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Original article

# A descriptive study of the usage of spinal manipulative therapy techniques within a randomized clinical trial in acute low back pain <sup>☆</sup>

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## Abstract

The majority of randomized clinical trials (RCTs) of spinal manipulative therapy have not adequately defined the terms 'mobilization' and 'manipulation', nor distinguished between these terms in reporting the trial interventions. The purpose of this study was to describe the spinal manipulative therapy techniques utilized within a RCT of manipulative therapy (MT;  $n=80$ ), interferential therapy (IFT;  $n=80$ ), and a combination of both (CT;  $n=80$ ) for people with acute low back pain (LBP). Spinal manipulative therapy was defined as any 'mobilization' (low velocity manual force without a thrust) or 'manipulation' (high velocity thrust) techniques of the spine described by Maitland and Cyriax.

The 16 physiotherapists, all members of the Society of Orthopaedic Medicine, utilized three spinal manipulative therapy patterns in the RCT: Maitland Mobilization (40.4%,  $n=59$ ), Maitland Mobilization/Cyriax Manipulation (40.4%,  $n=59$ ) and Cyriax Manipulation (19.1%,  $n=28$ ). There was a significant difference between the MT and CT groups in their usage of spinal manipulative therapy techniques ( $\chi^2=9.178$ ;  $df=2$ ;  $P=0.01$ ); subjects randomized to the CT group received three times more Cyriax Manipulation (29.2%,  $n=21/72$ ) than those randomized to the MT group (9.5%,  $n=7/74$ ;  $df=1$ ;  $P=0.003$ ).

The use of mobilization techniques within the trial was comparable with their usage by the general population of physiotherapists in Britain and Ireland for LBP management. However, the usage of manipulation techniques was considerably higher than reported in physiotherapy surveys and may reflect the postgraduate training of trial therapists.

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## 1. Introduction

Spinal manipulative therapy is commonly used by physical therapists, chiropractors and osteopaths for the management of people with low back pain (LBP), and is advocated by the majority of national clinical guidelines (Koes et al., 2001). Manipulative therapy typically

incorporates both mobilization (non-forceful, oscillatory techniques of high or low velocity) and manipulation (low amplitude range-expanding thrusts of high velocity) techniques that aim to reduce pain and increase joint range of movement (Kotoulas, 2002). While both forms of passive treatment fall within the remit of manipulative therapy, practitioners view them quite separately and this is reflected in their clinical practice. Large scale surveys have reported that mobilization is used by up to 59% of physiotherapists in the UK health service for the treatment of back pain, in contrast to a 9% uptake of manipulation techniques (Foster et al., 1999; Gracey et al., 2002).

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A recent review found that the majority (14/15) of randomized clinical trials (RCTs) of lumbar spine disorders failed to provide adequate definitions of the terms ‘mobilization’ and ‘manipulation’, and did not distinguish between these terms in reporting the trial interventions (Kotoulas, 2002). Many RCTs also permit therapists to utilize both mobilization and manipulation techniques within the manipulative therapy (MT) arm of a trial (Farrell and Twomey, 1982; Arkuszewski, 1986; Meade et al., 1990; Aure et al., 2003), thus mirroring clinical practice, but then fail to report separately on the usage of these techniques, details that are relevant to the clinician. Such limitations and lack of specificity in clearly defining manipulative therapy may result in misinterpretation of the literature by individuals, systematic reviewers and clinical guideline developers. Clinical trialists have therefore been urged to provide adequate definitions of the manipulative therapy techniques under investigation, as well as detailing the usage of these techniques (Kotoulas, 2002).

The authors have completed a three-arm RCT that investigated the difference in effectiveness of manipulative therapy and interferential therapy for patients with acute LBP when used as sole treatments and in combination (Hurley et al., 2004). The trial concluded that for acute LBP there was no difference at discharge, 6 or 12 month follow-up between the effects of a combined manipulative therapy and interferential therapy package and either manipulative therapy or interferential therapy alone. As subjects in two arms of the RCT received manipulative therapy the current study aimed to describe the usage of these techniques within the context of the trial.

