elsewhere.

DeJarnette was not without contemporary critics. Regarding his 'constructive criticism' of the National Chiropractic Association's research policies, in the Sacro-Occipital Research Bulletin (August 1944), Weiant (research director of the

NCA's National Council on Public Health) observed:

> *One can hardly help expressing amazement at the lack of appreciation of the nature and spirit of scientific enquiry and the advocacy – in place of a program of research – of indoctrinating chiropractors with a long series of unproved and, for the most part, highly debatable propositions, simply because DeJarnette says they are true.*

While Weiant thought that DeJarnette acted in a superior way to most technique teachers, he suggested that:

> *… when the itinerant teacher teaches as fact what is in reality but hypothesis or theory and when he succeeds in promulgating error among us, a situation exists which is … a cause for professional concern … (Weiant 1944)*

Unfortunately, Weiant's final statement still applies to much recent literature, such as that of Bathie (1996a, b) and Howat (1999), both of whom restate the work of DeJarnette without subjecting it to critical analysis or directly citing references to the literature to support his concepts. The author has sympathy for the position of these authors because while many of DeJarnette's ideas make sense in clinical situations, in a climate of increasing scientific rigor research validation has become increasingly important. It is the author's belief that if chiropractors continue to act as technicians, following procedures some of which lack validated underpinnings, they may find themselves severely challenged by other health-care providers.

DeJarnette may not have realized the full import of some of his findings. One example is postural sway, which he observed in the early 1930s using a plumb line and incorporated into his procedures. It is not suggested that his plumb line research was the immediate precursor of the methods used in postural analysis today but it confirms the significance of this practical clinical observation. Today international seminars (Duysens et al 2001) are held to present papers relating to posture and gait and their relationship to many of the reflexes that DeJarnette observed and reported on many decades ago (see Ge 2001, Sjöström et al 2003, Tucker et al 2001, Wollacott 2001).

DeJarnette apparently used independent researchers, on contract, to investigate some of his findings but no record of this work is in the public domain. Harrington (1992) has noted the lack of formal attribution of much of the information in his writings, possibly including such independent research.

On DeJarnette's death in 1992, his teachings were continued by those chiropractors, worldwide, who were members of the Sacro-Occipital Research Society International (SORSI), formed by DeJarnette in 1957. Lavitan (2003) says that, for internal political reasons, the Sacro Occipital Technique Organization (SOTO) USA split from SORSI. Both organizations have similar stated aims and both have websites and conduct courses promoting DeJarnette's teachings. Both appear to retain the core of DeJarnette's procedures but seem prepared to refine the original writings and remain open to information from other sources in the cranial field. This is clear from the documentation on the respective websites and from lists of speakers at seminars.

Analysis of definition and description of SOT

DeJarnette (1967) provided this overall definition of the diagnostic aims of his procedures.

> *The philosophy, art and science of Sacro Occipital Technique seeks to search for and find the reasons for neurological changes which affect muscles and the effect of muscle changes upon human mechanics, especially the mechanics of the vertebral spinal system of man.*

Specifically relating to the cranium, he said (1977):

> *This book is dedicated to an understanding of a co-ordinated movement of cranial sutural systems in such a manner as to maintain a normal for the brain systems and to provide those brain systems with nourishment through motion.*

More recent publications (Bathie 1996a, b, Howat 1999, Pick 1999, Saxon et al 1990) have refined DeJarnette's writings and give clearer indications of diagnostic procedures.

This involves:

- visual observations of surface landmarks
- lateral X-ray analysis
- static palpation of the whole skull, with sutural palpation (i.e. detecting sutural anomalies) and noting pain responses to light pressure
- detecting cranial motion using applied external pressure, using breathing to assist cranial motion and palpating the cranial rhythmic impulse
- detection and correction of dysfunction in body parts remote from the head
- consideration of patient history and symptoms to restore intrinsic cranial motion associated with the primary respiratory mechanism (PRM).

The SOT interpretation of the correlation of cranial findings to the condition of the rest of the body (as defined by the SOT categories) is discussed by Saxon et al (1990), with recommendations and cautions relating to the procedures to be used.

Howat (1999) has provided a beautifully illustrated interpretation of the effects of the three categories (see Box 5.4) on the cranium and spinal dura. The SORSI publications by Saxon et al (1990) and Bathie (1996a, b), referred to above, are clearly written and define SOT terms and procedures adequately.

There is no overall model of the procedures of SOT. However, the SORSI has developed logic trains (Rasmussen et al 1992) for the procedural sequences relative to each category. These and methods of undertaking procedures are adequately illustrated in Bathie's (1996a, b) work to act as an *aide mémoire* for participants at seminars. Howat's (1999) illustrations also provide a valuable aid to instruction.

The historical background of SOT and the rationale for treatment have been discussed. The SOT indications, contraindications and cautions for treatment are mostly defined within the confines of the technique.

The main difference between SOT and other procedures is the method of diagnosis and determination of the sequence of application of adjustments. Most of SOT's cranial manipulation procedures are similar to those used in osteopathy. Although there is no overall diagrammatic model defining the SOT approach to cranial procedures, it is clear that SOT co-ordinates cranial manipulation with whole-body procedures, using specific vertebral adjustments, blocking procedures, soft tissue techniques and a range of reflex techniques, in an attempt to address and influence neural, fluid dynamic and mechanical aspects of cranial structure and function.

