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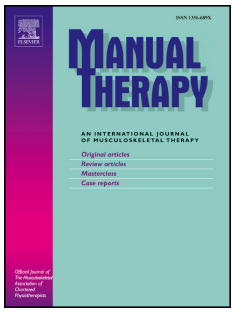

Can a professional development workshop with follow-up alter practitioner behaviour and outcomes for neck pain patients? A randomised controlled trial

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ABSTRACT

Background

Continuing professional development (CPD) is a fundamental component of physiotherapy practice. Follow-up sessions provide opportunity for the refinement of skills developed during CPD workshops. However, it is necessary to identify if such opportunity translates to improved physiotherapist performance and patient outcomes.

Objectives

To determine whether a traditional CPD workshop with a follow-up session with the educator is more likely to change physiotherapists' practice behaviour and patient outcomes than a traditional workshop with no opportunity for follow-up.

Design

A single-blind, randomised controlled trial.

Methods

Participants were stratified and randomly allocated to the intervention and control groups. The control group participated in a two-day workshop dedicated towards the management of neck disorders. The intervention group completed the two-day workshop and attended a five-hour follow-up session one month later. Outcome measures included self-reported physiotherapist practice behaviour and confidence, as well as patient clinical outcomes using the Neck Disability Index.

Results

While all participants exhibited changes in confidence and practice behaviours, between-group differences were not significant for any response ($p > 0.05$). There were also no significant differences between the groups in terms of patient outcomes (NDI:

F=0.36, p=0.56).

Conclusion

A single follow-up session to a traditional workshop is insufficient to significantly influence practice behaviours or patient outcomes.

Key words

Professional development, neck pain, patient outcomes

BACKGROUND

Continuing professional development (CPD) is the career-long process of maintaining and extending one's knowledge, skills and abilities (French & Dowds, 2008; Gunn & Goding, 2009; Lewis, 1998; PBA, 2011). In many countries, CPD is a mandatory requirement for professional registration (AHPRA, 2011; Mansouri & Lockyer, 2007). The term CPD generally encompasses formal learning methods, such as attendance at courses and conferences, and informal learning methods through experience and interaction (Fleet et al., 2008; PBA, 2011). Physiotherapists have a preference for formal learning methods, with a large industry devoted to the provision of face-to-face workshops and conferences (Chipchase et al., 2012; French & Dowds, 2008; Gunn & Goding, 2009).

Increasingly, attention is being paid to whether CPD can create change to practice sufficient to improve patient outcomes (Chipchase et al., 2012; Davis et al., 2003; Davis et al., 2011; Mansouri & Lockyer, 2007). This is due to two factors: First, health professionals spend between one and three weeks per year at courses and workshops (Mansouri & Lockyer, 2007). This means that CPD is associated with significant costs to governments, institutions and individuals. Second, and arguably of greatest importance, is that one third of patients have been shown to receive care that does not reflect current evidence (Davis et al., 2009; Grol & Grimshaw, 2003; Mansouri & Lockyer, 2007). In many instances care may be unnecessary or, at worst, potentially harmful.

Participation in CPD workshops has been shown to improve knowledge and guideline-consistent behaviours among physiotherapy practitioners (Menon et al., 2009). Rebbeck et al. (2006) demonstrated that a program involving a CPD workshop on whiplash-related disorders improved practice behaviours when compared to physiotherapy guidelines

received via mail. Such trends have been observed in reviews of both physiotherapy and medical literature (Chipchase et al., 2012; Menon et al., 2009; Davis & Galbraith, 2009; Davis et al., 1995; Mansouri & Lockyer., 2007). Active CPD approaches (workshops) tend to elicit greater improvements in practice behaviours than passive approaches, such as reading or viewing instructional material (Menon et al., 2009). However, studies of CPD workshops in physiotherapy have demonstrated inconsistent results in terms of improving patient outcomes (Brennan et al., 2006; Cleland et al., 2009; Bekkering et al., 2005). Educational interventions with continuing contact over time have demonstrated most success in this area, suggesting that the amount of follow-up provided during a CPD program may be a determining factor in its success (Menon et al., 2009; Mansouri & Lockyer., 2007). Unfortunately, many studies in this area have been of low-to-modest methodological quality (Scott et al., 2012; Jones et al., 2015).

The role of follow-up during CPD workshops is a developing area of research (Mansouri & Lockyer, 2007). Previous randomised controlled trials have demonstrated that physiotherapists who receive ongoing education following a two-day workshop on neck pain demonstrate superior patient outcomes in terms of Neck Disability Index (NDI) scores compared to those who undertake the workshop alone (Brennan et al., 2006; Cleland et al., 2009). While these studies highlight the potential for improvement with additional follow-up, the delivery of this follow-up, in the form of regular outreach visits or co-assessment and treatment of clients by physiotherapists and workshop leaders, is rarely feasible (Woollett, 1990). Indeed, the cost and time associated with the provision of outreach visits in a geographically dispersed population prohibits their widespread use in many countries (Asthana & Halliday, 2004; O'Brien et al., 2007; Woollett, 1990).