## 2. Methods

### 2.1. Spinal manipulative therapy education

The UK clinical guidelines for acute back pain state that the risks of MT are low provided patients are selected and treated appropriately by trained therapists (Waddell et al., 1999). The two largest professional bodies involved in postgraduate education in manipulative therapy in the UK are the Manipulation Association of Chartered Physiotherapists (MACP) and the Society of Orthopaedic Medicine (SOM). The MACP traditionally based its curriculum on the techniques described by Mr. Geoffrey Maitland, an Australian physiotherapist, while the SOM approach originated from the work of Dr. James Cyriax, a British orthopaedic physician.

In the RCT 240 patients with acute LBP (4–12 weeks duration) were treated by one of 16 therapists who had received training in the Maitland approach at undergraduate level, and had successfully completed the SOM

postgraduate membership examination (recognized by the Chartered Society of Physiotherapy and the International Federation of Orthopaedic Manipulative Therapists) as well as participating in a revision session lead by one of the senior SOM tutors. None of the participating therapists were members of the MACP.

### 2.2. Trial procedures

Following completion of a range of valid and reliable outcome measure questionnaires consenting subjects received a copy of the evidence-based patient education booklet the *Back Book* (Anon, 1996), which was designed to complement and support the UK Clinical Guidelines for Acute LBP (Waddell et al., 1996), and were randomized to one of three groups, i.e. manipulative therapy (MT), interferential therapy (IFT), or combined therapy (CT). Subjects in the MT and CT groups received the spinal manipulative therapy protocol detailed below, and those in the CT group also received a standardized IFT treatment that has been previously described (Hurley et al., 2001).

### 2.3. Spinal manipulative therapy protocol

Standardized operational definitions were used for the spinal manipulative therapy techniques within the trial, i.e. any ‘mobilization’ or ‘manipulation’ techniques for the lumbar spine described by Maitland (2000) or Cyriax (1984). The elements of the spinal manipulative therapy package were:

- *Maitland Mobilization*
  - Grade I, II, III or IV postero-anterior central, anteroposterior central, postero-anterior unilateral and transverse vertebral pressure glide techniques of the lumbar spine.
  - Grade I, II, III or IV unilateral rotation, longitudinal, flexion, straight leg raise, slump or manual traction oscillatory movements of the lumbar spine.
- *Maitland Manipulation*
  - Grade V postero-anterior central, postero-anterior unilateral and transverse vertebral pressure glide techniques of the lumbar spine.
  - Grade V unilateral oscillatory rotation movements of the lumbar spine.
- *Cyriax Mobilization (grade A or B)*
  - Grade A or B distraction technique; short and long lever rotation techniques.
  - Grade A or B straight extension, unilateral extension and extension with leverage techniques.
- *Cyriax Manipulation*
  - Grade C distraction technique; short and long lever rotation techniques.
  - Grade C straight extension, unilateral extension, extension with leverage techniques.

On the basis of the advanced clinical reasoning skills utilized during individual patient examination each physiotherapist determined the type(s) of mobilization and manipulation techniques to use and when, and the spinal levels to which they were applied at each intervention session. Therapists completed a proforma of the treatment provided after each session to verify adherence to the protocol; this included the spinal levels, manipulative therapy techniques and grades administered at each treatment session. Other than the designated protocol, therapists were not permitted to administer any other forms of spinal manipulative therapy, electrotherapy or other techniques (spinal traction, heel raises, corsets, acupuncture, injection therapy or taping) during the intervention period of the trial.

#### 2.4. Data analysis

All data were analysed using the Statistical Package for the Social Sciences (Windows 11.0) according to the ‘intention-to-treat’ principle. The type of spinal manipulative therapy treatment provided to patients in the MT and CT groups was categorized according to the type and grade of movement applied as follows: (i) ‘Maitland Mobilization’: Grades I to IV; (ii) ‘Maitland Manipulation’: Grade V; (iii) ‘Cyriax Mobilization’: Grade A and B; (iv) ‘Cyriax Manipulation’: Grade C and (v) all possible combinations of the above. Differences in patterns of usage of the spinal manipulative therapy techniques were determined using  $\chi^2$  analysis for categorical variables, and ANOVA for continuous variables.

