

## 1. Introduction

Neck and back pain together now represent the leading cause of disability in all high income countries, and globally for the 25–64 year age group [1]. Chronic [neck pain](#) is regarded as often complex in origin and nature and particularly difficult to manage [2]. Furthermore, the challenge of chronic neck pain is likely to grow due to increasing computer and mobile technology use, with recognised consequences such as 'text neck' [3–5].

One approach to the solution of this growing problem that warrants investigation, is to explore ways of encouraging better self-efficacy and self-care. In this research, self-efficacy is defined as confidence in one's ability to execute a behaviour to produce a desired outcome [6,7]. We define self-care broadly as a certain positive attitude and form of attention towards the self, in respect of any necessary function that is under individual conscious control and is self-initiated [8,9]. Greater self-efficacy and self-care could enable individuals to recognise and reduce some of the underlying causes of [musculoskeletal pain](#), such as mal-coordinated postural and movement habits, excessive muscular tension, and associated psychological distress [3,10–12]. [The Alexander Technique](#) is an effective long established but often under-utilised way of bringing about such constructive self-change. It is an embodied reflective practice that enables individuals to improve the way they go about their daily activities, through increased awareness, intentional inhibition of unwanted reaction and unnecessary action, and with more effective direction of thought; all leading to improved overall muscle tone and postural support with less stiffness [13–16]. The Technique is usually taught in one-to-one lessons, using integrated spoken and hands-on guidance [17,18]. Such lessons have led to diverse health and performance-related benefits [19,20]. Training in the Alexander Technique has been shown to increase dynamic postural muscle tone [21], and improve movement coordination and balance [22–24]. These movement and balance changes are thought to result from the altered postural tone [25]. Research studies, often using qualitative methods, have reported improvements in psychological well-being, mood and confidence, as well as reduction in performance-related anxiety following one-to-one Alexander lessons [20,26–28].

The ATLAS (Alexander Technique Lessons or [Acupuncture](#)Sessions) trial is the second large randomised controlled study to evaluate the

effectiveness of Alexander lessons in a chronic musculoskeletal pain population. The earlier ATEAM trial demonstrated that, compared with usual care alone, one-to-one Alexander lessons led to significant long-term reduction in chronic or recurrent back pain and associated disability, [18]. ATLAS compared usual care alone with either Alexander lessons or acupuncture (both plus usual care) for primary [care patients](#) with chronic (median 6 years) non-specific neck pain [16,29]. The ATLAS trial [clinical findings](#) have already been reported, with the primary outcome of the Northwick Park Neck Pain Questionnaire demonstrating statistically significant and clinically meaningful reductions in pain and associated disability for both Alexander lessons and for acupuncture sessions compared with usual care alone, with the benefit maintained to at least 12 months [16]. The trial design encompassed a range of additional participant-reported outcomes that were pre-specified in the protocol, mostly relating to self-efficacy and the ability to improve self-care [29]. In addition to the outcome data collected from participants, data were also collected from the practitioners regarding delivery of Alexander lessons and acupuncture. Findings for the acupuncture group have been published separately [16,30]. Here we report the results for the self-efficacy and other self-care-related outcomes in the Alexander group.

The main aims of the current analysis are: to evaluate the extent of change in self-efficacy and self-care ability during and following a series of one-to-one lessons in the Alexander Technique; to compare the extent of any such changes with those in the group receiving usual care alone; and to identify any relationships between such changes and the long-term clinical outcome already reported in this chronic neck pain population. The ATLAS trial was not designed for direct comparison of Alexander lessons and acupuncture; however, based on descriptive analyses, we report similarities and differences between the outcomes for the two interventions [30], as a means of gaining insight into their distinctive natures. An additional objective is to report on the content of the Alexander lessons delivered in the trial.

## 2. Methods

The design and methodology for the ATLAS trial (Current Controlled Trials, ISRCTN15186354) have been described in full elsewhere and are briefly summarised here [16,29].

## 2.1. Study design and participants

ATLAS (Alexander Technique Lessons or [Acupuncture](#) Sessions) was a pragmatic, [three-arm](#) randomised controlled trial that recruited people who had consulted their primary care practitioner (GP) for chronic, non-specific [neck pain](#). GP surgery databases were searched for potential participants who were invited to complete a baseline questionnaire, screened later for eligibility. Inclusion criteria were: age  $\geq 18$  years, neck pain duration  $\geq 3$  months, and a Northwick Park neck pain and associated disability Questionnaire (NPQ) score of  $\geq 28\%$  [[31,32](#)]. Exclusion criteria included serious underlying pathology. Eligible participants were randomised in a 1:1:1 ratio to Alexander lessons plus usual care, acupuncture plus usual care, or usual care alone. In total, 517 patients were recruited and randomised between March 2012 and April 2013.

