

Exploring the Evidence Base for Manual/Manipulative Therapy: A 40-Year Trend and Quantitative Synthesis of Articles

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Abstract

Background: Manual therapy or manipulative therapy had evolved from a technique-based paradigm to a profession-based one, with its scientific literature built upon anecdotal and theoretical or experiential evidence. **Objective of Study:** To quantitatively explore the existing evidence base for manual/manipulative therapy in PubMed through a review and analysis of current scientific literature. **Methods:** Descriptive exploratory study through a literature search was done to identify nine time-points in the timeline from 1970-2010, with five-year intervals in order to identify the scientific trend. The number of obtained citations were classified and analyzed under the names of search filters of PubMed namely- text availability, publication date, species, article type, language, gender, subject areas, journal categories and age groups. The numbers for categories and subcategories of search filters were considered for comparison and analysis. Descriptive analysis using frequencies on Microsoft Excel 2010 worksheet was done. **Results:** There is an exponential increase in number of articles in general over the 40 years. There was more number of 'abstract available' articles. Human studies were more than animal studies. There

was more number of clinical trials among the article types. More articles were of English language, with nearly equal gender representation. There were more number of articles on complementary medicine, and MEDLINE journals had more articles, with more in adult and middle-age for study populations. **Conclusion:** This study provided information on current state of evidence for manual/manipulative therapy in a 40-year trend. This trend was similar to overall trend for all articles indexed in PubMed reported previously.

Keywords: Evidence Analysis; Research Analysis; Research Trend; Manual Therapy.

Introduction

Manual therapy or manipulative therapy had evolved from a technique-based paradigm to a profession-based one, in its long journey well begun by Hippocrates in 400 BC by using His techniques for reducing shoulder [1] and spine dislocations and deformities [2,3]. The milestones in this journey were witnessed by growth in use of massage,^[4] chiropractic [5], osteopathy [6], joint mobilization/manipulation [7], myofascial therapies [8], neurodynamics [9] and motor control [10] in the treatment of patients with pain/ dysfunction.

Pettman [3] aptly opined, "With medical and osteopathic physicians initially instrumental in introducing manipulative therapy to the profession of physical therapy, physical therapists have since then provided strong contributions to the field, thereby solidifying the profession's claim to have manipulative therapy within in its legally regulated scope of practice." This thus necessitated the more suitable term for manual/ manipulative therapy as Orthopedic Manual Physical Therapy or Orthopedic

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Manipulative Physical Therapy (OMPT).

The scientific literature on manual therapy was built upon anecdotal and theoretical background and strengthened predominantly by one's own clinical experience [11]. This is well anticipated since as a profession, manual therapy had its deepest roots in practice, followed by education and much later by research. Thus manual therapist's own knowledge, experience and skills were transferred across generations with described principles for evaluation and management of patients termed as 'schools of thought' [12].

The infantile nature of manual therapy research could be best understood by the first published studies for its evidence being in recent years. Whilst the first randomized clinical trial was performed by James Lind in 1747 in the field of Medicine, the first randomized clinical trial in physiotherapy was published by Dora Colebrook only in 1929 [13]. The average increase of three randomized controlled trials on physiotherapy every day [14] enabled the growth of manual therapy in the subsequent period, and it was Suskind et al [15], who published first clinical report on manual therapy- massage effects on denervated muscle; followed by the first clinical trial on manual therapy by Simaan and Skach [16] on gingival massage for chronic gingivitis; and the first randomized controlled trial on manual therapy by Glover et al [17] on rotational manipulation for back pain.

The first systematic review on manual therapy was performed by Brunarski [18] which was on critical appraisal of clinical trials on spinal manipulation, and the first meta-analysis on manual therapy was by Koes et al [19] on spinal manipulation and mobilization for back and neck pain. The evidence for effectiveness of various types of manual therapy techniques is continuously growing with many systematic reviews [20] and meta-analyses [21] both for manual examination [22] and for manual therapy interventions [23,24].

The paradigm shift within OMPT occurred from an authority-based to an evidence-based and now an evidence-informed paradigm [12], which demands adequate retrieval, evaluation, understanding, and implementation of existing evidence base for a successful and effective shared informed decision making in a multidisciplinary inter-professional provision of biopsychosocial model of care [25]. Thus knowledge generation operates along a continuum with knowledge translation [26], in all the four professional domains of practice, education, research and administration [27] in the field of manual therapy.

Objective of Study

To quantitatively explore the existing evidence base for manual/manipulative therapy in PubMed through a review and analysis of current scientific literature.

Methodology

Study Design

Descriptive exploratory study

Search Methods

Two reviewers performed an independent blinded search of PubMed using specific search strategy and they independently extracted and synthesized the data from the selected studies using a structured checklist. At all stages of the review process, all disagreements were solved by mutual consensus before proceeding to the subsequent stages of the review.

Search Strategy

A combination of using search filters in PubMed was used for this study. A thorough literature search was done to identify nine time-points in the timeline from 1970-2010 in a 40-year period, with five-year intervals in order to identify the scientific trend. The search was performed in the month of October 2012, and retrieved numbers of citations were then used as data for extraction and synthesis.

Data Extraction and Synthesis

The number of obtained citations were classified and analyzed under the names of search filters of PubMed namely- text availability, publication date, species, article type, language, gender, subject areas, journal categories and ages. The numbers for categories and subcategories of search filters were considered for comparison and analysis.

Data Analysis

All data were entered in Microsoft Excel 2010 worksheet and computed descriptively using their respective frequencies- numbers and percentiles. All comparisons were done visually in order to obtain an overall appearance and trend.

Results – Main Findings

The total number of articles under "Manipulative Therapy/Manual Therapy[MeSH Major Topic]" were

7157 articles (on 5th November 2012) and 5975 articles indexed during the search period (1970-2010) which were identified by searching through publication dates in search filters of PubMed.

Trend for Number of 'Manual Therapy' Articles

The number of 'manual therapy' articles per year increased gradually from 1970 to 2000, and sharply afterwards until 2010 (Figure 1).

Text Availability of 'Manual Therapy' Articles

There was greater number of 'full text available' articles than 'abstract available' and 'free full text available' articles (Figure 2). The increase in number of 'full text available' and 'abstract available' articles were more rapid after 1995, and was more than that of 'abstract available' articles (Figure 3).

Species Studied in 'Manual Therapy' Articles

The number of articles and the trend of increase were more in human studies than on other animals' studies (Figure 4, Figure 5).

Types of 'Manual Therapy' Articles

Clinical trials, randomized controlled trials and case reports were more in number than other article types (Figure 6). The rapid increase in number of clinical trials on manual therapy occurred from 1995 onwards (Figure 7).

