

The self-reported aggravating activities of people with chronic non-specific low back pain do not involve consistent directions of spinal movement: an observational study

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Question: Do the self-reported aggravating activities of people with chronic non-specific low back pain move the spine in a consistent direction? **Design:** Cross-sectional observational study. **Participants:** 240 people with chronic non-specific low back pain. **Outcome measure:** The self-reported aggravating activities from the Patient Specific Functional Scale were classified as flexion, extension or unilateral according to the direction of lumbar spine movement. Participants were described as demonstrating a directional pattern if all three self-reported aggravating activities moved the spine in the same direction. **Results:** Of the 148 participants with three classifiable aggravating activities, 47 (32%) demonstrated a directional pattern with 46 (98%) demonstrating a flexion pattern and 1 (2%) an extension pattern. The observed incidence of a directional pattern in the three self-reported aggravating activities of the 148 participants (32%) was no different from what would have been expected by chance. There were no clinical or demographic differences between those who demonstrated a directional pattern and those who did not. **Conclusion:** There is no evidence for the existence of a consistent direction of spinal movement during the self-reported aggravating activities of people with chronic non-specific low back pain. [Wand BM, Hunter R, O'Connell NE, Marston L, McAuley J (2009) The self-reported aggravating activities of people with chronic non-specific low back pain do not involve consistent directions of spinal movement: an observational study. *Australian Journal of Physiotherapy* 55: 47–51]

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Introduction

Chronic non-specific low back pain is a common and costly health condition (Kent and Keating 2005). Consequently, there has been considerable research to develop and evaluate effective intervention for people with this condition. Numerous systematic reviews have synthesised the available evidence for most common interventions (Assendelft et al 2004, Clarke et al 2007, French et al 2006, Furlan et al 2005, Guzmán et al 2002, Hayden et al 2005), and these reviews suggest that current approaches do not provide a substantial, long-term answer to the problem. Clinicians have questioned these results as they feel the findings are at odds with their clinical experience. In trying to explain this perceived discrepancy between clinical trials and clinical practice, it is commonly proposed that people with chronic non-specific back pain are a heterogeneous group that contains distinct sub-groups, with the symptoms of each sub-group being caused by different mechanisms (Dankaerts et al 2006b, Delitto 2005, McCarthy et al 2004). It has been suggested that in many clinical trials, the effect of intervention is 'washed out' by the application of a single technique to a heterogeneous group with diverse needs (McCarthy and Cairns 2005). Therefore, research findings that do not account for sub-grouping may deliver a diluted effect (McCarthy et al 2004).

There is significant data demonstrating improved outcomes when patients with *acute* low back pain are sub-grouped (Brennan et al 2006, Childs et al 2004, Fritz et al 2003), and work continues to refine the definition of the sub-

groups (Fritz et al 2007, Hicks et al 2005, Hancock et al 2008). The value of sub-grouping is less clear in the *chronic* population and there is need for further research in this area. Three widely-used approaches to sub-grouping chronic low back pain patients are described by McKenzie (McKenzie and May 2003), O'Sullivan (O'Sullivan 2004), and Sahrman (Sahrman 2002). Inherent in these approaches is the grouping of patients based on the direction of painful movement of the spine. Although there are differences in the details of each approach and in the explanatory models offered to justify the proposed groups, they all seek to establish directional patterns of aggravating and easing activities (ie, whether the activities that either aggravate or ease the pain move the spine in the same direction, eg, flexion or extension) and these patterns subsequently inform patient management. Recent research has suggested these approaches may be reliable (Dankaerts et al 2006b, Kilpikoski et al 2002, van Dillen et al 1998) and in some ways valid (Clare et al 2007, Dankaerts et al 2006a, Hefford 2008, O'Sullivan et al 2006, van Dillen et al 2003). In addition, case studies have suggested promising results when these approaches are used in intervention for people with chronic low back pain (Dankaerts et al 2007, Harris-Hayes et al 2005, van Dillen et al 2005). However, there remains a lack of high-quality evidence confirming that sub-grouping people with chronic low back pain in this way significantly improves outcomes (Clare et al 2004, Machado et al 2006).