While CPD workshops targeting physiotherapists have been shown to be effective in terms of improving practice behaviours, benefits to patients have primarily been explored through programs consisting of multiple follow-up sessions over a period of weeks to months. Not only are such approaches costly and time-consuming, they do not reflect the belief held by many physiotherapists that short 'refresher' courses are sufficient to enhance techniques and improve patient outcomes when combined with clinical practice over time (PBA, 2011). Unfortunately, the effectiveness of this short-term follow-up has yet to be completely elucidated, and additional high quality studies are required (Menon et al., 2009; Scott et al., 2012; Jones et al., 2015). Thus, the aim of this study was to determine whether a traditional workshop with a single follow-up meeting with the educator was more likely to change practice behaviour and patient outcomes than a traditional workshop with no opportunity for follow-up.

METHOD

This study is reported in accordance with Consolidated Standards of Reporting Trials (CONSORT) guidelines (Schulz et al., 2010).

Research design

A single blind, randomised clinical trial was used with participant stratification for years of post-entry-level qualification experience and gender.

Participants

Physiotherapists were eligible for the study if they were able to attend a two-day workshop with follow-up one month later (depending on group allocation) and were willing to collect pre- and post-course patient data. Physiotherapists who did not have a musculoskeletal

caseload were not eligible to participate. Prior to the workshop, all participants completed a demographic questionnaire including age, gender and years of clinical experience. Ethical clearance for the study was gained from the institutional medical research ethics committee and all participants provided informed consent.

The sample size was determined based on the ratio of instructors (one course leader and an assistant) to participants. With two instructors, a sample size of no greater than 26 allowed participants to work practically in pairs with one instructor assigned to six or seven pairs.

Randomisation

Participants were stratified and randomly allocated after completion of the two-day workshop to ensure that the instructors were unaware of the group assignments when providing feedback on skill performance (Cleland et al., 2009). The first level of stratification grouped participants with similar years of experience in bands of five years and then by gender. The names of pairs of the same gender with similar experience were placed on separate pieces of paper in an opaque envelope. Unsighted names were drawn from the envelope by an independent researcher and the first drawn name was allocated to the control group and the second to the intervention group. This was repeated for each pair. As there were an uneven number of participants, the unpaired participant was allocated to the intervention group. In addition, participants who had work/social connections were specifically asked not to discuss the project with each other.

The workshop was developed and led by a specialist musculoskeletal physiotherapist, experienced researcher and Fellow of the Australian College of Physiotherapy. An experienced educator familiar with the workshop material assisted the lead instructor. The workshop was conducted in a state of Australia that was not the home state of the lead

instructor, and one in which the workshop material had not been presented for greater than two years.

Intervention

The two-day workshop provided an evidence-based approach towards the diagnosis and management of neck disorders, with an emphasis on multimodal interventions inclusive of advice, education exercise and manual therapy. The two-day timeframe was selected as it represents common practice and has been utilised by multiple studies exploring the effectiveness of continuing professional development workshops related to the neck and spine (Bekkering et al., 2005; Brennan et al., 2006; Cleland et al., 2009). The course especially promoted a research-informed therapeutic exercise program within the multimodal program that has been shown to be efficacious for persons with neck disorders in clinical trials (Jull et al., 2002; Jull et al., 2007). The workshop was 12.5 hours in duration and consisted of lectures (2.5 hours), as well as demonstrations, practice and discussion (10 hours) over a two-day period. The lead instructor and assistant provided supervision in the practical sessions.

Participants in the control group participated in the two-day workshop. Participants in the intervention group completed the two-day workshop and, in addition, attended a five-hour follow-up session with the same instructors one month later. This follow-up session provided participants with the opportunity for further skills practice, reflection and discussion.

Outcome measurements

Practice behaviour was measured with a purposively designed, semi-structured questionnaire containing closed (Likert-type responses) and open questions. The

questionnaire was developed in an iterative process based on previously published questionnaires (Grant & Niere, 2000; Hurley et al. 2002), the expertise of the project team, feedback from previous workshops and pilot testing on a sample representative of the study population. The questionnaire had two sections and questions are presented within the tables of results (Table 2 and Table 3, respectively). Briefly, section one included questions related to practitioner confidence in the assessment of cervical motor and sensorimotor function, as well as the prescription and progression of exercise in the management of patients with neck pain. Category codes were: 1 = not confident; 2 = somewhat confident; 3 = confident; 4 = very confident. Section two gathered information on their usual management strategies for patients with neck pain. Category codes were: 1 = not at all; 2 = some of the time; 3 = most of the time; 4 = all of the time.

Questionnaires were completed by all participants prior to the first weekend workshop and again four weeks after the final follow-up workshop. The four-week intervals between the initial workshop, follow-up workshop, and final assessment were selected to provide participants with sufficient opportunity to adapt their practice behaviours and treat an adequate number of patients (Bekkering et al., 2005; Brennan et al., 2006; Cleland et al., 2009). Questionnaires were mailed to participants with a Reply Paid envelope. Reminders and follow-up phone calls were made to enhance the response rate.