Language of 'Manual Therapy' Articles

The number of articles and the trend of increase

was more for studies on English language than on other languages (Figures 8 and 9).

Gender studied in 'Manual Therapy' Articles

The relative prevalence of number of articles and the corresponding trend was marginally more for 'female' gender' than 'male gender' amongst the 'manual therapy' articles (Figures 10 and 11).

Subject Categories of 'Manual Therapy' Articles

A prominently large number of 'manual therapy' articles were indexed under the subject category of 'complementary medicine', followed by 'cancer' and 'AIDS' (Figure 12). The trend analysis for 'manual therapy' articles indexed under subject category of 'complementary medicine' showed a rapid increase in number of articles from the year 1995 onwards (Figure 13).

Journals Publishing 'Manual Therapy' Articles

Maximum articles on 'manual therapy' were indexed in MEDLINE journals, and some articles in core clinical journals, dental and nursing journals (Figure 14). The trend analysis for 'manual therapy' articles indexed in MEDLINE showed a rapid increase in number of articles from the year 1995 onwards (Figure 15).

Age of Study Population in 'Manual Therapy' Articles

The relative prevalence of number of articles and the corresponding trend was more for 'manual therapy' articles indexed under 'adult age' than 'middle age' and 'old age' (Figures 16 and 17).

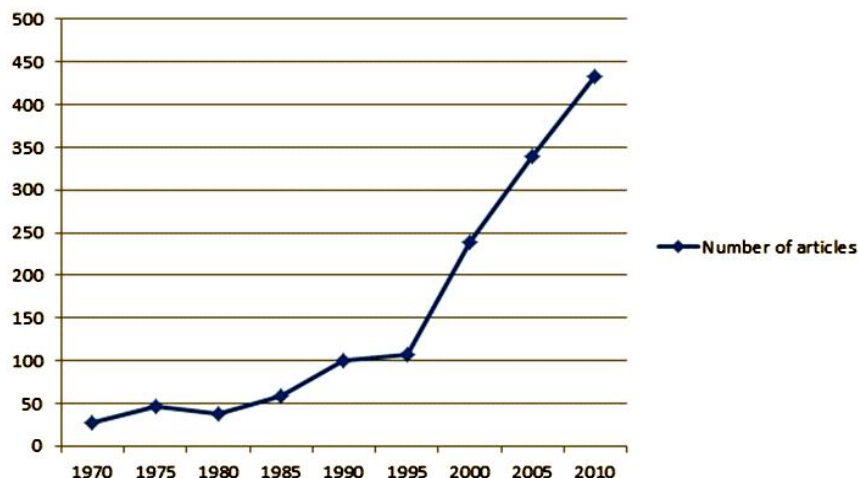


Fig. 1: 40-year trend for number of 'manual therapy' articles based upon year of publication

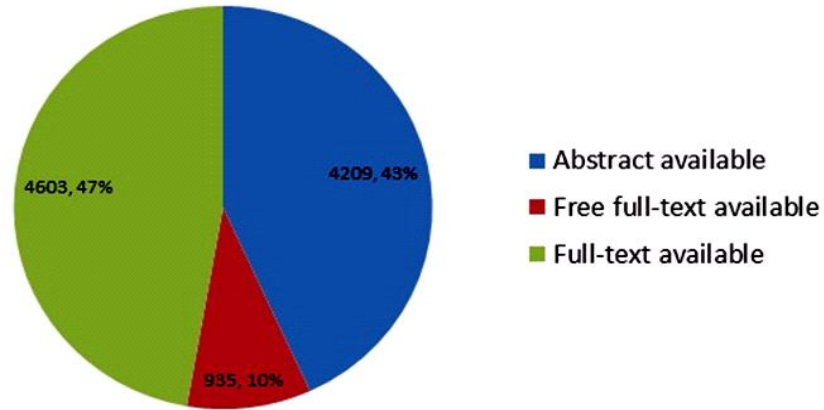


Fig. 2: Relative prevalence of sub-categories for text availability among 'manual therapy' articles

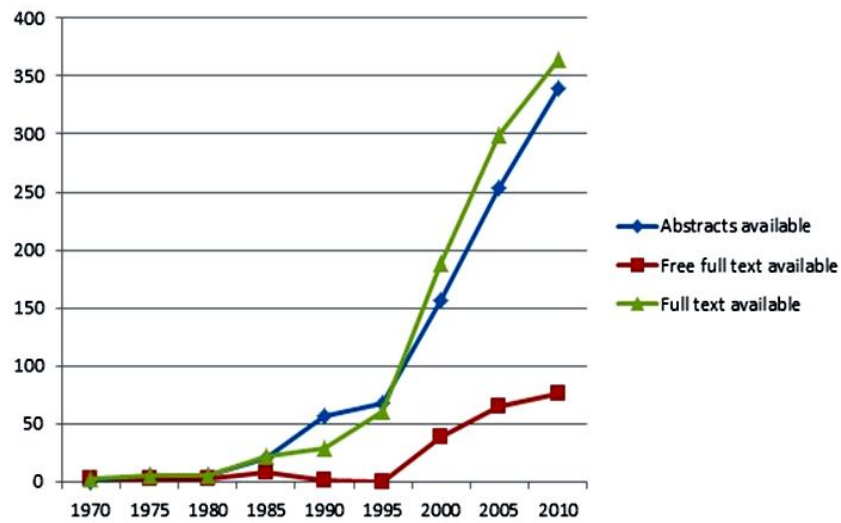


Fig. 3: Comparison of 40-year trend between the three subcategories of text availability among 'manual therapy' articles

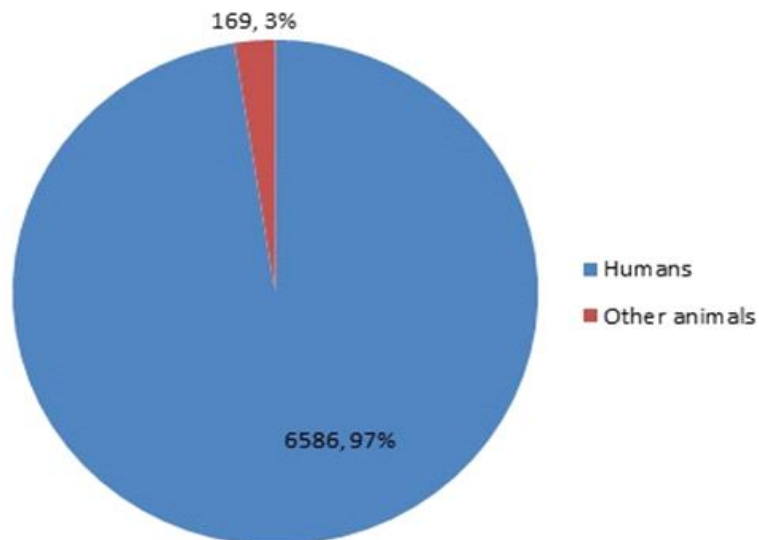


Fig. 4: Relative prevalence of sub-categories for species among 'manual therapy' articles