Two issues in the process of determining a directional pattern that have not been considered are confirmatory bias and

illusory correlation. Confirmatory bias refers to the tendency to look for and attend to evidence that fits pre-existing expectations and to ignore contradictory information (Klein 2005). Illusory correlation refers to the tendency to perceive a coincidental (or non-existent) relationship as causal (Klein 2005). Thus it is most important to control for the possibility that, when patients are describing the activities that aggravate their pain, directional patterns may emerge simply by chance. One method of reducing the influence of confirmatory bias is to ask patients to directly report their aggravating activities, rather than for the therapists to determine aggravating activities from an assessment process that may be influenced by preconceived ideas. The influence of illusory bias can be minimised by using statistical procedures that control for chance findings.

Proponents of sub-grouping suggest that analysis of self-reported aggravating activities is an important part of determining a directional pattern (Sahrmann 2002, O'Sullivan 2004, May and Donelson 2008). One reasonable assumption is that for an individual patient, the most aggravating activities should all move the spine in a similar way. To test this assumption, we aimed to determine, in a manner that minimised confirmatory bias and accounted for chance, whether a directional pattern existed in the self-reported aggravating activities of people with chronic non-specific low back pain. The specific research question was:

Do the self-reported aggravating activities of chronic non-specific low back pain patients move the spine in a consistent direction?

If directional bias is an important feature of chronic low back pain, we hypothesise that presence of a directional pattern in self-reported aggravating activities should be greater than chance.

Method

Design

A cross-sectional, observational study was undertaken. The data were collected at baseline as part of a randomised trial investigating the effect of physiotherapy intervention for chronic non-specific low back pain (Ferreira et al 2007). The Patient Specific Functional Scale was completed by 240 participants; they were required to report three activities that had aggravated their back pain on that day, and to rate the degree of difficulty they had performing each activity from '0' (unable to perform) to '10' (able to perform at pre-injury level) (Westaway et al 1998). Then, two authors independently reduced 716 self-reported aggravating activities to unique activities. Discrepancies were resolved by consensus, so that 104 unique activities resulted.

The 104 activities were classified as flexion, extension, or unilateral (side flexion or rotation) based on the direction of lumbar spine movement that occurred with the performance of the activity. To minimise confirmatory bias, the activities were arranged randomly to ensure that, when classifying an activity, the investigator was blinded to the other aggravating activities for a particular participant. To classify each activity we first used the suggestions made by the proponents of sub-grouping (McKenzie and May 2003, O'Sullivan 2004, Sahrmann 2002) which allowed us to classify approximately 20% of the activities. We classified the remaining 80% of activities ourselves. As well as flexion, extension, or unilateral, activities were classified as undecided and unclassifiable (eg, 'coping day to day' or

Table 1. Number (%) of participants reporting the four most common aggravating activities for each directional movement of the lumbar spine.

Direction of movement	Most common aggravating activities	Participants n = 179
Flexion	Vacuuming	79 (11)
	Gardening	59 (8)
	Bending forward	54 (8)
	Lifting	45 (7)
Extension	Walking	79 (11)
	Standing	30 (4)
	Ascending stairs	14 (2)
	Hanging out washing	10 (1)
Unilateral	Turning over in bed	2 (< 1)
	Twisting	1 (< 1)
	Turning	1 (< 1)
	Rotating	1 (< 1)
Unclassifiable	Housework	14 (2)
	Cleaning	9 (1)
	Sleeping	7 (1)
	Getting out of bed	5 (1)

'socialising'). We then validated our classification using the views of clinicians currently making decisions about the directional pattern of aggravating activities in people with chronic non-specific low back pain. A similar process has been used by van Dillen et al (2006) to validate the classification of self-reported leisure activities. In the first round, the results of our classification of the activities were sent to five postgraduate-qualified musculoskeletal physiotherapists familiar with sub-grouping by directional pattern. The clinicians were asked to indicate if they agreed with the classification and, if they disagreed, to provide an alternative classification. If at least four out of the five (80%) clinicians agreed on the classification, the activity was assigned that classification. In the second round, the activities for which there was no agreement were sent to the same physiotherapists who were told that they were the activities for which no consensus was achieved and were asked to repeat the previous classification process. Again, if four of the five clinicians agreed on the classification, the activity was assigned to that classification. Activities that failed to obtain 80% agreement at the end of the second round were placed under the heading unclassifiable. Participants who reported less than three classifiable activities were excluded from the analysis, and a directional pattern was determined for the remainder of participants.