Clinical outcomes achieved by participants were assessed with the Neck Disability Index (NDI), which is a reliable and valid outcome measure for patients with neck pain (Vernon, 2008). Patient data were collected on two occasions. First, on enrolment into the study (two months prior to the workshop), all participants were asked to administer the NDI to 10 successive neck pain patients on the first day of treatment and then again at the fourth

occasion of presentation to the physiotherapist. All participants were asked to repeat this again on another 10 successive neck pain patients after completion of the follow-up educational intervention (two months after the two-day program). The patient outcome data was collected this way to measure the clinical effectiveness of the educational intervention before and after the workshop/s following three treatments. This provided consistency in the outcomes of a defined amount of treatment, rather than a variable amount of treatment as would occur if data were collected at the initial treatment and at discharge.

Analysis

Baseline data were compared for practitioner variables (age, gender and years of experience) and patient variables (NDI scores) with an independent t-test for continuous data, and chi-squared tests for nominal/ordinal data (Altman & Bland, 2009).

For the practice behaviour questionnaire, data from closed-ended questions were entered into Statistical Products and Service Solutions (SPSS) for Windows version 14 (SPSS Inc, Chicago: USA). Closed questions that resulted in ordinal data were coded into numerical format. Analyses of covariance (ANCOVAs) were utilised to compare the changes in scores from baseline between the intervention and control. This method makes adjustments for any differences in scores reported between groups at baseline (Van Breukelen, 2006).

For clinical outcomes, the average change in NDI scores from first-to-fourth visit was calculated for each participating physiotherapist. Data were normally distributed (Shapiro-Wilk test, all $p > 0.05$), allowing the use of a repeated measures analysis of variance (ANOVA) with one between-subject factor GROUP (control and intervention) and one

within-subject factor TIME (pre- and post-education intervention). The level of significance was set at a p-value < 0.05.

RESULTS

Thirty-nine physiotherapists expressed interest in the study, and 23 were enrolled in the program (see Figure 1). Reasons for non-enrolment in the program included being unavailable for the dates of either the proposed workshop or the follow-up session (n=12) and not working with neck pain patients (n = 4). The 23 subjects included 13 females and 12 males, with a mean (SD) age of 41.57 (12.34) years. The sample had a range of clinical experience with a mean (SD) of 18.04 (12.77) years. Table 1 presents group demographics and reflects the stratification process in terms of the lack of differences in gender, age and years of experience of each participant group. In addition, there was no significant difference in the pre-intervention NDI data between the two groups. There were also no significant differences between groups in terms of practitioner confidence or management approaches at baseline.

Practice behaviour data

Section 1

Participants were asked to report their confidence in being able to perform a number of examination and management techniques for patients with neck pain disorders. Table 2 presents the mean scores for each question for both the intervention and control group before and after the intervention. While both groups significantly improved in all areas from baseline, no significant between-group differences were identified for any of the Likert scale responses (see Table 2). When subsections of the confidence questionnaire were totalled, no significant differences were observed between the intervention and control in terms of

assessment (F = 0.12, df = 1, p = 0.73, n^2 = 0.01 [95% CI -0.27 to 0.29]), clinical reasoning (F = 0.71, df = 1, p = 0.41, n^2 = 0.04 [95% CI -0.34 to 0.42]), or progression of exercises (F = 0.02, df = 1, p = 0.90, n^2 = 0.01 [95% CI -0.79 to 0.81]).

Section 2

Participants were asked to consider their last ten patients with neck pain/dysfunction and to report how often they used a range of management strategies. Table 3 presents the mean scores for the frequency with which participants reported their use of a variety of management techniques in their usual management of neck pain patients. The focus of most management for neck pain prior to the education intervention included manual therapy, postural re-education, ergonomic advice and home exercise programs. Following the educational intervention, there was no change in practitioners' reports of the frequency with which they used any of these management strategies (p > 0.05).

Patient outcomes data

Although reminders were sent to participants, not all practitioners collected data on 10 successive patients before and after the educational intervention. The participants collected a total of 158 patients with complete NDI data before the intervention and 115 after the intervention (Table 4). NDI scores were calculated out of 50. Changes in NDI data over time were calculated for each patient and then averaged for each participant. There was no effect of TIME (F = 0.45, df = 1, p = 0.51, n^2 = 0.00 [95% CI -0.04 to 0.04]) or GROUP (F = 0.36, df = 1, p = 0.56, n^2 = 0.00 [95% CI -0.04 to 0.05]). In addition, there was no significant TIME*GROUP interaction. This meant that there were no differences between groups in terms of patient outcomes as measured by the NDI before and after the educational interventions (Table 1; F = 2.88, df 1, p = 0.11, n^2 = 0.03 [95% CI -0.04 to 0.10]).