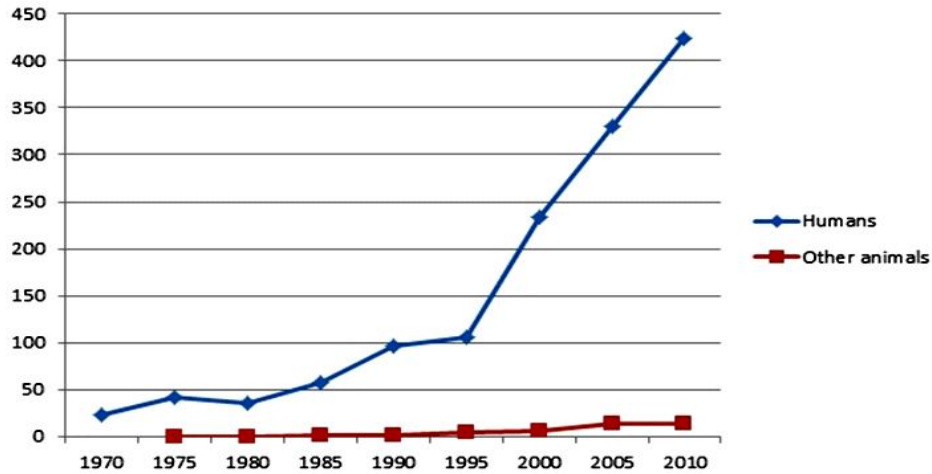


Fig. 5: Comparison of 40-year trend between the two subcategories of species among 'manual therapy' articles

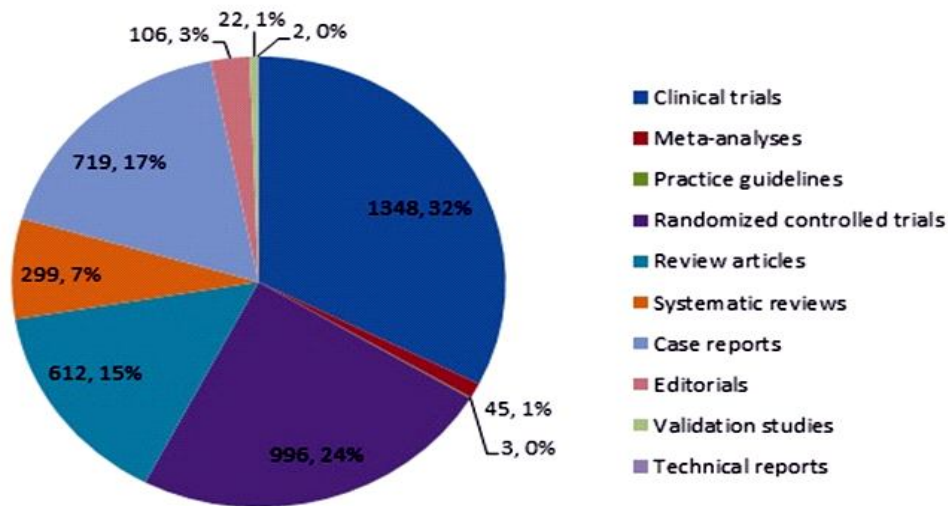


Fig. 6: Relative prevalence of sub-categories for article types among 'manual therapy' articles

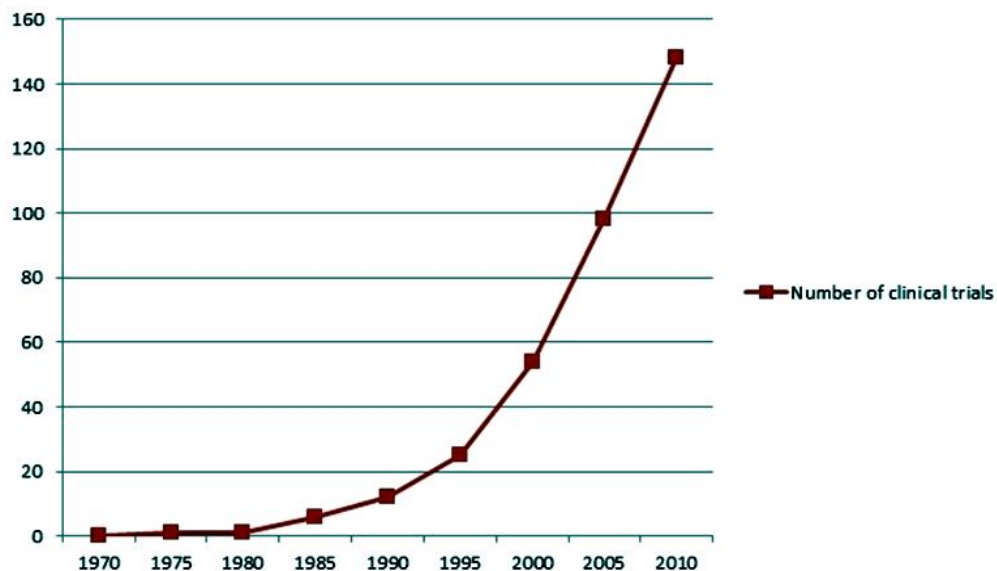


Fig. 7: 40-year trend for number of clinical trials among 'manual therapy' articles

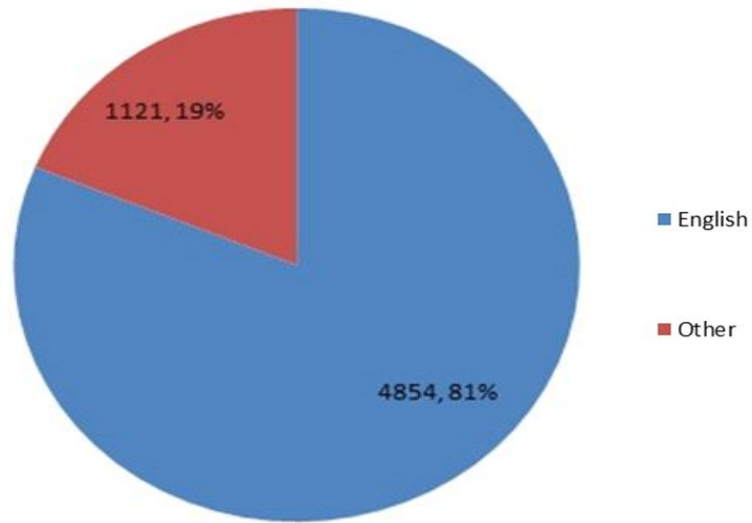


Fig. 8: Relative prevalence of sub-categories for language among 'manual therapy' articles