Participants

The original randomised trial included 240 patients from physiotherapy outpatient departments at three teaching hospitals in Sydney, Australia. Patients were included in the trial if they were aged between 18 and 80 years, had experienced non-specific low back pain for a minimum of three months, were currently experiencing symptoms, and were able to provide written informed consent. They were excluded if they presented with neurological signs, evidence of specific spinal pathology, or had undergone previous spinal surgery. Baseline demographic, anthropometric, and clinical characteristics were collected for all consenting participants.

Table 2. Characteristics of all participants, groups with a directional pattern or not, and difference between groups reported either as mean difference (95% CI) or odds ratio (95% CI).

Characteristic	All participants (n = 148)	Groups		Difference between groups
		Directional pattern (n = 47)	No directional pattern (n = 101)	Directional pattern minus no directional pattern
Demographics				
Age (yr), mean (SD)	55.4 (14.5)	55.5 (14.1)	55.4 (14.8)	MD 0.1 (-5.0 to 5.2)
Weight (kg), mean (SD)	74.6 (16.7)	73.9 (19.9)	74.9 (15.0)	MD -1.0 (-6.8 to 4.8)
Height (m), mean (SD)	164.7 (9.2)	165.8 (9.7)	164.1 (9.0)	MD 1.7 (-1.5 to 4.9)
Duration of LBP (mth), mean (SD)	105 (119)	118 (131)	99 (113)	MD 19 (-22 to 61)
Pain (0 to 10), mean (SD)	6.3 (2.0)	6.3 (2.2)	6.4 (1.9)	MD -0.11 (-0.8 to 0.6)
PSFS (0 to 30), mean (SD)	10.7 (4.2)	10.3 (4.2)	10.9 (4.2)	MD -0.6 (-2.1 to 0.9)
RMDQ (0 to 24), mean (SD)	13.6 (5.4)	13.3 (5.8)	13.7 (5.3)	MD -0.4 (-2.3 to 1.5)
Sex (female), n (%)	101 (68)	31 (66)	69 (68)	OR 1.11 (0.53 to 2.32)
Working				
Full time/full duties, n (%)	5 (3)	2 (4)	3 (3)	OR 0.69 (0.11 to 4.27)
Part time/full duties, n (%)	4 (3)	2 (4)	2 (2)	OR 0.45 (0.06 to 3.33)
Part time/part duties, n (%)	4 (3)	1 (2)	3 (3)	OR 1.41 (0.14 to 13.91)
Not working/unemployed, n (%)	116 (78)	37 (78)	79 (79)	OR 0.97 (0.42 to 2.26)
Compensation, n yes (%)	7 (5)	4 (8)	3 (3)	OR 0.33 (0.07 to 1.53)

PSFS = Patient-Specific Functional Scale, RMDQ = Roland Morris Disability Questionnaire

Measurement of directional pattern

In order to determine whether the aggravating activities demonstrated a directional pattern, participants were coded YES if all three self-reported activities moved the lumbar spine in the same direction. This could include all flexion, all extension, or all unilateral activities.

Data analysis

Descriptive statistics were used to describe the participants and the direction of movement of the spine during the aggravating activities. Odds ratios (95% CI) (categorical variables) and mean differences (95% CI) (continuous variables) between participants who did or did not demonstrate directional patterns were determined for demographic and clinical characteristics.

The probability of a directional pattern emerging by chance was tested using a chi-squared analysis. As the distribution of flexion, extension, and unilateral activities was not uniform, we calculated the exact probability for a directional pattern emerging by chance and used this as the expected value in the analysis. First we determined the proportion of flexion (67%), extension (30%), and unilateral (1%) activities for the participants with three classifiable activities. Then we calculated the probability that the self-reported activities would move the spine in the same direction during Activity

1, Activity 2, and Activity 3 by chance, based on these proportions (flexion = 0.34, extension = 0.03, unilateral = 0.00). The probability of a directional pattern occurring by chance was the addition of the three individual direction-specific probabilities (0.34 + 0.03 + 0.00 = 0.36).