DISCUSSION

This study evaluated the effectiveness of a CPD workshop on neck pain employing a single follow-up session compared to a traditional workshop with no opportunity for follow-up. No significant differences were identified between groups in terms of practitioner confidence, management approach, or patient NDI scores after three treatments. The results of the present study therefore indicate that a single follow-up session to a traditional workshop is insufficient to significantly influence practice behaviours or short-term outcomes among neck pain patients.

While this study identified significant improvements in practitioner confidence and management approaches from baseline in both the intervention and control group, between-group differences were not significant. A single follow-up session therefore provided no additional benefits to clinician performance when compared to a traditional workshop with no opportunity for follow-up. This finding supports those of a meta-analysis by Mansouri & Lockyer (2007), which indicated that the number of follow-up sessions provided as part of a CPD workshop is strongly correlated with the degree of change in practitioner behaviour, with a small number of follow-up sessions being less likely to result in changes to practitioner skills or knowledge. Beer et al. (1990) demonstrated similar results when using educational interventions to improve the quality of their technical centres. Both Beer et al. (1990) and Mansouri et al. (2007) suggested that successful CPD programs should be continuous and periodic, supporting the current study in identifying that a single follow-up session does not provide sufficient stimulus to elicit behavioural change. This has been emphasised by Menon et al. (2009), who highlighted in their review the need for multifaceted approaches towards CPD in the physiotherapy profession.

This study also investigated the influence of a single follow-up CPD session on patient outcomes. No significant differences in patient outcomes were identified between the intervention and control group after three treatment sessions. The addition of a single follow-up session therefore yielded no further improvement to short-term outcomes achieved following a traditional workshop. This supports the findings of systematic reviews by Davis & Galbraith (2009) and Mazmanian et al. (2009), which indicate that increased opportunity for follow-up does not necessarily translate to improved patient outcomes. Rather, such studies suggest that the medium itself influences the degree of patient improvement, with outreach visits being more likely to improve patient outcomes when compared to traditional CPD workshops or didactic education approaches alone (O'Brien et al., 2007; Forsetlund et al., 2009).

Despite a rigorous approach towards data collection and synthesis, this study is not without limitations. As participants were self-selected, the results of the study may not be generalisable to all physiotherapy practitioners. The fact that participants in this study had, on average, 18 years of clinical experience may have led to the development of a 'ceiling effect', with improvements in performance being far less likely among experienced individuals. This is supported by the fact that significant improvements in patient outcomes were occurring prior to the educational intervention in both groups. Patients of both groups demonstrated a reduction in NDI scores (7 points on 50 point scale) after three treatments, which is approaching the minimal clinically important difference (MCID) of 7.5 for mechanical neck disorders (Young et al., 2009), and exceeds the MCID of 3.5 for non-specific neck pain (Pool et al., 2007). While practice behaviours and confidence improved in both groups following the initial intervention, it is possible that experienced practitioners may

not actually need follow-up beyond this point. Early career physiotherapists may not have had such favourable outcomes at baseline, leaving more room for observable improvement following additional feedback.

Another limitation of this study was its relatively short follow-up period, with changes in outcomes possibly not being observable between the first and fourth treatments. While the timeframes in this study were based upon previous research, it is not clear if differences between the two groups may have become more apparent given a longer timeframe. Additionally, the short duration of the study may not have enabled identification of improvements in the management of novel and complex presentations. These factors were compounded by the study's small sample size, which may also limit the generalisability of the results.

Future research may be improved with longitudinal study designs involving random sampling, rather than relying upon self-selection processes. This would minimise the influence of any ceiling effect in terms of patient improvements, and ensure enough time is provided for physiotherapists to encounter novel and complex cases. Studies directly comparing workshops with multiple follow-up sessions to those incorporating a single follow-up session would also be beneficial, as previous research suggests there may be an optimal, yet currently undetermined, level of follow-up (Mansouri & Lockyer, 2007).

CONCLUSION

No significant differences were identified between a traditional CPD workshop with a single follow-up session and a traditional workshop with no opportunity for follow-up in terms of practitioner confidence, management approach, or patient outcomes after three treatment sessions. The results of the present study therefore indicate that a single follow-up session

to a traditional workshop is insufficient to significantly influence practice behaviours or patient outcomes.

Table 1: Participant demographics and NDI change scores before the educational interventions

	Control group	Intervention group	χ^2 p value	t-test p value
GENDER	5 M: 6 F	5M: 7 F	$\chi^2 = 0.034$, p = 0.86	-
	Mean (SD)	Mean (SD)		
AGE (years)	41.91 (11.62)	41.25 (13.47)		0.64
EXPERIENCE (years)	18.00 (12.51)	18.08 (13.55)		0.84
Mean (SD) scores for change in NDI between 1st and 4th presentations pre educational intervention	7.07 (2.66)	7.17 (3.79)		0.33

Key: SD = Standard deviation, M = Male, F = Female, NDI = Neck Disability Index

Table 2: Mean Likert scores and ANCOVA results for confidence with assessment and management techniques pre and post-educational interventions

