

## COMMENTARY



### Manual Healing Diversity and Other Challenges to Chiropractic Integration

#### INTRODUCTION

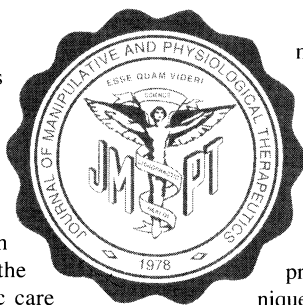
Chiropractic has made significant strides in establishing itself as a leading contender for integration in the emerging health care system. However, recent articles in prominent medical journals illustrate key issues that must be resolved for chiropractic to fully establish itself within the new health care model. Manual therapy diversity and the corollary question of whether chiropractic care should be defined solely in terms of the high-velocity low-amplitude adjustment are issues in need of urgent attention and analysis. Other problematic areas affecting chiropractic's integration into the health care mainstream include research methodology issues, treatment of visceral disorders, and professional relationships.

Chiropractic has met many challenges in its development as a healing art. Throughout most of its existence, the chiropractic profession has battled opposition from organized medicine, suffered financially as a result of exclusion from health insurance reimbursement, and been widely regarded as a marginal profession.<sup>1</sup> Despite these obstacles, chiropractic has flourished, becoming the third largest of the learned health care professions.<sup>2</sup> Although the quality and quantity of chiropractic research during the early years of the profession left much to be desired,<sup>3</sup> modern research has contributed significantly to the success and acceptance of chiropractic.

With the rapidly changing political and economic aspects of health care delivery, chiropractic is well situated to make important contributions to the emerging health care paradigm. However, to fully participate in this revolution, key issues must be addressed with regard to manual therapy diversity, research methodology, the treatment of systemic dysfunction, and professional relations.

#### MANUAL THERAPY DIVERSITY

Chiropractic is one of the main branches of manual therapy. Historically, one of the major challenges of chiropractic has been to define and maintain its unique identity among the various manual therapy professions. This has often resulted in a competitive stance toward other forms of manual therapy. Notably, the rift between chiropractic and osteopathy goes back to the founders of the professions, who openly debated the conceptual and clinical differences of their respective approaches.<sup>4</sup> Osteopathy has integrated a wide variety of



modalities, most notably the practice of medicine, whereas chiropractic has remained primarily focused on the application of manual therapy. Although the role of manual therapy in osteopathy (osteopathic manipulative treatment [OMT]) has decreased, the diversity of techniques practiced by osteopaths has increased. The minority of osteopaths who practice OMT use a broad spectrum of techniques, including inhibitive pressure, soft tissue manipulation, and cranial-sacral treatment.

In chiropractic as well, the short-lever high velocity-low amplitude (HVLA) thrust adjustment (typically associated with an audible cavitation or cracking sound) has been supplemented by a wide range of noncavitating methods, including flexion-distraction, sacro-occipital, Thompson, Activator, applied kinesiology, directional nonforce, and dozens of others. Defining chiropractic strictly in terms of the HVLA adjustment fails to accurately describe the practice of contemporary chiropractic.

Historically, chiropractic has struggled with the dilemma of therapeutic diversity in a number of ways. To some extent, the battle between purists and mixers continues to this day.<sup>5</sup> Some chiropractors offer a blend of diverse manual therapy techniques in addition to complementary and alternative medicine (CAM) options, including nutrition, herbal medicine, energy medicine, and physiotherapy. These chiropractors view themselves as chiropractic physicians qualified to address a broad range of disorders, including systemic dysfunction and visceral disease. Many of these clinicians use methods from the full spectrum of manual therapy, including soft tissue manipulation. Other chiropractors limit their therapeutic methods to the hands-on adjustment but apply this method to both somatic and visceral complaints. Still others feel strongly that the role of chiropractic should be limited to treating somatic dysfunction, primarily back and neck pain.

Manual therapy diversity is more than a historical or academic issue. Structuring research to reflect this diversity poses a significant methodological problem and, if recent well-publicized studies are a harbinger of things to come, represents a potential major stumbling block to chiropractic's full integration into the mainstream of health care.