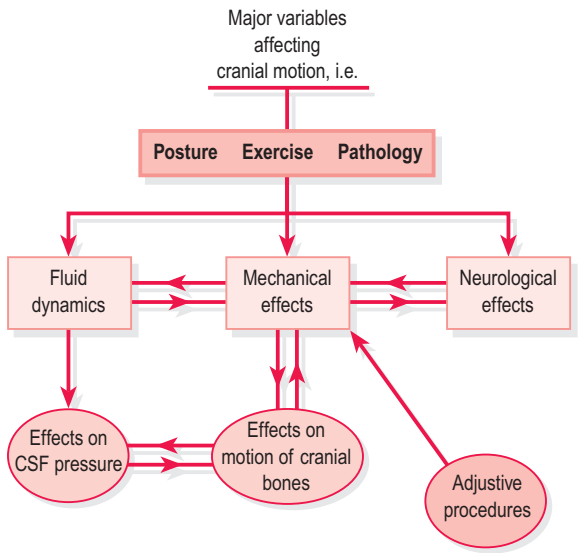

Figure 5.6 This figure summarizes the interacting factors influencing cranial motion. Body position, exercise and pathology may have major mechanical, neurological and fluid dynamic effects which influence cranial bone motion. (Adapted from Pederick 1994.)

George Goodheart: applied kinesiology (AK)

Goodheart, the son of a chiropractor, graduated from the National College of Chiropractic (Chicago) in 1939 and went into practice with his father. In 1941 he began military flying training, eventually becoming involved in air operations research. He resumed his chiropractic career in 1946.

Many of the influences on Goodheart are described in his book *You'll be better: the story of applied kinesiology* (undated, early 1980s). They derive from his clinical experience, leading to the development of AK, and include:

- observing the excellence of his father's work and realizing that his own clinical and diagnostic skills needed further development

- recognizing the value of nutrition. Later this area of his work was expanded using temporo-sphenoidal–vertebral reflexes, as developed by Rees
- gaining an understanding of the principles of muscle testing and the value of stimulation of muscle origins and insertions, using manual pressure
- finding that some conditions could be affected by lymphatic drainage, leading to the use of Chapman's, or neurolymphatic, reflexes, first described by osteopathic physician Frank Chapman (Owen 1963)
- becoming aware of cases where application of cranial procedures, as developed by Sutherland and Magoun, produced beneficial results
- finding an application for neurovascular reflexes, developed in the 1930s by Bennett (a chiropractor) leading to the evolution of the neurovascular component of AK
- studying acupuncture in the early 1960s, leading to the detection of a relationship between viscera and muscles, resulting in procedures which were subsequently incorporated into AK
- adopting the use of DeJarnette's blocks and category system, for treating pelvic dysfunction.

Goodheart (1980s) says:

> *Applied Kinesiology is based upon the fact that body language never lies. The opportunity of understanding body language is enhanced by the ability to use muscles as indicators of body language. The original method for testing muscles and determining function, by the methods first advocated by Kendall and Kendall (4th edn. 1993), is a prime diagnostic device. Once muscle weakness has been ascertained, a variety of therapeutic actions are available.*

Some aspects of AK have been taken over by other health-care providers, such as massage therapists and naturopaths, some of whom may not have the diagnostic skills and breadth of knowledge of the neuromusculoskeletal system expected of a chiropractor. Such therapists often base their approach on the work of Thie, as described in his book *Touch for health* (1973), who originally collaborated with Goodheart.

The primary reference book describing AK is the work of Walther (1988), a monumental, heavily referenced text of 572 pages.

Within the chiropractic profession there are a number of techniques which seem to be offshoots of AK or that appear to use similar approaches, e.g.:

- Touch for health (Thie 1973)
- SOTAK (Denton 1979)
- Neural organization technique (NOT) (Ferreri 2003)
- Neuro emotional technique (NET) (Walker 2003)
- Total body modification (Frank 1995)
- Nambudripad's allergy elimination technique (NAET) (Nambudripad 2002)
- Chiropractic ecology (Peacock 1999).

Analysis of definition and description of AK

One of AK's basic concepts, held in common with other health-care fields, is that the body is self-correcting and self-regulating (Goodheart 1980s). A complete standard diagnostic work-up is strongly advocated, to which AK adds a functional element.

Many standard diagnostic procedures may fail to detect significant changes of function until they are two standard deviations from the norm. That is, when the normal negative feedback control mechanisms of homeostasis have failed. AK aims to detect what could be termed 'noise in the system', which detracts from system performance, so providing a functional diagnosis.

AK techniques including use of the stomatognathic system

Widely used approaches within AK include:

- adjustment of spinal and extremity joints
- observation of and actions to normalize posture and gait
- soft tissue techniques
- neural receptor treatment
- meridian balancing
- balancing the craniosacral primary respiratory system
- nutritional therapy.