	PRE		POST			Sig
Assessment	**Control**	**Intervention**	**Control**	**Intervention**	**Mean Dif (95% CI)***	**p**
Static spinal and scapular postural analysis	2.91 (0.30)	2.58 (0.67)	3.80 (0.42)	3.25 (0.62)	0.28 (-0.16 to 0.71)	0.20
Dynamic spinal and scapular postural analysis	2.73 (0.47)	2.25 (0.75)	3.30 (0.68)	3.08 (0.79)	0.18 (-0.54 to 0.91)	0.61
Clinical reasoning in establishing the role of spinal and scapular posture in a patient's neck pain syndrome	2.73 (0.65)	2.08 (0.67)	3.40 (0.52)	3.18 (0.60)	-0.02 (-0.52 to 0.48)	0.93
Analysis and differentiation of impairments in cervical range of motion	2.36 (0.67)	2.17 (0.72)	3.30 (0.68)	3.00 (0.74)	0.24 (-0.40 to 0.87)	0.45
Test of the cervical flexors (i.e. analysis of cranio-cervical flexion test)	1.73 (0.79)	1.50 (0.52)	3.20 (0.63)	3.25 (0.62)	-0.12 (-0.69 to 0.46)	0.68
Test of the cranio-cervical and cervical extensor muscles	1.64 (0.51)	1.25 (0.45)	3.20 (0.79)	3.08 (0.67)	-0.08 (-0.74 to 0.59)	0.82
Tests of the axio-scapular muscles – muscle tests	1.91 (0.54)	1.75 (0.87)	3.20 (0.63)	2.83 (0.72)	0.32 (-0.27 to 0.90)	0.28
Tests of the axio-scapular muscles – functional tests	1.90 (0.57)	1.42 (0.67)	3.00 (0.47)	2.67 (0.65)	0.17 (-0.39 to 0.73)	0.53
Test of cervical sensorimotor function						
Cervical joint position error	1.55 (0.69)	1.58 (0.79)	3.10 (0.74)	3.00 (0.85)	0.28 (-0.38 to 0.94)	0.39
Dynamic standing balance	1.82 (0.60)	1.92 (0.90)	3.20 (0.63)	3.50 (0.52)	0.10 (-0.61 to 0.80)	0.78
Eye movement control	1.55 (0.69)	1.58 (1.00)	3.10 (0.74)	3.17 (0.84)	-0.29 (-0.82 to 0.24)	0.26
Gaze stability	1.45 (0.69)	1.50 (1.00)	3.10 (0.74)	3.08	-0.07 (-0.75 to 0.60)	0.83
Clinical reasoning						
Clinical reasoning in establishing the degree of contribution of muscle impairments to the patient's neck pain disorder	1.91 (0.65)	1.67 (0.77)	3.00 (0.67)	2.67 (0.65)	0.02 (-0.67 to 0.71)	0.96
Clinical reasoning in decisions whether or not to test for cervical sensorimotor function	1.73 (0.65)	1.36 (0.51)	2.80 (0.79)	3.08 (0.79)	-0.62 (-1.23 to 0.02)	0.06
Prescription of a motor relearning exercise program for the cervical muscle system	2.00 (0.63)	1.75 (0.62)	3.00 (0.67)	3.08 (0.79)	-0.12 (-0.67 to 0.42)	0.65
Prescription of a motor relearning exercise program for the axio-scapular region	2.45 (0.52)	1.92 (0.67)	3.00 (0.67)	2.92 (0.52)	-0.18 (-0.67 to 0.31)	0.46
Prescription of an exercise program to retrain cervical sensorimotor function	1.64 (0.51)	1.42 (0.52)	2.70 (0.82)	2.67 (0.65)	-0.05 (-0.70 to 0.60)	0.87
Prescription of exercise dosage	2.18 (0.60)	1.92 (0.67)	2.90 (0.74)	3.00 (0.43)	-0.10 (-0.65 to 0.44)	0.70
Progression of exercises						
Progression of exercise for the cervical muscle system	1.91 (0.54)	1.50 (0.80)	3.10 (0.74)	2.75 (0.45)	0.21 (-0.31 to 0.72)	0.42
Progression of exercise for the axioscapular region	2.55 (0.52)	1.73 (0.91)	3.00 (0.82)	2.75 (0.45)	0.12 (-0.57 to 0.80)	0.73
Progression of exercise for cervical sensorimotor function	1.45 (0.52)	1.17 (0.39)	2.80 (0.79)	2.33 (0.49)	0.34 (-0.23 to 0.91)	0.22
Prescription of a post discharge maintenance program	2.00 (0.63)	1.50 (0.80)	2.80 (0.79)	2.83 (0.39)	-0.03 (-0.60 to 0.55)	0.93

*Adjusted for baseline differences.

Table 3: Mean Likert scores and ANCOVA results for use of management strategies for neck pain patients' pre and post educational interventions.