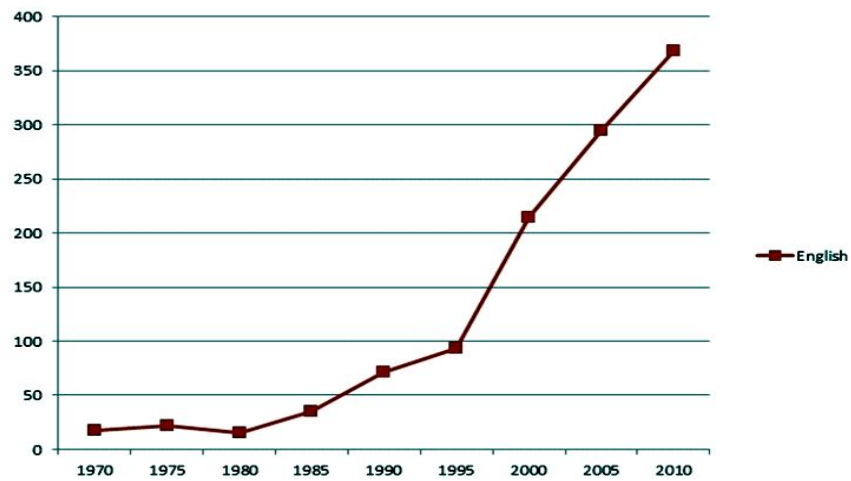


Fig. 9: 40-year trend for number of English language articles among 'manual therapy' articles

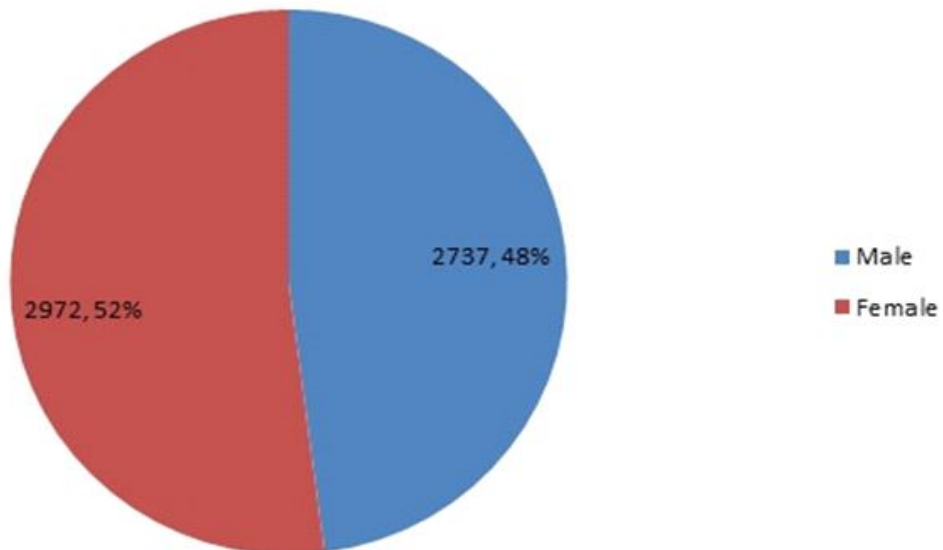


Fig. 10: Relative prevalence of sub-categories for gender among 'manual therapy' articles

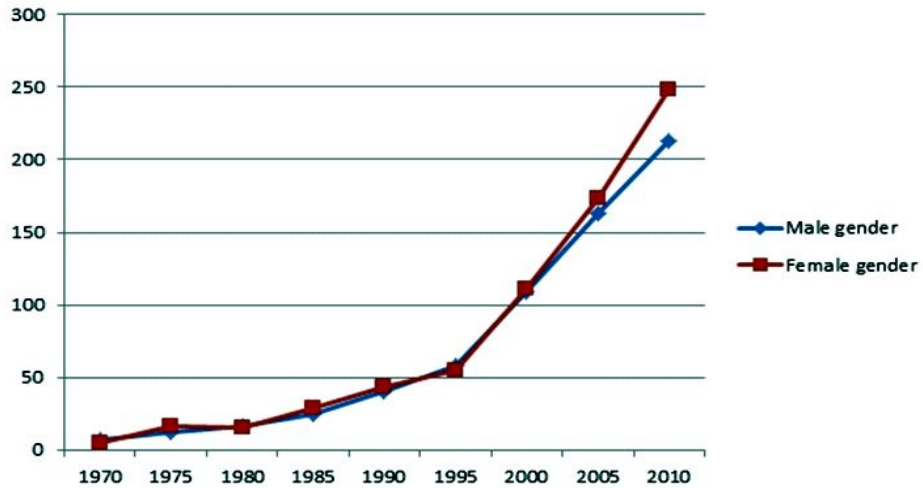


Fig. 11: Comparison of 40-year trend between the subcategories of gender among 'manual therapy' articles

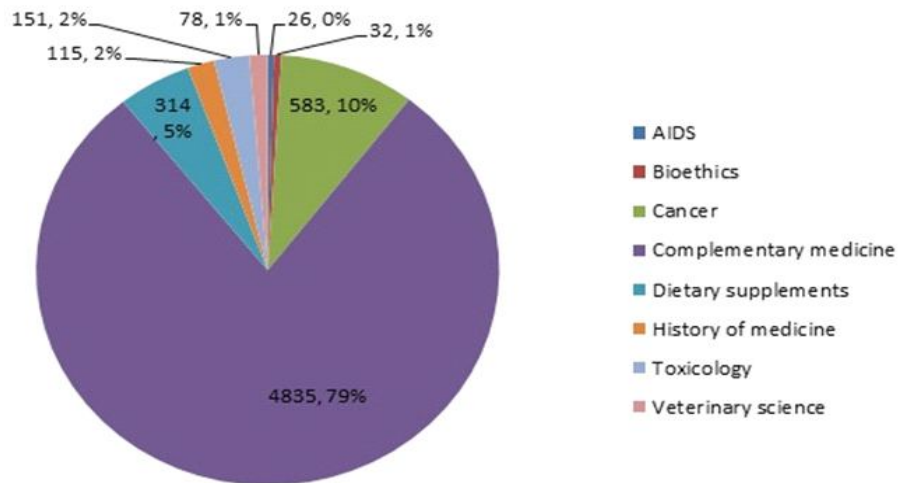


Fig. 12: Relative prevalence of sub-categories for subject areas among 'manual therapy' articles