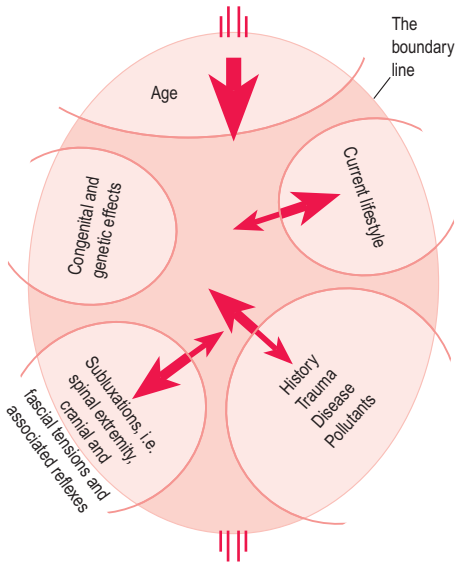

Figure 5.7 Outline of a theory of dysfunction. Australian Rules football is played on an oval ground. The shaded area represents the homeostatic range available to the body's feedback mechanisms. In youth and perfect health, the human body is extremely adaptable: the shaded area occupies most of the ground. The shaded area is reduced in size by factors such as age, lifestyle, congenital and genetic factors, traumatic insults from physical injury, disease processes, environmental factors and subluxations which may be vertebral, paravertebral, extremity or cranial, allied with muscle or fascial dystonias and associated reflexes. The effect of these factors is to generate noise or aberrant signals into sensory nerves, leading to interference with homeostatic and other control processes. Arrows indicate the potential for reversing these factors. Lifestyle and traumatic factors may be reversed slowly but reducing subluxations is the quickest way to increase the available shaded area, i.e. the range of homeostatic and other control processes. The concepts in this diagram may indicate a basis for AK and other techniques testing procedures. (Adapted from Pederick 1994.)

AK practitioners consider cranial procedures to be part of their comprehensive approach to the body and particularly to the stomatognathic system (referring to the mouth and jaw).

The stomatognathic system involves the complex interaction between structures and functions of the head and neck (Walther 1988, p. 344). Shore (1976) has listed the components of this system as including 'the bones of the skull, the mandible, the hyoid, the clavicle and the sternum; the muscles and ligaments; the dento-alveolar and the temporo-mandibular joints; the vascular, the lymphatic and the nerve supply systems; and the soft tissues of the head and teeth'. In addition Walther includes within the stomatognathic system the dural connection to the sacrum and coccyx and, by extension, the innominate bones.

The stomatognathic system is therefore considered during the initial history taking and examination. In AK, dysfunction of the endocrine system, indications of sympathetic/parasympathetic imbalance, proprioception relative to visual righting, labyrinthine and head-on-neck reflexes are some of the features examined which might suggest the need for cranial treatment.

The cranial bones are assumed to be capable of being restricted in either extension or flexion positions (see Chs 1 and 2) and such dysfunctional patterns are tested during the inhalation and exhalation phases of respiration.

Rebound challenge

Cranial restrictions are detected by what has been termed the *rebound challenge* method. The cranial bone being assessed is subjected to a vector of force, in order to exaggerate the putative lesion (a method described by Magoun 1976, p. 100) and is then released. Following the challenge, temporary inhibition of the strength of a previously tested muscle is regarded as confirmation of a cranial restriction.

Treatment is completed by 'applying pressure in the direction of optimal challenge, on the phase of respiration that correlates with the cranial fault' (Walther 1988, p. 353; see also Cuthbert 2003). (This is a positional release approach; see notes relating to 'strain/counterstrain' in Appendix 1.) Gentle continuous pressure is applied, possibly repeated several times, until improved motion of the bone is detected.

Cuthbert (2003) says:

> *The correction procedure is sustained through several respiratory cycles (using the same vector as found by the optimal challenge) allowing the reciprocal tension membranes (dura, arachnoid and pia mater surrounding the brain and spinal cord) to accumulate enough energy or tension, to free itself and spring back or 'rebound' into the correct relationship.*

Reapplication of the same rebound challenge should then result in a negative finding.

Walther (1988) has taken pains in his text to clearly define the terms he is using. He also uses a number of diagrams to illustrate aspects of cranial motion, notably the closed chains of kinematic gears and levers (p. 349) which simulate the mechanical relationships of cranial bones and the closed kinematic chain of the stomatognathic system (p. 375).

There is no representation of the whole-body interaction with the cranium, although in the text mention is made that: 'the stomatognathic system integrates with function of the pelvis and spine and those three divisions integrate with the rest of the body's actions' (p. 375). AK procedures include a comprehensive range of treatments for these areas and the bony and soft tissue components of the stomatognathic system.

The history of AK has been discussed, as have the indications for cranial manipulation. Specific contraindications and cautions for cranial treatment have not been defined but the detailed initial examination that Walther advocates should detect any such cases.

The main differences between AK cranial methods and those procedures more closely aligned to traditional osteopathy are the methods of diagnosis and the determination as to which bones require manipulation, as well as the range of methods of treatment.

Although there is no comprehensive model defining the AK approach to cranial procedures, it is clear that AK attempts to co-ordinate cranial manipulation with whole-body procedures, using specific vertebral adjustments, blocking procedures, muscle receptor and other soft tissue techniques, plus a range of reflex techniques based on meridian patterns, in order to address and influence the neural, fluid dynamic and mechanical aspects thought to be affecting cranial structures.

W J Kotheimer: applied chiropractic in distortion analysis

Kotheimer's work (1976) is not as well known as that of either DeJarnette or Goodheart. However, he has made a significant contribution to the field. Kotheimer was an instructor at the SORSI annual seminars for 3 years and president of the SORS of Ohio. He also lectured for state SOT study groups. He was fully aware of Goodheart's work and keenly interested in motion palpation, having maintained correspondence with Dr Henri Gillet on the subject. Gillet, a Belgian physician, is regarded as the modern developer of motion palpation as a diagnostic procedure for manual therapy. Kotheimer (1976, pp 3–4) was especially interested in patterns of fixation, as noted by Gillet, particularly those between the altanto-occipital joints and the pelvis.

Discussing the impetus for his work, Kotheimer (1976, p. 4) says: 'I reasoned that if Dr Gillet's and Dr DeJarnettte's teachings were valid, then there should be a definite correlation between the two'.