	PRE		Post			Sig
	Control	**Intervention**	**Control**	**Intervention**	**Mean Dif (95% CI)***	**p**
Manual Therapy	3.10 (0.57)	3.25 (0.62)	3.11 (0.78)	3.25 (0.62)	-0.18 (-0.74 to 0.39)	0.52
Cervical Manipulation	1.20 (0.42)	1.25 (0.45)	1.30 (0.68)	1.08 (0.29)	0.27 (-0.07 to 0.61)	0.12
Ergonomic advice/change in work habits	3.00 (0.67)	3.33 (0.65)	3.40 (0.52)	3.50 (0.80)	-0.01 (-0.62 to 0.59)	0.97
Worksite visit	1.10 (0.32)	1.25 (0.45)	1.20 (0.42)	1.33 (0.49)	-0.03 (-0.43 to 0.37)	0.87
Neural tissue management	1.90 (0.32)	2.00 (0.43)	2.00 (0.01)	2.17 (0.39)	-0.17 (-0.40 to 0.07)	0.16
Postural re-education	3.70 (0.68)	3.50 (0.80)	3.70 (0.48)	3.83 (0.39)	-0.23 (-0.55 to 0.10)	0.16
Active mobilising exercise	3.50 (0.53)	3.17 (1.03)	3.10 (0.57)	2.83 (0.84)	0.06 (-0.55 to 0.67)	0.84
Home exercise program	3.80 (0.42)	3.58 (0.67)	3.80 (0.42)	3.67 (0.49)	0.02 (-0.36 to 0.40)	0.89
Motor relearning for the cervical extensors	2.30 (0.95)	1.83 (0.72)	2.60 (0.52)	2.42 (0.67)	0.31 (-0.27 to 0.90)	0.28
Motor relearning for the cervical flexors	2.30 (1.06)	1.92 (0.79)	3.10 (0.57)	2.75 (0.62)	0.53 (-0.02 to 1.07)	0.06
Motor relearning for axio-scapular muscles	2.30 (0.68)	2.17 (0.94)	2.90 (0.32)	2.58 (0.52)	0.27 (-0.12 to 0.65)	0.16
Exercises for sensorimotor function						
Cervical kinaesthetic sense	1.50 (0.53)	1.17 (0.39)	1.70 (0.48)	1.67 (0.49)	$-2.38e^{-16}$ (-0.44 to 0.44)	1.00
Balance exercises	1.60 (0.52)	1.50 (0.91)	1.70 (0.48)	2.00 (0.95)	-0.25 (-0.88 to 0.37)	0.41
Eye movement exercises	1.30 (0.48)	1.17 (0.39)	1.70 (0.48)	1.50 (0.52)	0.25 (-0.221 to 0.72)	0.28
Functional retraining exercises	2.20 (0.79)	2.08 (1.00)	2.50 (0.85)	2.36 (0.51)	0.19 (-0.49 to 0.87)	0.56
Strengthening exercises for cervical muscles	2.30 (0.48)	2.08 (0.52)	2.70 (0.82)	2.58 (0.79)	-0.14 (-0.82 to 0.53)	0.67
Strengthening exercises for axio-scapular muscles	2.50 (0.53)	2.25 (0.62)	2.60 (0.70)	2.42 (0.67)	0.05 (-0.62 to 0.71)	0.89
Heat	1.50 (0.71)	1.75 (0.62)	1.30 (0.48)	1.75 (0.87)	-0.29 (-0.86 to 0.28)	0.30
Ultrasound	1.44 (0.53)	1.58 (0.52)	1.40 (0.52)	1.64 (0.81)	-0.22 (-0.70 to 0.26)	0.35
Electrical stimulation	1.00 (0.01)	1.00 (0.01)	1.10 (0.32)	1.00 (0.01)	0.13 (-0.10 to 0.35)	0.25
Acupuncture/dry needling	1.78 (0.67)	1.75 (0.75)	1.80 (0.63)	1.50 (0.52)	0.06 (-0.28 to 0.39)	0.73

*Adjusted for baseline differences.

Table 4: NDI scores (scored out of 50) before and after the educational interventions

	PRE EDUCATIONAL INTERVENTION				POST EDUCTIONAL INTERVENTION			
	Patients	NDI scores first visit	NDI scores fourth visit	Mean change in NDI scores	Patients	NDI scores first visit	NDI scores fourth visit	Mean change in NDI scores
	n	Mean (SD)	Mean (SD)	Mean (SD)	n	Mean (SD)	Mean (SD)	Mean (SD)
CONTROL	86	15.43 (8.10)	7.88 (6.88)	7.07 (2.66)	53	10.64 (8.66)	4.82 (5.76)	7.46 (2.91)
INTERVENTION	72	15.31 (8.32)	8.32 (6.93)	7.17 (3.79)	62	13.64 (9.61)	6.73 (7.09)	7.16 (3.16)

CAPTIONS TO ILLUSTRATION

Figure 1: Participant flow through study

REFERENCES

AHPRA (2011). *Registration standards.* Australian Health Practitioner Regulation Agency. Retrieved March 2, 2015, from http://www.physiotherapyboard.gov.au/Registration-Standards.aspx

Altman, D., & Bland, J. (2009). Parametric v non-parametric methods for data analysis. *BMJ, 338*(apr02 1), a3167-a3167. doi:10.1136/bmj.a3167

Asthana, S., & Halliday, J. (2004). What can rural agencies do to address the additional costs of rural services? A typology of rural service innovation. *Health Soc Care Comm*, *12*(6), 457-465. doi:10.1111/j.1365-2524.2004.00518.x

Beer M., Eisenstat R., Spector B. (1990). *The critical path to corporate renewal.* Boston: Harvard Business School Press.