Written informed consent was obtained from all participants and ethical approval from Leeds West Research Ethics Committee (REC ref 11/YH/0402).

## 2.2. Alexander Technique teachers

All participating Alexander teachers were members of the Society of Teachers of the [Alexander Technique](#) (STAT) with at least 3 years' teaching experience and a declared commitment to their continuing professional development. Teaching methods involved verbal and hands-on guidance in line with usual practice and UK-based National Occupational Standards Skills-for-Health guidelines [[33](#)].

## 2.3. Interventions

Participants randomised to the Alexander group were offered a total of 20 one-to-one lessons, each 30-minutes' duration (600 minutes total) plus continued usual medical care. Lessons were typically weekly, with the option of being twice-weekly initially and later fortnightly, with the intention of completion within 5 months. Participants randomised to the acupuncture group were offered an equivalent intervention duration of traditional Chinese acupuncture plus continued usual medical care. All participants received usual care which consisted of treatment routinely provided to primary [care patients](#) (both general and neck pain-specific), such as prescribed medications and visits to other healthcare professionals, for example [physiotherapists](#).

#### 2.4. Participant-reported outcomes

The primary outcome measure for the trial was the Northwick Park Neck Pain and associated Disability Questionnaire (NPQ), and these findings, together with secondary clinical outcome measures, have been reported elsewhere [16]. Additional outcome measures were included in the participant questionnaires that were completed at baseline, 6 and 12 months. Self-efficacy was determined by the five-question pain management sub-scale of the Chronic Pain Self-Efficacy Scale. In line with previous studies, we used the validated modified version in which the original 0–10 scale is replaced with 0–8 and ‘certain’ replaced with ‘confident’ [6,7,34]. The questions in this scale, scored 0 (totally unconfident) to 8 (totally confident), were ‘How confident are you that you can: i) decrease your pain quite a bit?; ii) continue most of your daily activities?; iii) keep pain from interfering with your sleep?; iv) make a small-to-moderate reduction in your pain by using methods other than taking extra medications?; v) make a large reduction in your pain by using methods other than taking extra medications?’. The four-item version of the [Perceived Stress Scale](#) was also used, and asked the following questions, scored 0 (never) to 4 (very often): ‘In the last month, how often have you i) felt that you were unable to control the important things in your life?; ii) felt confident about your ability to handle your personal problems?; iii) felt that things were going your way?; iv) felt difficulties were piling up so high that you could not overcome them?’ [35,36]. Other questions included in the participant questionnaire at 6 and 12 months were: 1. ‘Can you use/apply the things you have learned from the care in everyday life situations to reduce pain?’, a question modified from one that was used to assess self-management in a previous neck pain trial (‘reduce’ replacing ‘cope with’) [37]; 2. ‘During the care you received in the last 6/12 months, did you learn to improve the way you live and care for yourself?; 3. ‘To what extent are you able to put into practice the advice or teaching you received?; 4. ‘To what extent are the changes you have been making helpful to you?; 5. ‘Did you make any changes related to a) diet, b) exercise, c) relaxation, d) rest, e) work’?

#### 2.5. Practitioner-reported data

Following each lesson, the Alexander teachers recorded lesson content in a participant-specific log book that listed the basic components of lessons in terms of Alexander principles to explore, and practical activities that

might be engaged in to help people discover how to apply the principles and improve their skill and understanding. Teachers recorded additional information in the log book when the participant had finished attending lessons.

## 2.6. Statistical analyses

Participants were analysed in the groups to which they were randomised, regardless of intervention adherence. Analyses were conducted in Stata version 13 (StataCorp. 2013. *Stata Statistical Software: Release 13*. College Station, TX: StataCorp LP). All analyses of participant-reported data were pre-specified in the published protocol [29] (the trial was registered prior to patient recruitment beginning), and in a statistical analysis plan (which was finalised prior to data analysis). Analyses of data from the teacher log books were pre-specified prior to data lock. Assumptions were checked for all analyses and no transformations or adjustments were required.

Descriptive data were reported as means and standard deviations, or median, minimum and maximum for continuous variables, and counts and percentages for categorical variables.

Ability to make improvements in living/self-care and any changes in diet, exercise, relaxation, rest and work at 6 and 12 months were analysed individually by logistic regression. Self-efficacy, Perceived stress, ability to use what has been learnt, extent to which advice or teaching were put into practice, and extent to which changes were helpful—all at 6 and 12 months, were analysed individually by linear regression. To explore the impact of participant-reported variables measured during the intervention period and changes in NPQ outcomes at 6 and 12 months, either linear or logistic regression was utilised. NPQ outcomes were analysed individually at each time point and included the participant-reported variables (or changes in these variables from baseline) as fixed effect covariates in the model.