A sensitivity analysis was undertaken, in which a less stringent criterion for a directional pattern was used. Participants who reported two strongly-aggravating (0, 1, or 2 on the visual analogue scale) activities that moved the spine in the same direction, and a third mildly-aggravating (8, 9, or 10 on the visual analogue scale) activity that moved the spine in a different direction were classified as demonstrating a directional pattern for this additional analysis.

Results

Participants

Of the self-reported aggravating activities of the 240 participants, 58% moved the lumbar spine into flexion, 26% into extension, 1% into a unilateral direction, and 15% of reported aggravating activities could not be classified. Table 1 lists the four most common activities for each direction. Because they reported less than three classifiable aggravating activities, 92 participants (38%) were excluded

from further analysis. This left 148 (62%) participants with three classifiable aggravating activities from which to determine a directional pattern. The characteristics of these participants are presented in Table 2.

Directional pattern of the self-reported aggravating activities

Of the 148 participants, 47 (32%) displayed a directional pattern; 46 (98%) of these demonstrated a flexion pattern, 1 (2%) an extension pattern, while no participant demonstrated a purely unilateral pattern. There were no significant differences in demographic or clinical characteristics between participants who displayed a directional pattern and those who did not (Table 2).

The observed incidence of a directional pattern in the three self-reported aggravating activities (32%) of the 148 participants was no different from what would have been expected by chance (36%) ($p = 0.33$). The additional sensitivity analysis returned only one extra participant. Again, the observed incidence of a directional pattern in two of the three self-reported aggravating activities (33%) of the 148 participants was no different from what would have been expected by chance (36%) ($p = 0.42$).

Discussion

The aim of this cross-sectional, observational study was to investigate whether the self-reported aggravating activities of people with chronic non-specific low back pain demonstrate a directional pattern. Using a large data set sampled from a well-defined population, we provide evidence that approximately 32% demonstrate such a pattern. However, this is no different from what would be expected by chance. This suggests that a directional pattern of aggravating activities might not be an important feature of chronic non-specific low back pain. The additional sensitivity analysis reached the same conclusion, further strengthening our findings.

We also failed to find any relationship between demographic, anthropometric, or clinical characteristics and the presence of a directional pattern. The failure to find any systematic difference between those patients who do and do not demonstrate a directional pattern supports the idea that the appearance of a directional pattern may be the result of chance rather than representing the existence of an important clinical entity.

By using expert clinicians, we have attempted to ensure that the system of classifying aggravating activities according to the direction of lumbar spine movement reflects clinical practice. The potential influence of confirmatory bias was reduced by using the self-reported aggravating activities of the participants and ensuring that when classifying the direction of movement, the investigators were blind to the other aggravating activities of that participant. We have also controlled for chance with the statistical procedures used.

In interpreting these findings, consideration must be given to the limitations of the study. Sub-grouping approaches that seek to establish a directional pattern employ a process of questioning complemented by clinical testing to classify patients, a procedure which we obviously did not replicate. The sensitivity analysis we undertook attempted to capture some of this procedure; however, the results of this additional analysis were the same as the primary analysis. The inclusion of additional clinical testing may change the

results presented here. However, proponents of directional sub-grouping emphasise that self-reported aggravating activities are an important part of determining a directional pattern (May and Donelson 2008).

In addition, this study was undertaken on a chronic sample with a mean duration of back pain for almost nine years. It is possible that the self-reported aggravating activities of a more acute population may demonstrate a directional pattern, though the duration of back pain was not significantly different between those who did or did not demonstrate a directional pattern (mean difference 19 mth, 95% CI -22 to 61). Finally, the direction of movement assigned to each activity is open to different interpretations. We believe, however, that the approach used in this study was the most satisfactory available way of solving this issue.

A reasonable assumption of directional sub-grouping is that patients should demonstrate a directional pattern in their aggravating movements. We were unable to confirm this assumption. While this finding does not invalidate these approaches, it does suggest clinicians and researchers may need to account for the influence of bias and chance when considering the presence of directional patterns in people with chronic non-specific low back pain. ■

Ethics: The original randomised controlled trial was approved by the ethics committees of the University of Sydney and the South Western and Western Sydney area Health Services. Participants provided signed informed consent on entry into this study. Ethical approval for the secondary analysis was obtained from the University of Notre Dame Human Research Ethics Committee.

Competing interests: None declared.

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