Bekkering G., van Tulder M., Hendriks E., Koopmanschap M., Knol D., Bouter L., Oostendorp R. (2005). Implementation of clinical guidelines on physical therapy for patients with low back pain: Randomized trial comparing patient outcomes after a standard and active implementation strategy. *Phys Ther*, 85(6), 544-55.

Brennan, G., Fritz, J., & Hunter, S. (2006). Impact of continuing education Intervention on clinical outcomes of patients with neck pain who received physical therapy. *Phys Ther*, *86*(9), 1251-1262. doi:10.2522/ptj.20050382

Chipchase, L., Johnston, V., & Long, P. (2012). Continuing professional development: The missing link. *Manual Ther*, *17*(1), 89-91. doi:10.1016/j.math.2011.09.004

Cleland, J., Fritz, J., Brennan, G., & Magel, J. (2009). Does continuing education improve physical therapists' effectiveness in treating neck pain? A randomized clinical trial. *Phys Ther*, *89*(1), 38-47. doi:10.2522/ptj.20080033

Davis, D., Davis M., Jadad A., Perrier L., Rath D., Ryan D., Sibbald G., Straus S., et al. (2003).

The case for knowledge translation: Shortening the journey from evidence to effect. *BMJ*, *327*(7405), 33-35. doi:10.1136/bmj.327.7405.33

Davis, D., & Galbraith R. (2009). Continuing medical education effect on practice performance. *Chest*, *135*(3_suppl), 42S. doi:10.1378/chest.08-2517

Davis, D., Prescott, J., Fordis, C., Greenberg, S., Dewey, C., & Brigham, T. et al. (2011). Rethinking CME: An imperative for academic medicine and faculty development. *Acad Med*, *86*(4), 468-473. doi:10.1097/acm.0b013e31820dfacf

Fleet, L., Kirby, F., Cutler, S., Dunikowski, L., Nasmith, L., & Shaughnessy, R. (2008). Continuing professional development and social accountability: A review of the literature. *J Interprofessional Care*, *22*(s1), 15-29. doi:10.1080/13561820802028360

Forsetlund, L., Bjørndal, A., Rashidian, A., Jamtvedt, G., O'Brien, M., Wolf, F., et al. (2009). Continuing education meetings and workshops: Effects on professional practice and health care outcomes. *Cochrane Database Syst Rev,* April 15(2): CD003030. doi:10.1002/14651858.CD003030.pub2.

French, H., & Dowds, J. (2008). An overview of continuing professional development in physiotherapy. *Physiotherapy*, *94*(3), 190-197. doi:10.1016/j.physio.2007.09.004

Grant, T., & Niere, K. (2000). Techniques used by manipulative physiotherapists in the management of headaches. *Aust J Physiother*, *46*(3), 215-222. doi:10.1016/s0004-9514(14)60330-5

Grol, R., & Grimshaw, J. (2003). From best evidence to best practice: Effective implementation of change in patients' care. *The Lancet*, *362*(9391), 1225-1230. doi:10.1016/s0140-6736(03)14546-1

Gunn, H., & Goding, L. (2009). Continuing professional development of physiotherapists based in community primary care trusts: A qualitative study investigating perceptions,

experiences and outcomes. *Physiotherapy*, *95*(3), 209-214. doi:10.1016/j.physio.2007.09.003

Hurley, L., Yardley, K., Gross, A., Hendry, L., & McLaughlin, L. (2002). A survey to examine attitudes and patterns of practice of physiotherapists who perform cervical spine manipulation. *Manual Ther*, *7*(1), 10-18. doi:10.1054/math.2001.0430

Jones, C.A., Roop, S.C., Phar, S.L., Albrecht, L., & Scott, S.D. (2015). Translating knowledge in rehabilitation: Systematic review. *Phys Ther, 95*(4), 663-677. doi:10.2522/ptj.20130512.

Jull, G., Sterling, M., Kenardy, J., & Beller, E. (2007). Does the presence of sensory hypersensitivity influence outcomes of physical rehabilitation for chronic whiplash? A preliminary RCT. *Pain*, *129*(1), 28-34. doi:10.1016/j.pain.2006.09.030

Jull, G., Trott, P., Potter, H., Zito, G., Niere, K., & Shirley, D., et al. (2002). A randomized controlled trial of exercise and manipulative therapy for cervicogenic headache. *Spine*, *27*(17), 1835-1843. doi:10.1097/00007632-200209010-00004

Lewis, M. (1998). Lifelong learning: Why professionals must have the desire for an capacity to continue learning throughout life. *Top Health Info Manag,* 28(2), 62-6.