#### ISSUES IN RESEARCH METHODOLOGY

Two studies reported in leading medical journals illustrate the potential methodological problems confronting chiropractic researchers. In the *New England Journal of Medicine*,

Balon et al<sup>6</sup> compared “active” and “simulated” chiropractic manipulation as adjunctive treatments for childhood asthma.

The active treatment consisted of “manual contact with spinal or pelvic joints followed by low-amplitude, high velocity directional push often associated with joint opening, creating a cavitation, or ‘pop’.” This treatment is a standard direct technique used by a wide variety of manual therapy practitioners, primarily chiropractors and osteopaths.

The simulated treatment involved the following:

- “soft-tissue massage and gentle palpation” to the spine, paraspinal muscles, and shoulders;
- “turning the subject’s head from one side to the other”;
- “a nondirectional push, or impulse” to the gluteal area with the subject lying on one side and then the other;
- with the subject in the prone position, “a similar impulse was applied bilaterally to the scapulae”;
- with the subject in a supine position “with the head rotated slightly to each side, and an impulse applied to the external occipital protuberance”;
- “low-amplitude, low-velocity impulses were applied in all these nontherapeutic contacts, with adequate joint slack so that no joint opening or cavitation occurred.”

Jongeward<sup>7</sup> questioned the appropriateness of the simulated treatment, noting that standard chiropractic practice commonly includes soft tissue work. Furthermore, the sham treatment in the Balon et al<sup>6</sup> study bears a marked similarity to a traditional general osteopathic treatment.<sup>8-10</sup> The Early American Manual Therapy Web site provides easy access to several such examples from the traditional manual therapy literature.<sup>11</sup>

The authors of the Balon et al study summarized the simulated treatment by stating, “Hence, the comparison of treatments was between active spinal manipulation as routinely performed by chiropractors and hands-on procedures without adjustments or manipulation.”<sup>6</sup> Apparently these investigators were unaware of the early osteopathic works addressing asthma<sup>8-10</sup> and more recent literature on OMT for respiratory problems in general, particularly as cited in *Osteopathic Considerations in Systemic Dysfunction*.<sup>12</sup> The methodological limitations of the Balon et al<sup>6</sup> study with regard to manual therapy were noted by Richards et al.<sup>13</sup> Balon et al<sup>14</sup> responded that they were unconvinced by the evidence supporting the efficacy of the simulated treatment.

The results, as reported by the researchers, were that “symptoms of asthma and use of  $\beta$ -agonists decreased and the quality of life increased in both groups, with no significant differences between the groups.” On the basis of this equality of improvement, the authors concluded that “the addition of chiropractic spinal manipulation to usual medical care provided no benefit.”<sup>6</sup> In our view this is unfortunate because the data clearly indicate that the subjects in both groups improved after being treated by diverse forms of manual therapy.

Another article, reported in the *Journal of the American Medical Association*, also fails to accurately portray and interpret manual therapy diversity. In certain respects “Spinal manipulation in the treatment of episodic tension-type head-

ache”<sup>15</sup> duplicates the questionable methodologic choices in the Balon et al<sup>6</sup> study. The researchers compared two forms of manual therapy for the treatment of tension headache. The experimental treatment consisted of HVLA chiropractic adjustments and deep friction massage plus trigger-point therapy (if indicated). The subjects receiving this intervention were designated as the “manipulation” group. The “active control” group received deep friction massage plus low-power laser light (considered not to be efficacious for tension headache). Thus as in the asthma study, one form of manual intervention was compared with another.

The researchers observed that “by week 7, each group experienced significant reductions in mean daily headache hours and mean number of analgesics per day.” However, because both groups benefitted equally from the diverse forms of manual therapy, the authors concluded that “as an isolated intervention, spinal manipulation does not seem to have a positive effect on episodic tension-type headaches.”<sup>15</sup> Unlike the Balon et al<sup>6</sup> study, this carefully worded conclusion is technically correct, although it would also have been technically correct to conclude that both massage and manipulation plus massage resulted in measurable improvements for patients with tension headache.