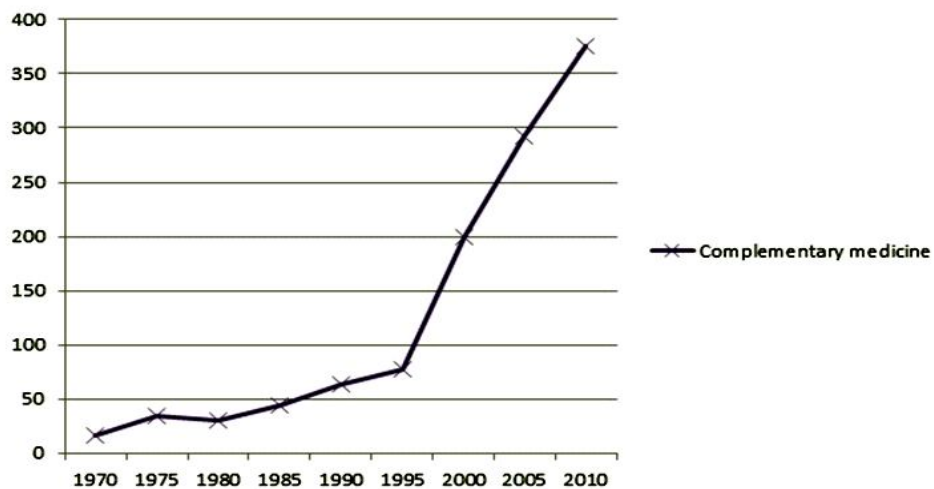


Fig. 13: 40-year trend for number of articles under subject category of complementary medicine among 'manual therapy' articles

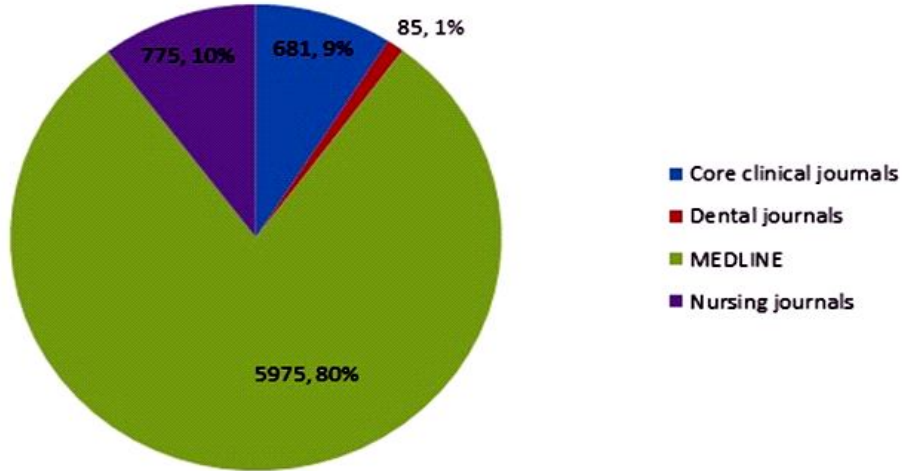


Fig. 14: Relative prevalence of sub-categories for journals among 'manual therapy' articles

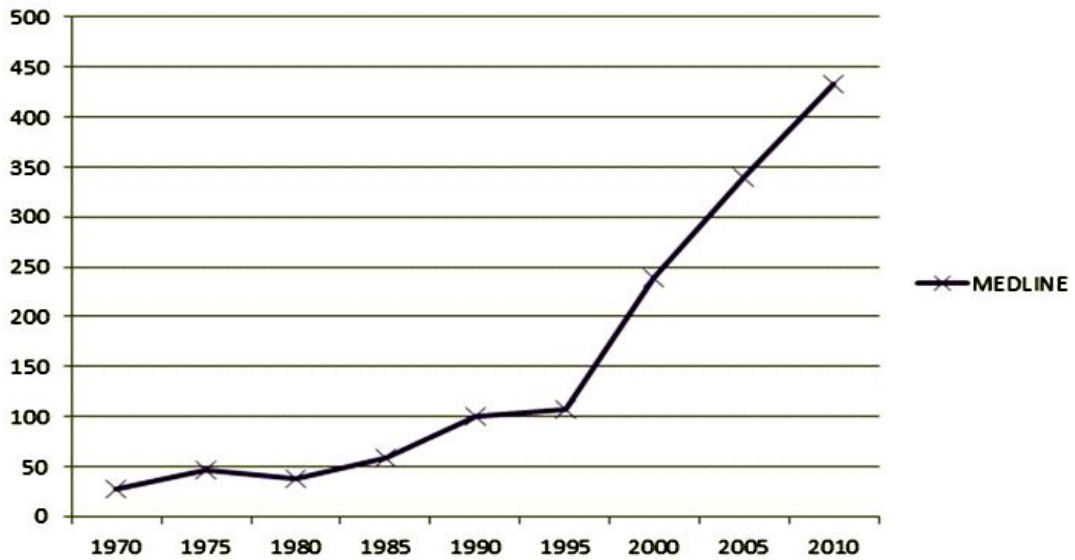


Fig. 15: Comparison of 40-year trend for number of 'manual therapy' articles in MEDLINE journals

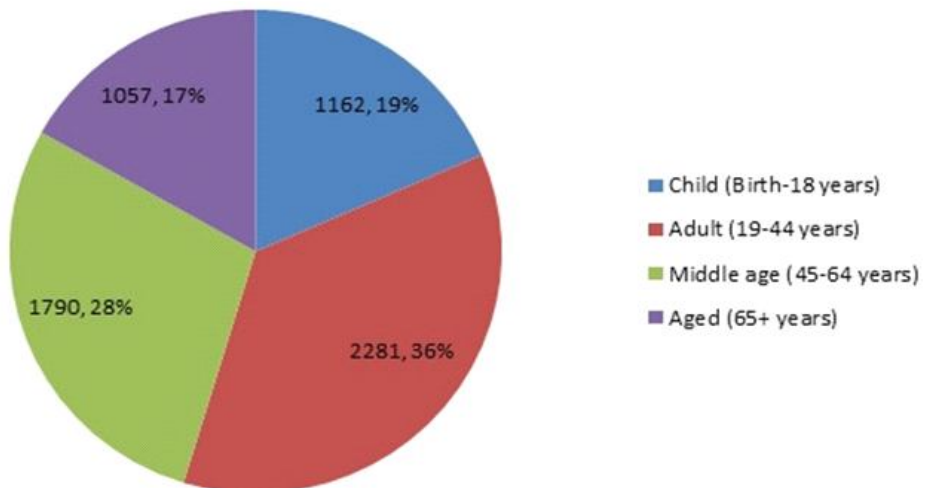


Fig. 16: Relative prevalence of sub-categories for ages among 'manual therapy' articles