Kotheimer defined a whole-body distortion pattern, including cranial distortion, similar to patterns noted by others, e.g. Bergmann (1993), Cooperstein (2003a), Defeo & Hicks (1993), Hammer (1993a, b), Masse et al (2000), Siclare (1993) and Wiegand (1996). He also developed a challenge method (1976, pp 9–12), a modified Malcolm Test (see Box 5.5) for assessing spinal and cranial distortions. This test relies on observation of changes in leg length when a subluxated spinal segment or cranial bone has pressure applied in a specific direction. The test developed by Malcolm (1972) was originally used for evaluating food intolerances.

Kotheimer (1976, p. 132) determined the most desirable direction of cranial adjustment by using the challenge test. The optimal direction for the manipulation is considered to be opposite to the positive challenge direction. He also used 'a light flipping action in the prescribed direction', which, as noted previously, was originally advocated by Dr Nephi Cottam.

Kotheimer used multiple repetitions of his adjustment, up to approximately 50, in the course of one treatment.

Kotheimer's procedures: definition and analysis

Kotheimer (1976, p. 2), noted that his research was based on the proposition that:

Box 5.5 Kotheimer's modified Malcolm Test

Kotheimer's modified Malcolm Test involves placing the patient prone and symmetrically on an adjusting table with a split headpiece. The patient is made comfortable with the knees bent to about 10° with the ankles supported on a footrest. The pelvic portion of the table is raised about 2.5 cm to place the weight of the lower trunk and pelvis at the acetabular level. If the patient has a pendulous abdomen, the abdominal section of the table should be dropped to take the weight off this part.

Using a ruler and marker, a line is made across both calves, about 8 cm above the ankle, at right angles to the centerline of the patient.

The challenge is made to any vertebra or cranial bone which may be considered to be restricted, by exaggerating the putative distortion using firm finger pressure.

The practitioner then moves to the patient's feet and gently raises the ankles to bend the knees to 15–20° and observes any change in leg length, as determined by the position of the marks on the calves. A positive finding is clearly obvious as the change is usually 7 mm or more.

The effect lasts for about 25–30 seconds and can be reversed by the practitioner flexing and unflexing the patient's knees a few times.

The author has considerable experience with this test and, after ruling lines for long enough to establish confidence in the method, now relies on comparison of change of leg length at the medial malleoli. If the major structural corrections have been made to the body, the legs will usually appear to be of equal length.

The practitioner needs to be observing the malleoli from directly above, with the hands supporting the ankles and the vertical flexed second fingers against the medial inferior aspects of the malleoli. The change for a positive finding is usually great enough (often a finger's width) to be readily seen.

The effect may also be observed when testing cranial bones with the patient supine. The examination of the change in leg length is made, again viewed from directly above the malleoli with the patient's ankles supported on the footrest of the table with the thumbs placed firmly up against the medial inferior malleolar surfaces.

> *Man has a tendency to develop specific structural distortions which may involve the cranial and facial features, the atlas rotations, the pelvis and the physiological leg length. And each of several of these distortions that are prevalent is characterized by specific patterns of fixation, also involving the cranium, the atlas and the pelvis.*

Kotheimer (1976, p. 4) detailed the general characteristics of the cranial fixation patterns for the temporal, occipital and frontal bones, with atlas rotation, leg length differences, innominate and sacral distortion. He inferred cranial extension restrictions on the side of the long leg and flexion on the short (see Box 5.5). He also associated the long leg with a flexion fixation of the innominate and extension of the sacrum. He associated the short leg with innominate extension and sacral flexion.

Along with use of the modified Malcolm Test, Kotheimer inferred the type of sacroiliac restriction from the atlas position, combined information on leg length differences and atlas position, to indicate likely cranial distortion patterns. The spontaneous release of the atlas fixation was used to assess the effectiveness of cranial or pelvic manipulations.

A further understanding of the neurological mechanisms involved in the modified Malcolm Test may be found in the research of Denslow et al (1947). They studied facilitation of motor neuron pools by assessing the reflex threshold at several spinal levels, by determining the lowest pressure on a spinous process that elicited spike potentials, detected in electrodes imbedded at the same level. Among other things, they found:

> *… low threshold segments are those in which a relatively large portion of the motoneurons are maintained in a state of facilitation, due to chronic bombardment from some unknown source. Presumptive evidence indicates that the facilitating impulses arise from segmentally related structures.*

Kotheimer considered that application of pressure to a vertebra, in a low threshold segment, should induce a leg length difference. However, extrapolation of this process to cranial bones requires further investigation.

Having used the modified Malcolm Test for approximately 20 years, this author supports the value of Kotheimer's work. The experience has been one of consistently positive patient outcomes following treatment, when the dysfunctional, restricted structure retests negative after an initial positive finding. The author has also observed that, in some instances of severe spinal injury, such as are incurred during a motor vehicle accident, a spinal segment may never retest as negative. He has also used this test to check for restrictions in non-palpable structures, for example in the centerline of the skull. A positive finding is commonly negated by careful application of procedures designed to restore motion in the area under test.

Kotheimer also used the modified Malcolm Test to check the patient's nutritional status.

Although Kotheimer clearly described his procedures and provided tables, drawings and photographs to illustrate details of these, he does not appear to have developed a comprehensive model. His writing is based mainly on his clinical experiences and provides few references or explanations as to the physiological mechanisms that may be operating.

Kotheimer does not provide any contraindications or cautions for cranial manipulation but makes a careful preliminary examination. He considers the main indications for cranial manipulation to involve facial and cranial asymmetry, tender points on the temporosphenoidal sutures, occipital fiber nodularity and recurrence of these indicators following four or five treatments (possibly involving spinal and extremity adjustments, soft tissue treatment and nutritional supplementation). The modified Malcolm Test is used to locate cranial faults in specific bones/sutures.