Mansouri, M., & Lockyer, J. (2007). A meta-analysis of continuing medical education effectiveness. *J Contin Educ Health*, *27*(1), 6-15. doi:10.1002/chp.88

Mazmanian, P., Davis D., & Galbraith R. (2009). Continuing medical education effect on clinical outcomes. *Chest*, *135*(3_suppl), 49S. doi:10.1378/chest.08-2518

Menon, A., Korner-Bitensky, N., Kastner, M., McKibbon, K., & Straus, S. (2009). Strategies for rehabilitation professionals to move evidence-based knowledge into practice: A systematic review. *J Rehabil Med*, *41*(13), 1024-1032. doi:10.2340/16501977-0451

O'Brien, M., Rogers, S., Jamtvedt, G., Oxman, A., Odgaard-Jensen, J., Kristoffersen, D., et al. Educational outreach visits: Effects on professional practice and health care outcomes.

(2002). *J Contin Educ Health*, *22*(2), 121-122. doi:10.1002/chp.1340220208

PBA (2011). *Guidelines for Continuing Professional Development*. Retrieved 4 March, from www.physiotherapyboard.gov.au

Pool, J., Ostelo, R., Hoving, J., Bouter, L., & de Vet, H. (2007). Minimal clinically important change of the neck disability index and the numerical rating scale for patients with neck pain. *Spine*, *32*(26), 3047-3051. doi:10.1097/brs.0b013e31815cf75b

Rebbeck, T., Maher, C., & Refshauge, K. (2006). Evaluating two implementation strategies for whiplash guidelines in physiotherapy: A cluster-randomised trial. *Aust J Physiother*, *52*(3), 165-174. doi:10.1016/s0004-9514(06)70025-3

Schulz, K., Altman, D., & Moher, D. (2010). CONSORT 2010 statement. *Obstet Gynecol*, *115*(5), 1063-1070. doi:10.1097/aog.0b013e3181d9d421

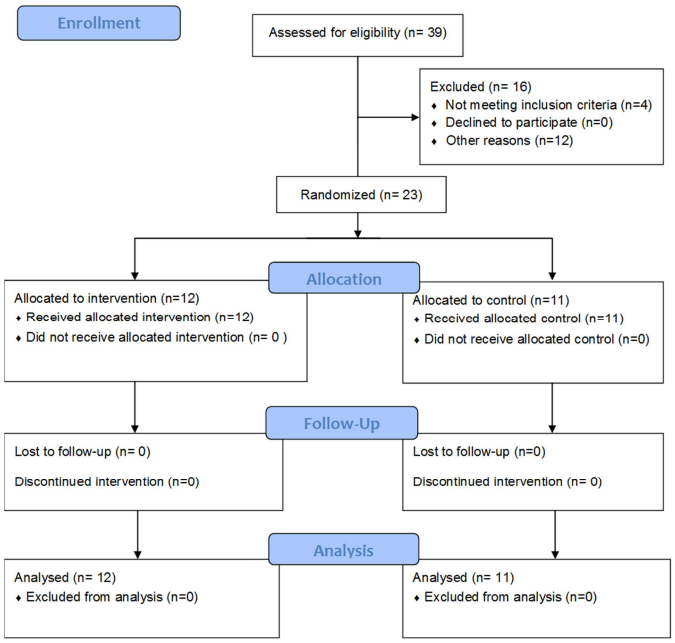
Scott, S., Albrecht, L., O'Leary, K., Ball, G., Hartling, L., & Hofmeyer, A. et al. (2012). Systematic review of knowledge translation strategies in the allied health professions. *Implement Sci*, *7*(1), 70. http://dx.doi.org/10.1186/1748-5908-7-70

Van Breukelen, G. (2006). ANCOVA versus change from baseline had more power in randomized studies and more bias in nonrandomized studies. *J Clin Epidemiol*, *59*(9), 920-925. http://dx.doi.org/10.1016/j.jclinepi.2006.02.007

Vernon, H. (2008). The psychometric properties of the neck disability index. *Arch Phys Med Rehab*, *89*(7), 1414-1415. doi:10.1016/j.apmr.2008.05.003

Woollett, S. (1990). *Counting the rural cost*: The case for a rural premium. London: National Council for Voluntary Organisations.

Young, B., Walker, M., Strunce, J., Boyles, R., Whitman, J., & Childs, J. (2009). Responsiveness of the Neck Disability Index in patients with mechanical neck disorders. *Spine J*, *9*(10), 802-808. doi:10.1016/j.spinee.2009.06.002



Highlights

- A CPD workshop with follow-up resulted in no change to practice and confidence.
- No differences in patient outcomes were found with the addition of a follow-up.
- Further research is needed to evaluate outcomes following CPD.