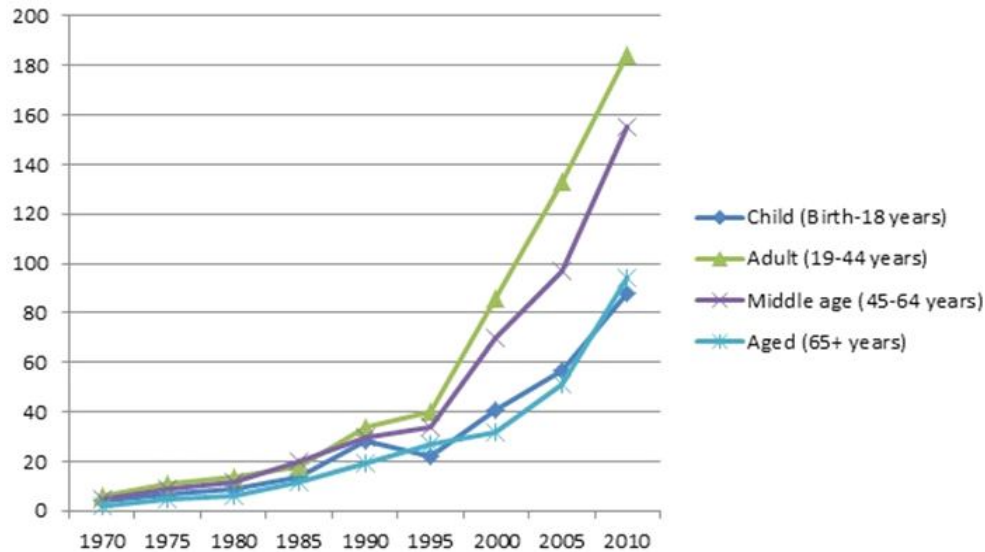


Fig. 17: Comparison of 40-year trend between the subcategories of ages among 'manual therapy' articles

Discussion

Previous reviews in manual therapy published over the years were mainly focused either on treatment techniques such as spinal manipulation [18] or on disorders such as low back pain [28], and this study is the first review that is both evidence-oriented and profession-oriented, especially in the field of manual therapy. This study's findings reflected the widely recognized professionalization of manual therapy in treatment of all regions of the body- upper quadrant,²⁹ lower quadrant [30] and spine [31]. Manual therapy is not only orthopedic but also increasingly been applied into cardiopulmonary [32] and neurological conditions [33], and other systemic diseases and disorders such as pregnancy-related disorders [34], diabetes [35], cancer [36], fibromyalgia [37], stress urinary incontinence [38], scoliosis [39], dysphonia [41], angina pectoris [41], asthma [41], pulmonary resection [43], interstitial cystitis and urgency-frequency syndrome [44], duodenal ulcer [45], emotional disorders [46], and hypertension [47].

Manual therapy for the spine [48] and extremities [49] had been established as an effective treatment in all age groups- pediatric [50] to geriatric [51], with its well-proven central and peripheral mechanisms [52]. The mechanisms through which manual therapy inhibits musculoskeletal pain are likely multifaceted and related to the interaction between the intervention, the patient, the practitioner, and the environment, and the known placebo effects of manual therapy are also well researched [53]. Manual therapy influences all types of connective tissue thus helping to restore tissue tensesgrity and balance in

most disorders [54]. The efficacy of manual therapy [55] and its treatment effects should be evaluated using a criteria-based approach.

The effects, efficacy and effectiveness [56] of manual therapy and its techniques are also largely dependent upon training and expertise levels of therapist [57], which equally indicates more studies on education and training in manual therapy. Content analysis of manual therapy articles and journals are warranted to enquire into aspects of education and training. Transparent reporting and extensive researching is evidently witnessed by the presence systematic reviews on adverse events of Manual therapy [58]. Carnes et al [58] found 41% rate for minimal to moderate adverse events, which were much lesser than medical management or usual care.

Cook and Sheets [59] opined that there needs to be a delicate balance between clinical equipoise and personal equipoise during clinical decision making in manual therapy practice, and they said, "Clinical and personal equipoise exists when a clinician has no good basis for a choice between two or more care options or when one is truly uncertain about the overall benefit or harm offered by the treatment to his/her patient." This generates a methodological bias that is inherent in manual therapy clinical trials [60]. Clinical reasoning in manual therapy is a complex self-reflective critical thinking process inherent among experts who generate explicit hypotheses and testing methods during clinical examination, and thereby develop clinical patterns for patient presentations [61]. Evidence-based manual therapy is not a substitute to clinical reasoning; instead it acts a supplement to it, when applied upon a thorough base of knowledge, cognition and meta-

cognition.

Evidence-based manual therapy has its own challenges [62] in not only search and retrieval skills of professionals but also on establishing and disseminating research findings and application of such findings into practice. Integration of science into the art of manual therapy though was mentioned as a 'marriage of convenience [63], ' between the philosophical differences [64] of various manipulative therapy approaches and concepts [65]. Since manual therapy is a component of physiotherapy [66], physical therapists need to foster responsibility to conduct and report better evidence both in quality and quantity. This study found that complementary medicine journals had more articles on manual therapy which was understandable due to use of holistic techniques such as massage as under manual therapy [67].

The role of manual therapy in medical practice [68] is well recognized by the presence of articles published in medical journals. Future analyses on manual therapy journals would provide information on evidence base for manual therapy. Manual therapy journals should aim at bibliometrics and impact factors [69] and hence reporting trend analysis of such journals would provide directions for prospective authors. Gosling et al [70] evaluated referencing and quotation accuracy among manual therapy journals and found large prevalence of errors, which essentially dictated policy changes by the concerned journals.