Kotheimer's approach, compared with SOT and AK, places more weight on observation of bodily distortion patterns and uses motion palpation and the modified Malcolm Test to determine the level and direction of standard manipulative procedures for the spine. The cranial manipulation methods are based on those developed by Cottam and involve applying light force in directions determined by the modified Malcolm Test (see Box 5.5).

Although there is no overall model defining his approach to cranial procedures, it is clear that Kotheimer co-ordinates cranial manipulation with whole-body procedures. He advocated use of specific vertebral adjustments, soft tissue techniques (principally Nimmo trigger point therapy) and reflex techniques (principally DeJarnette's occipital fiber-line techniques), in order to address and influence the neural, fluid dynamic and mechanical aspects influencing cranial structures.

Assessment of the evidence for SOT, AK and Kotheimer's methods

The next phase of this examination of chiropractic influences on cranial treatment methodology will be to assess them for measurable evidence using the methods devised by Kaminski et al (1987) (see Box 5.1).

There are no measurable observation studies that relate specifically to the three chiropractic approaches under discussion. However, there are numerous studies relative to the broader cranial field of study that do support the validity of these procedures. For further evidence see Chapters 1 and 2, as well as the works of British Society of Osteopaths (BSO 2003), Drangler & King (1998), Farvis (2003), Moran & Gibbons (2001), Oleski et al (2002), Pederick (1997, 2000), Sergueef et al (2001) and SOT USA (2003).

Research papers that appear to challenge cranial concepts include those by Ferre et al (1990), Fiepel et al (2003), Hartman & Norton (2002) and Herniou (1998, 1999).

Feipel's study on 11 formaldehyde-fixed whole-body anatomical specimens (mean age: 82 years) fails to support the contention that cervical spinal motion induces strain, measured by linear transducers in the dura mater of the skull.

However, a report by Upledger (2000), associated with dissection of the fresh unembalmed cadaver of an 80 year old, found that gentle traction on the dural tube, at various points between the occciput and sacrococcygeal complex, could be palpated in the falx and tentorium and vice versa.

These are not directly comparable experiments but suggest that Fiepel could be incorrect and that the preservation process may have affected the findings. It might be worthwhile repeating

Upledger's experiment with induced cervical spinal motion. (See also Ch. 6 regarding Kostopoulos & Keramides (1992) who demonstrated that 4 ounces of traction force could encourage elongation of the falx cerebri.)

Ferre, Herniou and Hartman & Norton challenge many of the basic cranial concepts. Herniou states that his experimentation showed that changes in CSF pressure could not account for cranial bone motion and that the primary respiratory motion (PRM) was a myth. Hartman & Norton examined all of the elements of the PRM and placed special emphasis on interrater unreliability of CRI measurements. A detailed review of this work is beyond the scope of this chapter and the reader is referred to the first two chapters of this book (see particularly Norton's (1996) discussion of these issues in Ch. 2).

In response to negative observations it is worth noting that: 'The combination of the human brain/hand, with training plus experience, is an extremely sensitive and accurate detection system, not readily replicated or modeled. The ability to more readily palpate movement of "other" rather than "self" has been documented' (Vines 1999). As with all forms of detection, palpation is imperfect and subject to interpretation. From the author's personal observations of performance at seminars and in classes, it appears that at least 10% of participants have initial difficulty in palpating the CRI.

The histological and physiological basis of cranial manipulation has been examined within the limits of the ethics of experimentation on humans and equipment accuracy, with sufficient detail to enable replication, in experiments noted earlier (Chaitow 1999, Pederick 1997, 2000).

Niculescu (1999) has suggested that brain imaging studies, using functional MRI or PET scans, correlated with detection of biochemical changes in neurons, could be used to detect changes in brain function. The use of SQUID (superconducting quantum interference device) detectors to note such changes has been reported in earlier chapters (see full discussion of SQUID in Ch. 2).

Surface detectors, as used by the Brain Sciences Institute (2004) at Swinburne University of Technology in Melbourne, could also provide low-cost applications to map changes in brain function. However, cranial research is unlikely to readily attract the funding needed to undertake this type of work on an ongoing basis. See the observations of Professors Ernst and Korr later in this chapter on this topic (p. 132). On a clinical level greater use could be made of paper-based comprehension and intelligence tests, as a relatively low-cost means of evaluating changes induced by cranial manipulation. Upledger's research (1977, 1978) appears to offer validation of such changes.

Although not directly related to the diagnostic procedures used in the three chiropractic approaches being examined, the experimental observations discussed in preceding paragraphs provide a basis for a rationale for cranial procedures. Despite dissenting voices, there is a broad consensus in the literature, supported by measurement, for at least two key elements of the cranial concept: the detectable motion of cranial bones and the existence and detection of the CRI. This consensus applies to the techniques under discussion (see Chs 1 and 2).

Scientific knowledge

The data input in this step of the Kaminski evaluation is detailed in Box 5.1. Much of the basic science information relating to the techniques under examination has been discussed above. Papers cited and those on chiropractic clinical science form an expanding body of evidence and, in the case of SOT and AK, can be examined in detail in references listed previously, including related websites.

The SOTO USA site shows a growing list of papers, most of them peer reviewed, relating to cranial issues. These contain a large number of case reports but there is a dearth of research into clinical aspects. Case reports offer a useful way to relatively inexpensively direct research effort in the future.