Both the headache and the asthma studies were widely reported in the mass media as demonstrating that chiropractic fails to help patients with childhood asthma and tension headache. In our view a more informative conclusion is that diverse forms of manual therapy appear to be at least mildly helpful for these conditions. Although the favorable outcomes could have resulted from chance or placebo effects, a reasonable person might also justifiably conclude that various forms of manual medicine can be helpful for these conditions. The diversity and potential validity of the full spectrum of manual therapy applications significantly confounds the issue.

Although less publicized, Nilsson<sup>16</sup> used the same methodology in an earlier study on cervicogenic headache (n = 39). Standard chiropractic (HVLA spinal manipulation) was compared with deep massage, trigger-point therapy, and light therapy (control treatment). The subjects in both the experimental and control groups showed notable improvement. There was no statistical difference in the outcomes between the two groups. Ironically and disconcertingly, Nilsson specifically noted in this earlier article that “the control group in the present study (massage/trigger points) is normally assumed to have some effect on this group of headaches.” He further noted the inherent methodological shortcomings of using such a group as a control: “Future studies need necessarily include higher numbers of experimental subjects, but should take care to use an absolutely inert control treatment (for example, low-level laser only).” One can only wonder why Nilsson elected not to follow his own clearly stated recommendation and instead used the same admittedly questionable methodology in the later tension-headache study.

Future research must seriously consider the full spectrum of diverse manual therapy options rather than assuming that

some forms are ineffective and can therefore be used as sham treatments. Legitimate alternative methodologies exist, particularly direct comparisons of chiropractic procedures (allowing the full range of methods typically used by chiropractors in real-world practice settings) versus standard medical care. Some comparative studies<sup>17-21</sup> have shown chiropractic to be equal or superior to conventional medical procedures, with fewer side effects. If fairly constructed, future studies of this type will yield data that allow health practitioners and the general public to place manual therapy procedures in proper context. Comparing manual therapy to highly questionable placebos confuses the issue and delays the advent of a level playing field.<sup>22</sup>

### MANUAL THERAPY AND SYSTEMIC DYSFUNCTION

Apart from the diversity issue, the other fundamental question raised by these studies is the possible influence of chiropractic (and by inference other primary forms of manual therapy) in the treatment of systemic dysfunction. Is manual therapy only helpful for somatic dysfunction (ie, back and neck pain), or can systemic dysfunction (including visceral disease) also be effectively treated by chiropractors and other manual therapy practitioners?

Interestingly, the origins of both chiropractic and osteopathy can be traced to positive outcomes in the treatment of systemic dysfunction. Palmer's<sup>23</sup> treatment of a patient with hearing impairment marks the beginning of chiropractic. Still<sup>24</sup> used an inhibitive technique (lying with his head in a sling) to relieve his own headaches. This, in addition to his grief over the death of 3 of his children from meningitis despite the best available medical treatment, drove Still to create a system for healing systemic dysfunction.

In recent years, the treatment of systemic dysfunction by chiropractors has declined,<sup>25</sup> although reports of effective treatment for nonmusculoskeletal problems continue to be published.<sup>26-29</sup> Although osteopathy has seen a general decrease in the use of manual therapy, interest still exists with regard to the treatment of systemic dysfunction.<sup>12</sup>

To clarify the role of manual therapy in the treatment of systemic dysfunction, Sawyer et al<sup>1</sup> recommended clinical research aimed at investigating outcomes and effectiveness of chiropractic care on somatovisceral disorders. The priority list of disorders included dysmenorrhea, asthma, otitis media, essential hypertension, irritable bowel syndrome, and peptic disorders. This research has begun, but it is still in a preliminary phase.

