Subjects and Self-Report Measures

- **SUBJECTS:** A convenience sample was recruited from the local San Diego community; 9 subjects (6 male, 3 female; 23-50 yrs; BMI 20.3-29.6 kg/m²), including 6 people with CLBP and 3 without CLBP (Table 1).
- **SELF REPORT MEASURES:** Information on subjects’ demographics, LBP history, and medical history was collected. The Rolands-Morris was used to measure functional limitation and disability associated with LBP (Table 1).

<table>
<thead>
<tr>
<th>TABLE 1: Subject Characteristics</th>
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<tbody>
<tr>
<td>LBP or CON/Subject #</td>
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<td>-----------------------</td>
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<tr>
<td>LBP1</td>
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<td>LBP2</td>
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<td>CON1</td>
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<td>CON3</td>
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**Abbreviations:** LBP, Low Back Pain; CON, Control; BMI, Body Mass Index; RMDQ, Roland Morris Disability Questionnaire

Background

- Low back pain (LBP) is a problem that affects up to 80% of the population.
- Impairments of lumbar spine posture and movement, when sustained and repeated, may lead to excessive tissue stress and LBP.
- Associations between posture, movement and LBP have been previously identified using clinic- and laboratory-based measures.
- Clinical and laboratory data may not reflect posture and movement patterns across the day or in real-life environments.
- Limited evidence exists on posture and movement behavior in an ecological setting.
- **PURPOSE:** To use a case series design to describe posture and movement behavior across the day in people with and without chronic low back pain (CLBP).
- **CLINICAL RELEVANCE:** These data will provide a basis for directing individualized posture and movement retuning interventions for people with CLBP.

Posture and Movement Measures

**CLINICAL ASSESSMENT (CA):**
- Subjects were guided through a series of postures and movements in the lab and were asked whether each movement increased, decreased, or did not affect pain.
- Postures in standing included usual standing posture, and maximum range of motion (ROM) in forward flexion, extension, and left/right lateral flexion.
- Postures in sitting included anterior/posterior pelvic tilt, maximum left/right rotation, and usual, slouched, and upright postures.

**ECOLOGICAL MONITORING (EM):**
- Posture and movement behaviors during each WD and WE session were analyzed using ViMove software to approximate number of standing minutes.
- Maximum range of motion into flexion, extension and left/right lateral flexion.
- Frequency and duration of movement into flexion, extension and left/right lateral flexion.
- *Short-term events* were defined as less than 30 seconds spent in flexion, and less than 15 seconds in extension or left/right lateral flexion.
- *Sustained events* were defined as greater than 30 seconds spent in flexion, and greater than 15 seconds in extension or left/right lateral flexion.
- Time spent in sitting, standing, horizontal or dynamic positions; and longest period of uninterrupted time in standing.
- Percentage of total sitting time spent in usual, slouched and upright postures.

Analysis

- Data from CA and EM sessions were evaluated to identify posture and movement patterns.
- Differences between CA and EM sessions, between WD and WE sessions, and between subjects with and without CLBP were evaluated.

Results

- **Portable Motion Sensor Measures**
  - Lumbar spine posture and movement was recorded on one weekday (WD) and one weekend (WE) day. Each day consisted of a clinical assessment (CA) followed immediately by an ecological monitoring (EM) session during which subjects conducted typical daily activities while wearing the sensors for 8 hours.
  - Two portable motion sensors (ViMove, DorsaVi Inc.) were attached to each subject’s back, on the pelvis at the level of the PSIS and at L1, using adhesive applicators (Figure 1a).
  - Subjects carried a wireless handheld device that recorded data from the sensors (Figure 1b).

- **3 subjects (33%)** performed at least 5° more maximal ROM during EM than during the CA in at least one direction (Figures 2, 3 - highlighted).
- **5 subjects (56%)** displayed asymmetries of 5° in lateral flexion during EM but not during the CA (Figure 3 - denoted by *).
- All subjects displayed at least a 2:1 ratio of movement frequency favoring one direction of lateral flexion during EM (Figure 4).
- Subjects varied in movement patterns between WD and WE sessions.
- Sustained periods of lateral flexion and/or extension were evident in 92% of EM sessions in subjects with LBP vs. 17% of EM sessions in controls (Figure 5).
- Subjects with LBP who experienced pain with specific movements during the CA differed in whether they avoided (Figure 6a) or favored (Figure 6b) that same movement during EM.

**REFERENCES:**