Testing SOT procedures

SOT diagnostic methods have been subjected to examination.

- Leboeuf, who authored four papers on this subject between 1988 and 1991(Leboeuf 1990, 1991, Leboeuf & Patrick 1987, Leboeuf et al 1988), concluded in a more recent paper (Hestoek & Leboeuf-Yde 2000), based on a literature review: 'For the sacro-occipital technique, some evidence favors the validity of the arm-fossa test but the rest of the test regimen remains poorly documented'.
- Gatterman et al (2001), using a consensus approach, concluded that: 'The ratings for the effectiveness of chiropractic technique procedures for the treatment of common low back conditions are not equal. Those procedures rated highest are supported by the highest quality of literature'. Techniques described as 'non-thrust reflex/low force', which could include SOT, were rated amongst techniques considered least effective, for four low back conditions.
- Gleberzon (2000a) examined 111 papers on 'named techniques', of which 11 dealt with SOT. He found that: 'The literature suggested that prone leg length testing and some X-ray mensurations may have acceptable inter- and intrarater reliability'.
- The reader is referred to the comments on Walker & Buchbinder's paper (1997), later in this chapter.
- Muscle testing by Unger (1998), which he conducted before and after SOT Category 2 blocking procedures on 16 patients, found a statistically significant increase in muscle strength in 15 of 16 muscles tested. Unger concludes that this demonstrated the effect of blocking. However, Unger's procedure is not part of SOT diagnostic procedures.
- None of the papers listed above relates directly to the cranial aspects of SOT and they do not provide validation of the procedures.

Testing AK procedures

Most AK procedures are based on muscle testing. The essential hypothesized link is that dysfunction of the neuromusculoskeletal system (including cranial components), together with influences involving the autonomic nervous system, vascular, lymphatic and visceral dysfunction, also produces aberrant input into the nervous system which, if sustained, becomes evident in neuronal pools at spinal cord level and in the brain. The aberrant input degrades system performance, including muscle strength (see Fig. 5.7).

AK posits that a range of conditions may be detected by appropriate muscle testing. However, the method does not appear to tolerate independent examination.

Information from the ICAK USA website (2003) indicates that those trained in the methods conduct manual muscle testing at a more refined level and designates their tests as AK MMT ('applied kinesiology manual muscle testing'). This seems to be a rational basis for diagnosis on a theoretical level.

Most AK MMT studies have involved one of three types: comparisons of AK MMT to objective measures of muscle strength or neurological function; interexaminer reliability of AK MMT; and changes in AK MMT findings.

- Klinkoski & Leboeuf (1990) found none of the ICAK papers between 1981 and 1987 met all of their requirements for research papers and none contained statistical information which would enable conclusions to be drawn on the researcher's findings.
- The results of peer-reviewed papers by Hass et al (1994), Jacobs (1984), Peterson (1996) and Triano (1982) also failed to provide support for AK MMT as an accurate diagnostic procedure. See also comments later in this chapter on Walker & Buchbinder's paper (1997).
- McDaniel (1999), critically analyzing four papers said by ICAK representatives to support AK MMT procedures (Lawson 1997, Leisman 1989, 1995, Perot 1991), concludes: '… in the preceding four studies, manual muscle testing was found to have an interesting, reproducible but unexplainable, neurologic component. The conclusion drawn can only be that humans have strong and weak muscles and that this difference can be detected by machines and other trained humans. No pathologies were identified. No link was established between manual muscle testing and any diagnosis.

None of the standard challenges that in AK theory could change muscles from weak to strong and therefore indicate a pathology, were tested (i.e. neurolymphatic points, nutritionals, etc.). No pre- or post-treatment component was examined …'.

- Caso (2003) has tried to refute these criticisms by pointing out that parts of the papers can be interpreted to support aspects of AK propositions. He maintains that, as with deep tendon reflexes (DTRs), the results of AK MMT are a snapshot of the neurological condition of the patient and can only be interpreted in the context of all work-up information available to the practitioner, such as history, biochemical tests and other examination results.
- ICAK USA, in a status statement (2003), has pointed out the wide range of potential causes of facilitation or inhibition of a muscle, a range of modifying factors, plus several precautions that need to be observed if testing using AK MMT is to be reliably reproducible.
- Motyka & Yanuck (1999) have written a detailed examination of the implications of such testing.
- There is no experimental evidence of changes due to AK cranial procedures, previously described (Cuthbert 2003, Walther 1988).

It is this author's personal observation that the AK methods of diagnosis and treatment often result in patient benefits not readily achieved by other means. There would seem to be a need for devising different ways of evaluating AK performance.

Testing Kotheimer's procedures

No peer-reviewed papers on Kotheimer's technique appear in the literature. However, he wrote an article for the *Digest of Chiropractic Economics* (1993) in which he described his method as: '… a relatively simple approach to cranial analysis, which requires no cranial motion palpation, muscle testing or other vague signs, such as the cough test'. (The 'cough' test was devised by DeJarnette to detect dural adhesions in the spine by observing the motion of the thumb placed on the L5 spinous process when the prone patient coughs.) There are no studies to substantiate Kotheimer's findings. He has reputedly been able to have assistants accurately replicate some of his testing procedures.

The author has found, on the basis of extensive clinical application, that Kotheimer's methods, particularly his modified Malcolm Test, appear to offer accurate and reliable indications of subluxation. However, I have not conducted any tests to prove this. Again, many of the problems involved in testing procedures, mentioned earlier, arise, such as defining the 'gold standard' method of detecting a subluxation to enable testing to take place.