Researchers in manual therapy should be aware of newer models of manual therapy research [71] and should update their knowledge and skills towards publishing a manuscripts on manual therapy [72]. The existence of practice-reality gap could not be ignored when it comes to evidence from randomized controlled trials [73], and thus evaluation of evidence in manual therapy should be done with equal knowledge of their values and pitfalls [74]. Farrell and Jensen [75] said, "Interest in manual therapy appears to continue to grow among physical therapy clinicians and educators throughout the world even though the underlying concepts and techniques have not been justified by a knowledge base."

Conclusion

This study provided information on current state of evidence for manual/manipulative therapy in a 40-year trend. This trend was similar to overall trend for all articles indexed in PubMed reported previously.

References

1. Mattick A, Wyatt JP. From Hippocrates to the Eskimo—a history of techniques used to reduce anterior dislocation of the shoulder. *JR Coll Surg Edinb* 2000; 45: 312-6.
2. Paris SV. A history of manipulative therapy through the ages and up to the current controversy in the United States. *J Manual Manipulative Ther* 2000; 8: 66–77.
3. Pettman E. A history of manipulative therapy. *J Man Manip Ther.* 2007; 15: 165-74.
4. Beard G. A history of massage technic. *Phys Ther Rev.* 1952; 32: 613-24.
5. Green BN. A review and critique of Chiropractic History. *Chiropr Hist* 1995; 15(2): 9-11.
6. Geikie-Cobb I. Osteopathy, its history, theory and practice. *Practitioner* 1952; 168(1003): 72-6.
7. Livingston MC. The mystery and history of spinal manipulation. *Can Fam Physician* 1981; 27: 300-2.
8. Mikhail M, Rosen H. History and etiology of myofascial pain-dysfunction syndrome. *J Prosthet Dent* 1980; 44: 438-44.
9. Butler DS, Coppieters MW. Neurodynamics in a broader perspective. *Man Ther* 2007; 12 :e7-8.
10. Hodges PW. Pain and motor control: From the laboratory to rehabilitation. *J Electromyogr Kinesiol.* 2011; 21: 220-8.
11. Smith AR Jr. Manual therapy: the historical, current and future role in the treatment of pain. *The Scientific World Journal* 2007; 7: 109-20.
12. Huijbregts PA. Orthopaedic Manual Physical Therapy- History, Development and Future Opportunities. *J Phys Ther* 2010; 1(1): 11-24.
13. Kumar SP. "Sorting out Lemons and Oranges:" Towards Better Quality of Reporting Clinical Trials in Journal of Physical Therapy - The CONSORT 2010 Statement. *J Phys Ther* 2010; 1: 1-10.
14. Kumar SP. Physical therapy: past, present and future- a paradigm shift. *J Phys Ther* 2010; 1: 58-67.
15. Suskind MI, Hajek NM, Hines HM. Effects of massage on denervated skeletal muscle. *Arch Phys Med Rehabil* 1946; 27: 133-5.
16. Simaan C, Skach M. Clinical and histological evaluation of gingival massage in the treatment of chronic gingivitis. *J Periodontol* 1966; 37: 383-90.
17. Glover JR, Morris JG, Khosla T. Back pain: a randomized clinical trial of rotational manipulation of the trunk. *Br J Ind Med* 1974; 31: 59-64.

18. Brunarski DJ. Clinical trials of spinal manipulation: a critical appraisal and review of the literature. *J Manipulative Physiol Ther* 1984; 7: 243-9.
19. Koes BW, Assendelft WJ, van der Heijden GJ, Bouter LM, Knipschild PG. Spinal manipulation and mobilisation for back and neck pain: a blinded review. *BMJ* 1991; 303: 1298-303.
20. Posadzki P. Is spinal manipulation effective for pain? An overview of systematic reviews. *Pain Med* 2012; 13: 754-61.
21. Ottenbacher K, DiFabio RP. Efficacy of spinal manipulation/mobilization therapy. A meta-analysis. *Spine (Phila Pa 1976)* 1985; 10: 833-7.
22. Myburgh C, Larsen AH, Hartvigsen J. A systematic, critical review of manual palpation for identifying myofascial trigger points: evidence and clinical significance. *Arch Phys Med Rehabil* 2008; 89: 1169-76.
23. Ellis RF, Hing WA. Neural mobilization: a systematic review of randomized controlled trials with an analysis of therapeutic efficacy. *J Man Manip Ther* 2008; 16: 8-22.
24. Vernon H, Schneider M. Chiropractic management of myofascial trigger points and myofascial pain syndrome: a systematic review of the literature. *J Manipulative Physiol Ther* 2009; 32: 14-24.
25. Körner M. Interprofessional teamwork in medical rehabilitation: a comparison of multidisciplinary and interdisciplinary team approach. *Clin Rehabil* 2010; 24: 745-55.
26. Mensik JS. Understanding research and evidence-based practice: from knowledge generation to translation. *J Infus Nurs* 2011; 34: 174-8.
27. Spross JA, Gallagher J, Powel LL. Conference recommendations: practice, administration, research, education, and healthcare policy. *Oncol Nurs Forum* 1992; 19(1 Suppl): 32-41.
28. Abenhaim L, Bergeron AM. Twenty years of randomized clinical trials of manipulative therapy for back pain: a review. *Clin Invest Med* 1992; 15: 527-35.
29. Isabel de-la-Llave-Rincón A, Puentedura EJ, Fernández-de-Las-Peñas C. Clinical presentation and manual therapy for upper quadrant musculoskeletal conditions. *J Man Manip Ther* 2011; 19: 201-11.
30. Courtney CA, Clark JD, Duncombe AM, O'Hearn MA. Clinical presentation and manual therapy for lower quadrant musculoskeletal conditions. *J Man Manip Ther* 2011; 19: 212-22.
31. Millan M, Leboeuf-Yde C, Budgell B, Descarreaux M, Amorim MA. The effect of spinal manipulative therapy on spinal range of motion: a systematic literature review. *Chiropr Man Therap* 2012; 20:23.
32. Heneghan NR, Adab P, Balanos GM, Jordan RE. Manual therapy for chronic obstructive airways disease: A systematic review of current evidence. *Man Ther* 2012; 17: 507-18.
33. Holt KR, Haavik H, Elley CR. The effects of manual therapy on balance and falls: a systematic review. *J Manipulative Physiol Ther* 2012; 35: 227-34.
34. Khorsan R, Hawk C, Lisi AJ, Kizhakkeveetil A. Manipulative therapy for pregnancy and related conditions: a systematic review. *Obstet Gynecol Surv* 2009; 64: 416-27.
35. Düzgün I, Baltacı G, Atay OA. Manual therapy is an effective treatment for frozen shoulder in diabetics: an observational study. *Eklemler Hastalıkları* 2012;23:94-9.
36. Fernández-Lao C, Cantarero-Villanueva I, Díaz-Rodríguez L, Cuesta-Vargas AI, Fernández-Delas-Peñas C, Arroyo-Morales M. Attitudes towards massage modify effects of manual therapy in breast cancer survivors: a randomised clinical trial with crossover design. *Eur J Cancer Care (Engl)* 2012; 21: 233-41.
37. Nijs J, Van Houdenhove B. From acute musculoskeletal pain to chronic widespread pain and fibromyalgia: application of pain neurophysiology in manual therapy practice. *Man Ther* 2009; 14: 3 -12.
38. Grewar H, McLean L. The integrated continence system: a manual therapy approach to the treatment of stress urinary incontinence. *Man Ther* 2008; 13: 375-86.
39. Romano M, Negrini S. Manual therapy as a conservative treatment for adolescent idiopathic scoliosis: a systematic review. *Scoliosis* 2008;3:2.
40. Mathieson L, Hirani SP, Epstein R, Baken RJ, Wood G, Rubin JS. Laryngeal manual therapy: a preliminary study to examine its treatment effects in the management of muscle tension dysphonia. *J Voice* 2009; 23: 353-66.
41. Christensen HW, Vach W, Gichangi A, Manniche C, Haghfelt T, Høilund-Carlson PF. Manual therapy for patients with stable angina pectoris: a nonrandomized open prospective trial. *J Manipulative Physiol Ther* 2005;28(9):654-61.
42. Hondras MA, Linde K, Jones AP. Manual therapy for asthma. *Cochrane Database Syst Rev* 2005; (2): CD001002.