### 3. Results

#### 3.1. Physiotherapists profile

The majority of therapists (81%;  $n=13/16$ ) treated subjects in both the MT and CT trial groups. Almost all clinicians had a B.Sc. level undergraduate physiotherapy education, were at least 6 years post qualification and held a senior clinical grade of employment (Table 1). All had received undergraduate education in the Maitland approach to mobilization, but not manipulation techniques. At postgraduate level, in addition to 100% membership of the SOM, the vast majority had attended courses in the McKenzie Approach (94.8%,  $n=15/16$ ), over half had attended Maitland short courses, and 25% mobilization with movement (MWMs) courses.

#### 3.2. Patterns of usage of spinal manipulative therapy

##### 3.2.1. Overview

The majority of patients received mobilization, rather than manipulation techniques within the trial. Three

Table 1  
Summary of physiotherapists’ profile

	Valid percentage	Frequency
<i>Years since qualification</i>		
0–2 years	00.0	0
3–5 years	18.8	3
6–10 years	50.0	8
Above 10 years	31.3	5
<i>Level of qualification</i>		
Diploma	6.3	1
B.Sc. Degree	93.8	15
<i>Clinical grade</i>		
Senior II	50.0	8
Senior I	43.8	7
Superintendent	6.3	1
<i>Postgraduate courses</i>		
SOM Membership Exam	100.00	16
High velocity manipulation	6.3	1
Maitland short courses	56.3	9
McKenzie	94.8	15
Mobilization with movement	25.0	4
Acupuncture	18.8	3
Muscular system	6.3	1
Nervous system	6.3	1

distinct patterns of MT techniques were utilized by the therapists: i.e. (i) ‘Maitland Mobilization’ (40.4%,  $n=59$ ), (ii) ‘Maitland Mobilization/Cyriax Manipulation’ (40.4%,  $n=59$ ), and (iii) ‘Cyriax Manipulation’ (19.1%,  $n=28$ ). There was no evidence of subjects being treated with ‘Cyriax Mobilization’ or ‘Maitland Manipulation’ techniques.

#### 3.2.2. Individual therapists usage of spinal manipulative therapy

The patterns of spinal manipulative therapy used by each therapist are detailed in Table 2 and showed no obvious trends. For example, two physiotherapists used the same MT pattern to treat all patients in the trial, nine used two patterns and five used three patterns. Of the 13 therapists who treated patients in both RCT groups, one used the same pattern of MT treatment, four used the same two patterns, and one used the same three patterns. The results of  $\chi^2$  analyses showed no significant difference between groups in the number of MT patterns used and either the clinical grade, number of years’ since qualification or level of postgraduate training of therapists ( $P>0.05$ ).

#### 3.2.3. Comparison of randomized clinical trial groups

There was a significant difference between the MT and CT groups in the overall use of spinal manipulative therapy techniques ( $\chi^2=9.2$ ;  $df=2$ ;  $P=0.01$ ). Subjects randomized to the CT group received a significantly higher number of ‘Cyriax Manipulation’ techniques

Table 2  
Patterns of spinal manipulative therapy techniques used in the randomized clinical trial

Therapist	MT Group (n=74)			CT Group (n=72)		
	MMob	MMob/CManip	CManip	MMob	MMob/CManip	CManip
1		2			2	
2	5					
3	2			5		1
4	2			1	1	
5	2	5	2		1	4
6	2	1				
7	9	3		4	3	
8	3	2	1	1	1	
9		2	1		1	6
10	1	2	1	3	1	2
11	1					5
12	1	1		1	1	
13	4	5		2	3	
14	2	3	1		7	1
15		7	1	4	5	
16				4		2
	34	33	7	25	26	21

MT=Manipulative Therapy Group, CT=Combined Therapy Group.  
MMobs=Maitland Mobilization, CManip=Cyriax Manipulation.

The numbers in each box represent the number of patients treated by each therapist with each spinal manipulative therapy technique.

(29.2%,  $n=21/72$ ) than those randomized to the MT group (9.5%,  $n=7/74$ ;  $\chi^2=8.7$ ;  $df=1$ ;  $P=0.003$ ), as illustrated in Fig. 1. There was a similar rate of usage of 'Maitland Mobilization' (MT: 45.9%,  $n=34/74$ ; CT: 34.7%,  $n=25/72$ ;  $\chi^2=2.0$ ;  $df=1$ ;  $P=0.15$ ) and 'Maitland Mobilization/Cyriax Manipulation' techniques (MT: 44.6%,  $n=33/74$ ; CT: 36.1%,  $n=26/72$ ;  $\chi^2=1.2$ ;  $df=1$ ;  $P=0.28$ ).