This is a controversial topic with profound ramifications for the future role of chiropractic in the overall health care system. With recent changes in the health care system toward incorporation of CAM approaches, chiropractic has emerged as a leading candidate for integration in the new health care model. Thus far, however, this has been predicated on an implicit assumption that chiropractic's therapeutic domain is the treatment of somatic disease. In large measure chiropractic is perceived, rightly or wrongly, as a form of specialized physical therapy. If chiropractic is to be smoothly integrated into the health care mainstream, the path of

least resistance calls for dropping the notion of manual therapy for systemic dysfunction. To do so, however, would fly in the face of a century of chiropractic practice.

Manual therapy for systemic dysfunction is controversial from a scientific perspective. Nansel and Szlazak<sup>30</sup> provide a comprehensive and insightful review of the conceptual and biologic problems associated with the systemic dysfunction issue. Basically, these authors reframe the apparent influence of manual therapy on systemic dysfunction as an etiologic misunderstanding that is the result of misdiagnosis. According to Nansel and Szlazak, the visceral symptoms in question are actually "somatic mimicry syndromes" produced by somatic nerve reflexes that simulate (rather than cause) internal organ disease. Thus chiropractic treatment in such cases merely removes the "somato-somatic reflex." The abundance of citations provided by the authors strongly supports their position of the improbability of manipulation's effects on true somatovisceral disease.

However, a more recent article by Sato<sup>31</sup> presents strong biologic evidence of somatovisceral reflexes in animals, where cutaneous stimulation of somatic afferents evokes reflex sympathetic efferent activity. Sato's basic scientific work appears to strongly support the concept of somatovisceral disease. Sato's conclusion is that "a great deal of work remains to be done." It is noteworthy that Sato's studies have been presented in osteopathic and chiropractic publications<sup>32</sup> and have appeared in a variety of neurophysiology journals as well.<sup>33-36</sup> Sato's nonpolitical interdisciplinary approach is exemplary of the cooperative attitude needed in this type of research.

### PROFESSIONAL RELATIONSHIPS

What role will chiropractic play in the emerging health care system? As Lamm et al<sup>37</sup> have asked, "Are chiropractors portal-of-entry physicians, primary care givers, first contact physicians, generalists, specialists, or a hybrid of these?" To establish and maintain constructive relationships with other health care providers, chiropractors must come to terms with who they are and what they do. The process of integration into the evolving health care system may involve an identity crisis for chiropractors.

As a group, chiropractors are highly individualistic and independent. With changes in the health care system, opportunities are being created for chiropractors with the ability to adapt and cooperate to become more fully integrated into mainstream health care. Therefore as the health care system is reformed, the relationship with other professionals becomes a critical issue. The previous discussions of manual therapy diversity and the treatment of systemic dysfunction are relevant to evolving patterns of professional interaction.

To take one important example, will interactions with osteopaths become more collegial rather than perpetuating the historical division between chiropractic and osteopathy? Will respect for manual therapy diversity become the new ideal? Cooperation makes sense. Osteopathic research and clinical experience can contribute to chiropractic efficacy and vice versa. Perhaps some chiropractors worry that too close a relationship with osteopaths may be contagious, that

whatever prompted most osteopaths to largely abandon manual therapy will somehow afflict chiropractors.

Although this fear is based on a kernel of truth, the future of chiropractic need not mirror the past and present of osteopathy. One crucial difference is that, unlike the osteopathic profession, chiropractic's political and academic leadership and the vast majority of today's practitioners are united in support of maintaining the profession's central emphasis on the core concepts of chiropractic—the link between structure and function, the critical mediating role of the nervous system, and the primacy of the adjustment in chiropractic practice. This is strongly supported by both the American Chiropractic Association and International Chiropractors Association and was unanimously endorsed by all North American chiropractic college presidents at the historic 1996 meeting of the Association of Chiropractic Colleges.<sup>38</sup> Most significantly, no broad-based chiropractic political organization or educational institution has ever endorsed giving up manual therapy or limiting its application to strictly musculoskeletal conditions.