Analyses were undertaken to explore if baseline factors might predict outcome independent of any intervention effect, with the baseline factor of interest included individually as a covariate in a linear regression model using NPQ score at 12 months as the outcome and adjusting for the same covariates as in the primary analysis [16]. Other analyses explored whether intervention effects varied among the levels of these baseline factors by

extending this model to also include an interaction term between the potential moderator and intervention in the regression model. Estimates (including [odds ratios](#) for binary data) and 95% confidence intervals were presented (where appropriate) for each model.

All regression models adjusted for baseline NPQ, age, neck pain duration, gender and city as fixed effects and GP practice as a random effect using robust standard errors (Stata *regress* command with *cluster* option).

The teacher log book data were analysed using linear regression. These analyses were within-group only, since different data were collected for the Alexander lesson and usual care alone groups.

### 3. Results

#### 3.1. Baseline characteristics

The baseline characteristics of the 344 participants were similar across the [Alexander Technique](#) lesson and usual care alone groups ([Table 1](#)). The study population included more women than men (69% versus 31%, respectively), was predominantly white (89%), with mean age of 54 years (SD 14), and a mean age of leaving full-time education of 18 years. More than half of participants (61%) were currently in paid employment, although 8% had reduced their hours and 7% had stopped working altogether because of their [neck pain](#) ([Table 1](#)).

Table 1. Baseline demographics.

	<b>Alexander Technique lessons (N = 172)</b>	<b>Usual care alone (N = 172)</b>	<b>Overall (N = 344)</b>
<b>Mean age, years (SD)</b>	53.62 (14.59)	53.85 (12.95)	53.74 (13.77)
<b>Gender: Female, n (%)</b>	120 (69.8)	118 (68.6)	238 (69.2)
<b>Ethnicity, n (%)</b>			
<b>White-British</b>	151 (89.4)	152 (88.9)	303 (89.1)
<b>Indian</b>	4 (2.4)	3 (1.8)	7 (2.1)
<b>Bangladeshi</b>	0 (0.0)	0 (0.0)	0 (0.0)
<b>Pakistani</b>	4 (2.4)	2 (1.2)	6 (1.8)
<b>Chinese</b>	1 (0.6)	1 (0.6)	2 (0.6)
<b>Afro-Caribbean</b>	1 (0.6)	0 (0.0)	1 (0.3)
<b>Other</b>	8 (4.7)	13 (7.6)	21 (6.2)

	Alexander Technique lessons (N = 172)	Usual care alone (N = 172)	Overall (N = 344)
<b>Mean age left full-time education, years (SD)</b>	18.20 (6.13)	18.58 (5.98)	18.39 (6.05)
<b>Outcome measures at baseline, mean (SD)</b>			
<b>NPQ % score</b>	39.38 (11.91)	40.46 (11.60)	39.92 (11.75)
<b>SF-12 Physical Component score</b>	39.87 (9.75)	40.98 (9.49)	40.42 (9.62)
<b>SF-12 Mental Component score</b>	45.63 (12.22)	46.59 (10.87)	46.11 (11.56)
<b>Perceived Stress Scale score</b>	6.46 (2.96)	6.15 (3.36)	6.31 (3.17)
<b>Chronic Pain Self-efficacy Scale</b>	4.18 (1.53)	4.17 (1.54)	4.17 (1.53)
<b>Employment status, n (%)</b>			
<b>Currently in paid employment</b>	100 (59.2)	106 (62.0)	206 (60.6)
<b>Reduced hours due to neck pain</b>	11 (9.1)	8 (6.5)	19 (7.8)
<b>Stopped working due to neck pain</b>	10 (6.2)	12 (7.4)	22 (6.8)

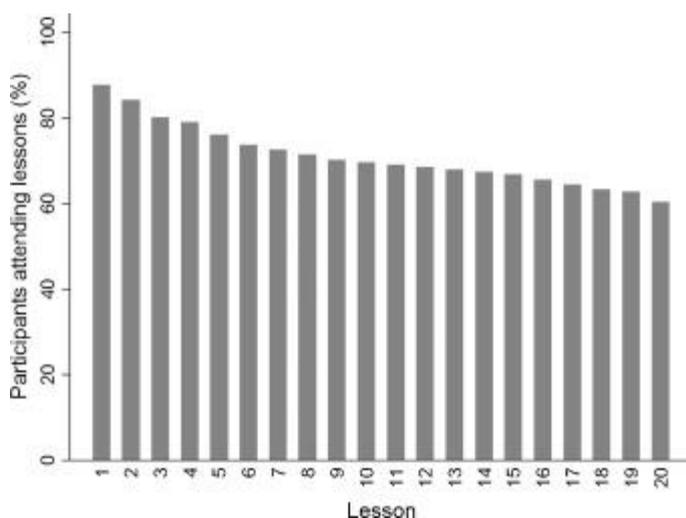
SD: standard deviation; NPQ: Northwick Park [Neck Pain](#) Questionnaire score; SF-12: short-form quality of life survey (6- and 12-month outcomes for SF-12 have been reported previously [16]; There were 3 missing responses for ethnicity in the Alexander group and 1 for the usual care group; 8 missing responses for age left full-time education in each group; 3 missing responses in each group for the SF-12; 1 missing response on the [Perceived Stress Scale](#) and Pain Self-Efficacy Scale in the Alexander group; 3 missing responses for in paid employment in the Alexander group and 1 in the usual care group; 51 missing responses for reduction in hours in the Alexander group and 48 in the usual care group; 11 missing responses for stopping work due to neck pain in the Alexander group and 10 in the usual care group.