### 3.3. Frequency of spinal manipulative therapy treatment

In the RCT, subjects received an average of five physiotherapy treatments ( $\pm SD=2.5$ ), over a period of five weeks ( $\pm SD=2.3$ ), and there were no significant differences between intervention groups for the number of treatments ( $F=0.49$ ;  $df=2$ ;  $P=0.61$ ) or the number of weeks of treatment ( $F=0.18$ ;  $df=2$ ;  $P=0.84$ ) received.

However, univariate ANOVA showed there was a significant difference in the number of treatments received by patients according to the type of manipulative therapy treatment provided ( $F=7.92$ ;  $df=2$ ;  $P=0.001$ ; Table 3). Those treated with 'Maitland Mobilization/Cyriax Manipulation' received significantly more treatment sessions than those treated with 'Maitland Mobilization' ( $P<0.001$ ; mean difference=1.61; 95% CI difference 2.63 to 0.59, Tukey test) or 'Cyriax Manipulation' ( $P=0.019$ ; mean difference=1.47; 95% CI difference 2.74 to 0.20, Tukey test). Similarly, there was a significant difference in the

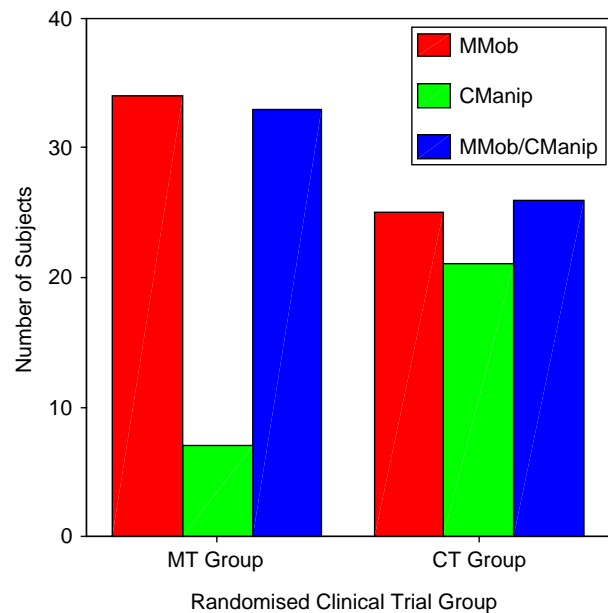


Fig. 1. Patterns of usage of spinal manipulative therapy.

number of weeks of treatment received by patients for each type of MT treatment ( $F=3.9$ ;  $df=2$ ;  $P=0.023$ ; Table 3). Post hoc analysis showed patients treated with 'Maitland Mobilization/Cyriax Manipulation' had a significantly greater number of weeks of treatment than those receiving 'Cyriax Manipulation' ( $P=0.032$ ; mean difference=1.47; 95% CI difference 2.85 to 0.09).

### 3.4. Outcome of spinal manipulative therapy treatment

Outcome was evaluated in terms of mean change in the primary outcome measure, the Roland Morris Disability Questionnaire (RMDQ). Regardless of the type of SMT treatment, subjects experienced a clinically significant improvement of at least four points on the RMDQ at discharge and 12 months (Stratford et al., 1998; Table 4), with no significant differences detected between SMT groups.

## 4. Discussion

One of the most common barriers to the uptake of evidence is the lack of consistency between research protocols and clinical practice (Hurley, 2000). Exploration of the patterns of usage of spinal manipulative therapy within a RCT, as reported in this study, should allow manual therapists to determine how closely the trial design, practitioners and interventions mirror their practice setting. Consequently, clinicians can interpret and perhaps implement the evidence in a more meaningful way. Furthermore, systematic reviewers and clinical guideline developers are provided with details of the spinal manipulative therapy elements of the trial, which should contribute to the evidence base.