While working at building relationships with practitioners of other health professions, chiropractic must also attend to splits within its own house. Traditional conflicts between "straights" and "mixers" are well-known and continue to be a source of contention. A modern counterpart of this division is the primary care physician–manual therapy specialist distinction. Some chiropractors endorse an exclusively somatic dysfunction model. At the same time, other chiropractors are carving out a niche as primary care physicians by treating somatic and systemic dysfunction with a broad range of therapeutic modalities. Others, perhaps the majority of the profession, find themselves in the middle ground between these two poles. Although basic research and outcome studies may help to eventually resolve this split, such resolution is unlikely to occur soon.

The interdisciplinary team model is a plausible vehicle for passage to a more diverse and integrated health care system. Lawrence<sup>39</sup> suggests that the rural setting is an ideal environment for interdisciplinary teams with chiropractic members but also recognizes the inherent challenges of such cooperation: "The involvement of chiropractors as members of interdisciplinary teams will no doubt suffer from initial problems, such as lack of professional acceptance by medical physicians and nurses, ill-defined roles for chiropractors, intraprofessional conceptual challenges (for example, will we be autonomous in decision making on a par with other professionals?), etc."

The increasing interest in CAM therapies is an especially promising track for improved professional relations. Interdisciplinary teams that include CAM practitioners are increasing, especially on the West Coast and in large urban areas in other parts of the country.<sup>40</sup> If chiropractors are unable or unwilling to create a niche in such groups, other manual therapy practitioners (ranging from massage therapy to reflexology to therapeutic touch) may fill the void.

Emphasis on research is helpful in these settings. Honest research acknowledges an openness and desire to learn.

These are essential qualities for members of an interdisciplinary research team. Research also provides an umbrella for mainstream practitioners to safely explore alternatives.

The authors of this article are members of an interdisciplinary team with diverse backgrounds in chiropractic, medicine, osteopathy, biology, and psychology. The rich diversity of the group enhances the research process. Manual therapy diversity is not a problem but an opportunity to explore the efficacy of a variety of techniques. Likewise, the use of manual therapy for systemic dysfunction is an enticing hypothesis that will require much time and effort to test. Commitment to an ideal higher than the advancement of a particular profession is necessary for such teams to work closely together over time. Such an ideal may be as simple and direct as improving the quality of patient care by whatever means available.

## CONCLUSION

Health care is in a time of great change. Chiropractic has much to offer the new health care system. With its rich heritage of therapeutic pragmatism, its growing body of research, and its well-developed professional infrastructure,<sup>41</sup> the profession is well positioned to influence the future direction of health care. However, to fully participate in this transition, several key questions must be addressed.

- Will chiropractic be defined solely in terms of the HVLA thrust adjustment or in terms of the full spectrum of manual therapy techniques?
- Can chiropractic provide efficacious treatment of systemic dysfunction, or will it be limited to the treatment of musculoskeletal ailments?
- Will chiropractic research address the methodological pitfalls that result from a failure to recognize the diversity of manual therapy approaches?
- Will further basic research into the biologic mechanisms of somatovisceral disease be pursued?
- Will the common ground between chiropractic and other forms of manual therapy (particularly osteopathy) be recognized and used?
- Will the economic and political pressures to integrate into the mainstream diminish the unique contributions of chiropractic?
- Will chiropractors be viewed as doctors equipped to address a wide range of human illnesses or as specialists in advanced musculoskeletal physical therapy?

These are controversial questions worthy of discussion and debate. Chiropractic is at a crossroads. The direction taken by today's chiropractors may well influence the role of manual therapy for years to come.

Historically, chiropractic has maintained itself as a relatively independent entity. Initially, chiropractic education, research, and clinical practice were isolated from the mainstream for a variety of factors.<sup>1</sup> Despite undeniable progress, for the most part chiropractors are still outsiders looking in. Now that the door has begun to swing open, will chiropractic come into the mainstream?

In the past chiropractic had to distinguish itself to survive. Emphasizing differences between itself and other similar

professions (especially osteopathy) was helpful in creating a unique identity. Although maintaining identity is still important, chiropractic has matured to the point at which it can benefit from mutually beneficial professional relationships. As health care reforms continue, it will be helpful to emphasize common ground rather than exaggerating differences. Where differences exist, acknowledging diversity without attacking will increase the chances of building positive professional relationships.