Conclusions so far

The analysis of these techniques so far suggests that one could infer that while there are an increasing number of case studies, as well as anecdotal evidence extending over many decades, to support the use of chiropractic cranial technique, adequate proof remains absent.

- There are no studies that link diagnostic procedures used to particular conditions.
- There is no evidence that one technique is superior to another and this would also seem to apply to cranial techniques used by other health-care professionals.
- The same observations seem to be true of cranial manipulation relying on palpation of the cranial bones.

The evidence is not consistent, based on the processes defined by Kaminski et al (1987). The techniques described can at best be rated as attracting 'provisional acceptance', subject to further experimentation and testing.

Experimentation and testing

The Kaminski process for experimentation and testing is detailed in Box 5.1.

In the case of the three types of chiropractic cranial methodology discussed above, there are no studies in the peer-reviewed literature which assess the efficacy and efficiency of these cranial procedures for any condition and none to provide a comparison of or between these methods.

There is little independently tested evidence to support the diagnostic procedures used in SOT

and AK and none for Kotheimer's. Yet practitioners and patients continue to report favorable outcomes for a variety of conditions. In some instances outcomes have been published in peer-reviewed journals as case reports. For example, the SOTO USA website (2003) contains a growing list of papers relating to the cranial field and there are an increasing number of case studies being reported. These could, in the future, lead to a means of overcoming the experimentation and testing impasse.

Korr, a renowned researcher in the osteopathic field, suggested a different approach to experimentally testing manipulative procedures. His talk to the 1956 annual convention of the American Osteopathic Association and his 'Andrew Taylor Still memorial lecture: research and practice – a century later' (1974) provide the background to his thinking on this topic. Korr (1956) stressed the need for independently trained researchers to direct research and for the development of research skills in interested practitioners.

Korr (1956, 1974) pointed out that osteopathic (and, by implication, chiropractic) patient–practitioner interactions involve much more than manipulative input to the spine, soft tissues or cranium. There appears to be an interaction taking place at several levels simultaneously and this is especially true with cranial work.

If research analysis interferes with this process, the results are unlikely to be the best attainable. Korr advocates treating the process as a 'black box' (not Korr's term), where experimenters do not concern themselves with the process but only with measuring objective findings relating to the patient's condition, before and after the therapeutic input, as well as assessing the patient's subjective impression of their condition, before and after the process.

Some of the difficulties inherent in research, including the 'black box' approach, have been pointed out (Blum 2001, Korr 1956, 1974). Looking at individual tests or parts of a procedure in isolation can be likened to tearing off a butterfly's wings in order to find out what makes it fly.

Ernst, in a *BMJ* article (2000) and in an editorial paper in a recent *Medical Journal of Australia* (2003), outlines the financial, methodological and ethical obstacles to research in complementary and alternative medicine. He points out that the shortage of funds prevents projects being started, limits the development of a research infrastructure comparable to medicine and keeps well-trained scientists out of the field. Ernst appears to agree with Korr that it is possible to: 'conduct an RCT [randomized control trial] comparing a complex, individualized, 'holistic', treatment package to the standard care for that condition'. He says that, while this may involve adaptation of standard research methods, in principle it is feasible.

Discussing the chiropractic field generally, Wenban (2003) raises the 'massive theory–research–practice gap'. He continues: 'this gap is being made increasingly obvious by events unfolding within the broader health-care environment, where there is a strong drive from many sources to act only in the presence of appropriate evidence'. He says this equates to a need for randomized controlled trials (RCT). Wenban raises the dangers of medical disease models driving chiropractic research and quotes Korr (1991) who suggests a change of research focus, directing it toward the causes of health as a phenomenon.

APPLICATION OF CRANIAL TECHNIQUES

Some years ago a pioneer in the cranial field, Paul Kimberley DO (1987), wrote:

> *Forty-five years after gaining the attention of a few osteopathic physicians and 85 years after its inception, the idea that the skull is mobile and influences health is less frequently rejected and is attracting a steadily growing following among all groups of health providers. Unfortunately, many of the areas in which application of the cranial concept might be of great benefit are controlled by specialists who are not yet aware of this very potent and vital tool which is applicable in both diagnostic and treatment procedures. Some such specialities include pediatrics, obstetrics, psychiatry and general medicine.*

A reading of the current literature suggests that not much has changed.

Keen (2000) and a multidisciplinary team in Sydney have included craniosacral methods in work involving the integration of retained primitive reflexes.

Davies (2000) in Melbourne, working in pediatrics, has produced encouraging evidence of the value of cranial treatment. Nevertheless, he has commented: 'The pediatricians I work with are very willing to accept the spinal and extremity work we do but see the cranial work as a sort of aberration on my part' (Davies 2003).

One area where there is a fair degree of interprofessional understanding and co-operation exists between orthodontists and chiropractors using cranial procedures, described by Ancell (2000), Chinappi & Getzoff (1994, 1995, 1996) and Bob Walker (2000).

An example of what may be achieved for some patients with complex problems, when cranial manipulation is included in multidisciplinary specialist environments, is contained in a recent case report by Elliott et al (2003). Elliott discusses the treatment, including cranial manipulation, of a patient with complex neurological sequelae of a blunt head injury, incurred in a motor vehicle accident.

Trends

An increasing trend in the use of cranial and cranially related procedures has been recorded by the USA's National Board of Chiropractic Examiners survey of US chiropractors (Christensen 2000). Methods involving cranial treatment are rated 8th, 9th and 11th among the 17 techniques listed as being regularly employed.