### 3.2. Intervention delivery and adherence

There was a wide range in the number of participants (1–21 participants, median: 8) taught by each of the 18 Alexander Technique teachers; 137 (40%) participants were located in Leeds, 123 (36%) in York, 47 (14%) in Manchester and 37 (11%) in Sheffield.

The majority of participants in the Alexander Technique group (60%, 104/172) attended all 20 of the lessons offered. The remaining 40% attended a mean of 5.4 lessons (SD 6.3; range: 0 to 19), including 12%

(21/172) who did not attend any. Overall, the mean number of lessons attended was 14.2 (SD 8.2; range 0 to 20). Dropout from the Alexander lesson group was most frequent in the period prior to and during the first few lessons; thereafter dropout was low and more evenly spread ([Fig. 1](#)). Where fewer than 20 lessons were attended (n = 68), discontinuation was initiated by: the participant (22%), by the teacher (13%), due to loss of contact (15%), due to crisis (6%), for other reasons (15%), or due to lessons never having begun (30%).



1. [Download high-res image \(104KB\)](#)
2. [Download full-size image](#)

Fig. 1. Intervention adherence: Percentage of participants attending [Alexander Technique](#) lessons over the 20 lessons offered.

Adapted with permission from MacPherson, H. et al. Alexander Technique lessons or acupuncture sessions for persons with chronic neck pain: A randomized trial. *Annals of Internal Medicine* 2015;163:653-662 (Appendix). Doi:[10.7326/M15-0667](https://doi.org/10.7326/M15-0667). ©American College of Physicians.

### 3.3. Participant-reported outcomes

Nine of the eleven outcomes differed significantly between the Alexander lesson and usual care alone groups at 6 months, and this difference was maintained at 12 months for eight of the outcomes ([Table 2](#)). Self-efficacy was significantly greater for the Alexander lesson group than for usual care at both 6 and 12 months. Furthermore, at both time-points, the Alexander group reported significantly greater ability to apply what had been learnt in the Alexander lessons to reduce pain in their daily lives, than was reported by the usual care group based on their experience of care received ([Table](#)

2). For the perceived stress score there was little difference between the Alexander and usual care groups at either 6 or 12 months.

Table 2. Participant-reported self-efficacy and self-care-related outcomes following [Alexander Technique](#) lessons compared with usual care alone at 6 and 12 months.

Outcome	6 months				12 months			
	Alexander Technique lessons Mean (SD; N)	Usual care alone Mean (SD; N)	Difference from usual care alone (95% CI)	p-value	Alexander Technique lessons Mean (SD; N)	Usual care alone Mean (SD; N)	Difference from usual care alone (95% CI)	p-value
<b>Chronic Pain Self-efficacy Scale [scored 0: 'totally unconfident' to 8: 'totally confident'; higher scores indicate greater self efficacy]</b>	5.05 (1.69; 134)	3.92 (1.52; 139)	1.09 (0.63 to 1.55)	<0.001	5.01 (1.78; 137)	4.14 (1.68; 139)	0.81 (0.37 to 1.24)	0.001
<b>Perceived Stress Scale [0 to 16; lower scores indicate less stress]</b>	5.54 (3.27; 136)	5.67 (3.23; 144)	-0.02 (-0.84 to 0.80)	0.97	5.63 (3.32; 139)	5.84 (3.48; 140)	-0.12 (-0.79 to 0.54)	0.70
<b>'Can you use/apply things you learned from the care in everyday life situations, to reduce pain?' [0: 'never' to 4: 'everyday']</b>	2.72 (1.10; 130)	1.45 (1.11; 125)	1.30 (0.94 to 1.66)	<0.001	2.59 (1.13; 140)	1.48 (1.09; 128)	1.11 (0.83 to 1.38)	<0.001
<b>'To what extent are you able to put into practice the advice or teaching you received?' [0: 'not at all' to 10: 'completely']</b>	6.59 (2.41; 116)	4.28 (3.20; 43)	2.20 (0.91 to 3.50)	0.002	6.21 (2.64; 126)	5.16 (3.26; 44)	1.01 (-0.20 to 2.21)	0.10