The physiotherapists in the trial were an experienced group of clinicians comparable with the general population of physiotherapists treating patients with LBP in the publicly funded health services of Britain and

Ireland (Foster et al., 1999; Gracey et al., 2002). While the usage of spinal manipulative therapy was analysed within a RCT setting rather than routine clinical practice, this was a pragmatic trial and the treating physiotherapists were free to select any type of MT techniques described by Maitland and Cyriax. The high usage of Maitland Mobilization techniques within the trial was consistent with their previously reported popularity in the physiotherapeutic management of people with LBP in the British Isles generally (Foster et al., 1999; Gracey et al., 2002). In contrast, there was a markedly higher usage of manipulation techniques within this study than previously observed amongst Northern Ireland physiotherapists (Gracey et al., 2002). Furthermore, therapists exhibited a marked preference for Cyriax rather than Maitland Manipulation techniques; due to the study criteria all therapists were members of the SOM, which is higher than the general physiotherapy population of 23% (Foster et al., 1999). Members of the SOM have a reportedly higher usage and somewhat less conservative attitude to manipulation than members of the MACP (Adams and Sim, 1998), which may reflect the view of Cyriax (1984) that manipulation should be used on all patients presenting with recent LBP unless otherwise contraindicated.

The higher usage of Cyriax Manipulation techniques in the CT group compared to the MT group was an interesting and unexpected finding. There is no previous evidence that usage of spinal manipulative therapy techniques is related to whether they are delivered as a sole treatment or in combination with other modalities, and thus possible explanations are purely speculative. Perhaps therapists were more likely to use manipulation in combination with IFT confident in the knowledge that they could apply the electrotherapy modality afterwards to minimize treatment soreness. In a preliminary study the therapists stated they would use IFT to 'calm down inflammation', 'relieve treatment soreness' and 'reduce muscle spasm' (Hurley, unpublished data). Additionally, the shorter time for delivery of a manipulation technique may have been preferable to that required for a series of mobilization techniques, in addition to interferential therapy in the CT arm of the trial.

Table 3  
Frequency of each spinal manipulative therapy treatment

Type of SMT	N	Number of treatments (mean, SD)	Number of weeks (mean, SD)
MMob	59	4.5 (2.4)	4.7 (2.3)
MMob/CManip	59	6.2 (2.4)	5.6 (2.4)
CManip	28	4.7 (2.2)	4.1 (1.9)

Table 4  
Outcome of each type of spinal manipulative therapy treatment

Type of SMT	Roland Morris difference score at discharge ( $n = 146$ ) (mean, 95% CI)	Roland Morris difference score at 12 months ( $n = 113$ ) (mean, 95% CI)
MMob	5.1 (3.8–6.4)	6.1 (4.5–7.7)
MMob/CManip	4.4 (3.1–5.6)	5.9 (4.3–7.5)
CManip	5.8 (3.9–7.6)	6.4 (4.1–8.6)
ANOVA results	$F = 0.79$ ; $df = 2$ ; $P = 0.45$	$F = 0.05$ ; $df = 2$ ; $P = 0.95$

The findings also suggested that factors related to the patient rather than therapists' clinical grade, level of experience and postgraduate training influenced the usage of SMT techniques. It has been previously shown that the selection of treatment techniques for patients with musculoskeletal disorders by expert clinicians is closely linked to specific hypotheses within the hypothetico-deductive clinical reasoning process related to individual patient presentation (Doody and McAteer, 2002). Patients who were treated with both mobilization and manipulation techniques received a higher number of treatments and weeks of treatment (at potentially higher cost) than those who were managed by manipulation or mobilization techniques alone. Perhaps patients in the former group failed to respond to a particular technique, which necessitated a change in SMT approach. Nonetheless, as no differences in the Roland Morris Disability Questionnaire change scores were detected at follow-up, the findings empower therapists to utilize their preferred spinal manipulative therapy approach (with or without interferential therapy) in the management of patients with acute LBP.

Given the multitude of variables that could contribute to the selection of spinal manipulative therapy techniques, research should establish the relative effect of the therapist, patient, environment, evidence base, and clinical guidelines.

## 5. Conclusion

A detailed description of the type of spinal manipulative therapy utilized within a RCT of manipulative therapy and interferential therapy for acute LBP has been provided. The findings showed that a group of experienced physiotherapists with postgraduate training in the SOM approach to manipulative therapy employed a range of mobilization techniques that were comparable with the general population of physiotherapists in Britain and Ireland. However, the usage of manipulation was considerably higher than reported in physiotherapy surveys and may reflect the postgraduate training of trial therapists.

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