43. Hirayama F, Kageyama Y, Urabe N, Senjyu H. The effect of postoperative ataralgia by manual therapy after pulmonary resection. *Man Ther* 2003; 8: 42-5.
44. Weiss JM. Pelvic floor myofascial trigger points: manual therapy for interstitial cystitis and the urgency- frequency syndrome. *J Urol* 2001; 166: 2226-31.
45. Haywood J, Kirk D, Sanders D. Use of spinal manipulative therapy in the treatment of duodenal ulcer: a pilot study. *J Manipulative Physiol Ther* 1995; 18: 117-8
46. Bradford SG. Role of osteopathic manipulative therapy in emotional disorders: a physiologic hypothesis. *J Am Osteopath Assoc*. 1965;64:484-93.
47. Johnson AM. The management of hypertension by osteopathic manipulative therapy. *J Osteopath (Kirksvill)*. 1963; 70: 50-3.
48. Cookson JC. Orthopedic manual therapy—an overview. Part II: the spine. *Phys Ther* 1979; 59: 259-67.
49. Cookson JC, Kent BE. Orthopedic manual therapy—an overview. Part I: the extremities. *Phys Ther* 1979; 59: 136-46.
50. Gleberzon BJ, Arts J, Mei A, McManus EL. The use of spinal manipulative therapy for pediatric health conditions: a systematic review of the literature. *J Can Chiropr Assoc* 2012; 56: 128-41.
51. Thomas RB. Osteopathic manipulative therapy in geriatric practice. *J Am Osteopath Assoc* 1956; 55: 539-43.
52. Bialosky JE, Bishop MD, Price DD, Robinson ME, George SZ. The mechanisms of manual therapy in the treatment of musculoskeletal pain: a comprehensive model. *Man Ther* 2009; 14: 531-8.
53. Bialosky JE, Bishop MD, George SZ, Robinson ME. Placebo response to manual therapy: something out of nothing? *J Man Manip Ther*. 2011; 19: 11-9.
54. Threlkeld AJ. The effects of manual therapy on connective tissue. *Phys Ther* 1992;72:893-902
55. Di Fabio RP. Efficacy of manual therapy. *Phys Ther* 1992; 72: 853-64.
56. Kumar SP. Effects, efficacy, efficiency, effectiveness ...of physical therapy- how far are we? *J Phys Ther* 2011; 3: 33-7.
57. Winer CE. Training in manual therapy. The current situation. *Med J Aust* 1973; 2: 937-9.
58. Carnes D, Mars TS, Mullinger B, Froud R, Underwood M. Adverse events and manual therapy: a systematic review. *Man Ther* 2010; 15: 355-63.
59. Cook C, Sheets C. Clinical equipoise and personal equipoise: two necessary ingredients for reducing bias in manual therapy trials. *J Man Manip Ther* 2011; 19: 55-7.
60. Fitzgerald GK, McClure PW, Beattie P, Riddle DL. Issues in determining treatment effectiveness of manual therapy. *Phys Ther* 1994; 74: 227-33
61. Jones MA. Clinical reasoning in manual therapy. *Phys Ther* 1992; 72: 875-84
62. Sizer PS Jr. Evidence-based manual therapy for chronic musculoskeletal pain: the challenges. *Pain Pract* 2010; 10 :379-81.
63. Singer KP. Manual therapy and science: a marriage of convenience? *Man Ther* 2000;5:61-2.
64. Cook CE. Philosophical differences in manual therapy. *J Man Manip Ther* 2008; 16: 5-6
65. Jull G, Moore A. Are manipulative therapy approaches the same? *Man Ther* 2002; 7: 63.
66. Quartermaine DM, MacGregor G. Manual therapy is component of physiotherapy. *BMJ* 2003; 327 (7411): 395.
67. Ramsey SM. Holistic manual therapy techniques. *Prim Care* 1997; 24: 759-86.
68. Northup GW. The role of manipulative therapy in the practice of medicine. *J Am Osteopath Assoc* 1972;71:537-42.
69. Smith DR, Rivett DA. Bibliometrics, impact factors and manual therapy: balancing the science and the art. *Man Ther* 2009;14:456-9.
70. Gosling CM, Cameron M, Gibbons PF. Referencing and quotation accuracy in four manual therapy journals. *Man Ther* 2004; 9:3 6-40.
71. Huijbregts PA. A new model for orthopaedic manual therapy research: description and implications. *J Man Manip Ther* 2007; 15: 197-9.
72. Cook C, Brismée JM, Courtney C, Hancock M, May S. Publishing a scientific manuscript on manual therapy. *J Man Manip Ther* 2009; 17: 141-7.
73. Milanese S. The use of RCT's in manual therapy— are we trying to fit a round peg into a square hole? *Man Ther* 2011;16:403-5.
74. Koes BW. How to evaluate manual therapy: value and pitfalls of randomized clinical trials. *Man Ther* 2004;9:183-4.
75. Farrell JP, Jensen GM. Manual therapy: a critical assessment of role in the profession of physical therapy. *Phys Ther* 1992;72:843-52.