As long as chiropractic provides cost-effective efficacious service, its future is bright. A strong commitment to research (both basic and clinical) is needed to document the efficacy of chiropractic treatment, while defining its limitations. Chiropractors must come to terms with manual therapy diversity. The treatment of systemic dysfunction by means of manual therapy will continue to be a controversial topic. Improved research design is essential, especially to avoid disregarding positive outcomes when manual therapy is used for systemic dysfunction. Interdisciplinary research teams offer a promising means of integration of chiropractic with other treatment modalities and improved professional relations.

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## REFERENCES

1. Sawyer C, Haas M, Nelson C, Elkington W. Clinical research with the chiropractic profession: status, needs and recommendations. *J Manipulative Physiol Ther* 1997;20:169-78.
2. Mootz RD, Coulter ID, Hansen DT. Health services research related to chiropractic: review and recommendations for research prioritization by the chiropractic profession. *J Manipulative Physiol Ther* 1997;20:1-17.
3. Keating JC Jr, Green, BN, Johnson, CD. "Research" and "science" in the first half of the chiropractic century. *J Manipulative Physiol Ther* 1995;18:357-78.
4. Brantingham JW. Still and Palmer: the impact of the first osteopath and the first chiropractor. *Chiropr Hist* 1986;6:19-22.
5. Keating JC. Purpose-straight chiropractic: not science, not health care. *J Manipulative Physiol Ther* 1995;18:416-8.
6. Balon J, Aker PD, Crowther ER, Danielson C, Cox PG, O'Shaughnessy D, et al. A comparison of active and simulated chiropractic manipulation as adjunctive treatment for childhood asthma. *N Engl J Med* 1998;339:1013-20.
7. Jongeward BV. Chiropractic manipulation for childhood asthma. *N Engl J Med* 1999;340:391-2.
8. Hazzard C. The practice and applied therapeutics of osteopathy. 3rd edition. Kirksville [MO]: Journal Printing Company; 1905. p. 75-80.
9. Barber ED. Osteopathy complete. 4th edition. Kansas City [MO]: Hudson-Kimberly Publishing Company; 1898. p. 60-8.
10. Goetz, EW. A manual of osteopathy. 2nd edition. Cincinnati: Nature's Cure Co; 1909. p. 85-6.
11. McMillin D. Early American Manual Therapy Web site. Available at: <http://www.meridianinstitute.com>. Accessed 1998.
12. Kuchera M, Kuchera WA. Osteopathic considerations in systemic dysfunction. Kirksville [MO]: KCOM Press; 1991.
13. Richards DG, Mein EA, Nelson CD. Chiropractic manipulation for childhood asthma. *N Engl J Med* 1999;340:391-2.
14. Balon J, Crowther ER, Sears MR. Chiropractic manipulation for childhood asthma [abstract]. *N Engl J Med* 1999;340:392.
15. Bove G, Nilsson N. Spinal manipulation in the treatment of episodic tension-type headache. *JAMA* 1998;280:1576-9.
16. Nilsson N. A randomized controlled trial of the effect of spinal manipulation in the treatment of cervicogenic headache. *J Manipulative Physiol Ther* 1995;18:435-40.
17. Meade TW, Dyer S, Browne W, Townsend J, Frank AO. Low back pain of mechanical origin: randomized comparison of chiropractic and hospital outpatient treatment. *BMJ* 1990;300:1431-7.
18. Meade TW, Dyer S, Browne W, Frank AO. Randomised comparison of chiropractic and hospital outpatient management for low back pain: results from extended follow-up. *BMJ* 1995;311:349-50.
19. Boline PD, Kassem K, Bronfort G, Nelson C, Anderson AV. Spinal manipulation vs. amitriptyline for the treatment of chronic tension-type headache: a randomized clinical trial. *J Manipulative Physiol Ther* 1995;18:148-54.
20. Winters JC, Sobel JS, Groenier KH, Arendzen HJ, Meyboom-de Jong B. Comparison of physiotherapy, manipulation, and corticosteroid injection for treating shoulder complaints in general practice: randomised, single blind study. *BMJ* 1997;314:1320-5.
21. Nelson CF, Bronfort G, Evans R, Boline P, Goldsmith C, Anderson AV. The efficacy of spinal manipulation, amitriptyline and the combination of both therapies for the prophylaxis of migraine headache. *J Manipulative Physiol Ther* 1998;21:511-9.
22. Redwood D. Same data, different interpretation. *J Altern Complement Med* 1999;5:89-91.
23. Palmer DD. The science, art and philosophy of chiropractic. Portland [OR]: Portland Publishing House; 1910.
24. Still AT. Autobiography of Andrew Taylor Still. Kirksville [MO]: Published by the author; 1897.
25. ACA Department of Statistics completes 1989 Survey. *J Manipulative Physiol Ther* 1990;27:80.
26. Gorman RF. The treatment of presumptive optic nerve ischemia by spinal manipulation. *J Manipulative Physiol Ther* 1995;18:172-7.
27. Froehle RM. Ear infection: a retrospective study examining improvement from chiropractic care and analyzing for influencing factors. *J Manipulative Physiol Ther* 1996;19:169-77.
28. Stude DE, Bergmann TF, Finer BA. A conservative approach for a patient with traumatically induced urinary incontinence. *J Manipulative Physiol Ther* 1998;21:363-7.
29. Haas M. Chiropractic management of primary nocturnal enuresis. *J Manipulative Physiol Ther* 1995;18:638-41.
30. Nansel D, Szlajak M. Somatic dysfunction and the phenomenon of visceral disease simulation: a probable explanation for the apparent effectiveness of somatic therapy in patients presumed to be suffering from true visceral disease. *J Manipulative Physiol Ther* 1995;18:379-97.
31. Sato A. Somatovisceral reflexes. *J Manipulative Physiol Ther* 1995;18:597-602.
32. Sato A. Reflex modulation of visceral functions by somatic afferent activity. In: Patterson, MM, Howell, JN, eds. The central connection: somatovisceral/viscerosomatic interaction. 1989 International Symposium; Athens, Ohio. Indianapolis (IN): American Academy of Osteopathy; 1992. p. 53-76.
33. Sato A, Schmidt RF. Muscle and cutaneous afferents evoking sympathetic reflexes. *Brain Res* 1966;2:399-401.
34. Sato A, Sato Y, Suzuki A, Uchida S. Neural mechanisms of the reflex inhibition and excitation of gastric motility elicited by