	% of DCs using technique		% of patients receiving technique
Adjustive technique	1991	1998	1998
SOT	41.3	49.0	16.5
Applied kinesiology	37.2	43.2	14.5
Cranial	27.2	37.3	11.2

For comparison, diversified technique, a full spine manual technique, was reported as being used by 95.6% of chiropractors in 1998, who applied it to 73.5% of their patients.

These statistics appear to be supported by research in Australia by Leboeuf & Patrick (1987), who stated: 'Applied Kinesiology, Sacro-Occipital technique and Nimmo were most commonly reported as minor core techniques'.

Walker & Buchbinder (1997) conducted an assessment of frequency of use of methods employed to detect spinal subluxations, as well as the reliability of the methods, amongst 85% of chiropractors in the state of Victoria, using a self-administered questionnaire. Frequency of use and estimated reliability of each method was rated on a seven-point scale, a score of 1 indicating never used or very unreliable and a score of 7 indicating always used and very reliable. The percentage of respondents with an opinion on a particular method was also recorded.

Method	Freq. of use	Rated reliability	Respondents %
Static palp.	6.6+/-1.1	5.7+/-1.2	99
Motion palp.	5.8+/-1.6	5.9+/-1.2	96
AK MMT	3.7+/-2.2	4.3+/-1.9	80
SOT diag. tests	2.9+/-2.3	3.9+/-2.1	68
Visual postural	5.5+/-1.8	4.7+/-1.5	97

These figures give an indication, at that time, of the opinions of chiropractors practicing in the state of Victoria as to the value and reliability of these methods. They are, however, not necessarily an indication of the opinion of those who regularly employed the less commonly used methods, such as AK and SOT. This may be reflected in the higher standard deviations noted for these methods. The results do not necessarily relate to cranial dysfunction but similar diagnostic tests, as used in both SOT and AK, are commonly used as part of cranial assessment.

More recently, Gleberzon (2000b) reported that Canadian chiropractic students have shown a preference for the continued exclusion of SOT, AK and craniosacral techniques from the core of elective subjects available to them.

In the 7 years between the USA's NBCE surveys, the major increase has been in the category of 'cranial'. In correspondence with the author in 2003, the NBCE indicated that the 'cranial' figures should be considered to represent forms of cranial training other than the cranial components of SOT and AK.

Chaitow (1999) has pointed out that between 1985 and 1995 the Upledger Foundation claims to have trained 25 000 people worldwide in his methods. Although most of these are members of

other professions (many being massage therapists), a large number were undoubtedly chiropractors. This may be reflected in the survey results.

The NBCE survey also shows that the utilization of cranial techniques appears to be low.

Use of cranial techniques amongst US osteopathic physicians would seem to be even lower than amongst chiropractors. A recent survey by Johnson & Kurtz (2003) indicated that cranial techniques are the least used of 11 osteopathic manipulative treatment (OMT) techniques amongst US osteopaths surveyed. These authors also note that indirect techniques (such as cranial) were predominantly the province of female and older male osteopathic practitioners. The author's observations suggest that within chiropractic, as with osteopathy, females and older males are the principal providers of cranial techniques.

CONCLUSION: POSSIBLE FUTURE TRENDS IN THE CHIROPRACTIC CRANIAL FIELD

SOT and AK may need to simplify methods if they are to retain numbers of chiropractors using their cranial techniques. As has been mentioned, there have been several evolutions from AK. Getzoff (1996) has developed a simpler version of SOT's cranial procedures which can be used alongside other chiropractic technique systems.

Other apparently simpler techniques, such as Kotheimer's or those based on palpation and standard manipulative techniques, can be used to treat spinal mobility and balance problems, as well as to release fascial and muscular dystonia.

Conventional osteopathic techniques can also be incorporated into chiropractic practice. Chiropractors may need to evaluate the types of cranial procedures being used and debate the physiological underpinning of these. Ideally, procedures need to be developed to establish which methods consistently yield the best results for patients.

Some ideas from the pioneers live on in procedures used today. Cooperstein (2003b) summarizes the situation:

> *Contemporary technique-system practitioners might best show their respect for the founders by taking an honest look at the creation myths and non-reproducible research typically present at their historical core. The founders would expect and demand nothing less. I know people (friends) who have assigned themselves the impossible and totally unnecessary task of validating just about everything the legendary founder … said and did. What a pity; what a waste of time! Chiropractic techniques deserve a healthy admixture of constructive and destructive criticism; that is how they might best be supported. Although it is proper to show respect – even reverence – for early attempts at research and for the techniques that developed from it and [which] have withstood the test of time, it would be a terrible mistake to accept conclusions without the same scrutiny we would maintain for modern research. No double standard for old and for new research is warranted.*

Chiropractors will probably continue to use cranial techniques that appear to them to offer benefit for patients. Unless they also take the trouble to record their work and report on it in the open literature, there is little likelihood of establishing best practice for cranial procedures.

A recent article (Kelly 2003, discussing a possible candidate for sainthood, Father Mychal Judge, who died tending others during the terrorist attack on the World Trade Center) included the remark: '… we find a man whose life teaches us that holiness is not about being perfect but about being real'. There is a parallel with the chiropractic technique systems discussed above. They do not fully meet the standards of acceptability set by Kaminski but they are real. In part they are based on proven physiological phenomena, many of the clinically observed effects are capable of rational explanation and they do commonly lead to benefits for patients. The immediate challenge is to note the words of Korr (1956, 1974, 1991) and Ernst (2000, 2003) and to verify clinical efficacy first and later investigate efficient means of achieving and explaining those results.

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