- acupuncture-like stimulation in anesthetized rats. *Neurosci Res* 1993;18:53-62.
35. Sato A, Sato Y, Sugimoto H, Terui N. Reflex changes in the urinary bladder after mechanical and thermal stimulation of the skin at various segmental levels in cats. *Neuroscience* 1977;2:111-7.
  36. Araki T, Ito K, Kurosawa M, Sato A. Responses of adrenal sympathetic nerve activity and catecholamine secretion to cutaneous stimulation in anesthetized rats. *Neuroscience* 1984;12:289-99.
  37. Lamm LC, Wedner E, Collord D. Chiropractic scope of practice: what the law allows—update 1993. *J Manipulative Physiol Ther* 1995;18:16-20.
  38. Cleveland CS III. Vertebral subluxation. In: Redwood D, ed. *Contemporary chiropractic*. New York: Churchill Livingstone; 1997. p. 29-44.
  39. Lawrence DJ. Chiropractic and rural health. *J Manipulative Physiol Ther* 1996;19:75-81.
  40. Hawk C, Nyiendo J, Lawrence D, Killinger L. The role of chiropractors in the delivery of interdisciplinary health care in rural areas. *J Manipulative Physiol Ther* 1996;19:82-91.
  41. McAndrews JF. Appropriate care, ethics and practice guidelines. In: Redwood D, ed. *Contemporary chiropractic*. New York: Churchill Livingstone; 1997. p. 219-27.