Assessment of activities of daily living with an ambulatory monitoring system: a comparative study in patients with chronic low back pain and nonsymptomatic controls

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Objective: The aim of this study was twofold: (1) to investigate whether differences in activities of daily living exist between patients with chronic low back pain (CLBP) and nonsymptomatic controls; (2) to investigate the day-to-day variability in daily activities.

Design: Physical activities were measured over a 24-hour period with an ambulant monitoring system.

Setting: Measurements were carried out in the subject’s own environment.

Subjects: Forty-seven CLBP patients and 10 nonsymptomatic controls participated in this study.

Results: On group level, CLBP patients show a lower activity pattern compared with controls, especially during the evening. This is reflected in a lower walking step frequency during the day and evening, more lying time during the day and a lower physical activity level, less standing time and more lying time during the evening. The day to day variability in activity pattern is high and similar for both the patient and control group.

Conclusion: The lower activity level especially found during the evening might indicate that patients need all their capacity to perform the tasks imposed during the day and as a consequence have less capacity left for their leisure time, in general the evening. This suggests the existence of an imbalance between the patient’s physical capacity and the imposed environmental load. The large but similar day to day variability in activity pattern, which does not support the clinical findings of ‘bad days’ in CLBP patients, suggests the need for repeated measures.
Introduction

Chronic low back pain (CLBP) is a medical, social and economic problem in Western industrialized countries. Lifetime prevalence of back pain exceeds 70% and the annual incidence has been reported to be 5%. In over 90% of these acute cases the complaints disappear within a couple of weeks, but in about 10% chronic or recurrent back problems develop. CLBP is responsible for very high costs in health care and in society. Most of these costs are indirect costs, related to disability, work absenteeism, insurance and social benefits.

Despite the magnitude of the problem, little is known about the causes of CLBP and the effectiveness of diagnostic and therapeutic interventions. The literature indicates that a substantial number of CLBP patients develop a deconditioning syndrome. Fear of pain and ignorance of how to deal with the back problem lead to carefulness, avoidance of movement and inactivity. As a consequence, their condition gets worse, which results in tiredness and pain during activities. This will increase their fear of movement and leads to the development of depressive characteristics. CLBP patients thus end up in a vicious cycle, characterized by a decrease in activity and an increase in psychological complaints.

In general, the treatment of CLBP aims to break through this cycle and therefore to achieve a normalization of activities of daily living. In order to evaluate the functional outcome of treatment it is necessary to quantify these activities.

In the last few decades many different types of instruments have been developed and used to measure activities of daily living. Some of these, like observational techniques, have practical shortcomings because they are time-consuming and difficult to interpret. In addition, many interfere with the subject’s performance. Other types of instruments, such as self-assessment scales, questionnaires and diaries, have problems concerning objectivity.

Ambulatory monitoring techniques may offer new possibilities because they are potentially objective, not labour-intensive and can be used in a natural setting. Within the Eureka project ‘Dynaport’ (EU1058) an ambulatory home monitoring system has been developed. This monitor utilizes three accelerometers to obtain information about the orientation and movement patterns of the trunk and the left upper leg. These data are analysed and categorized into static (standing, sitting or lying) and dynamic activities (walking or bicycling). As such the monitor provides information about a subject’s activities of daily living. Previous studies have shown, by comparing the activities classified by the monitor with a video-tape, that the monitor provides valid measurements of activities of daily living. The reliability in the sense of day-to-day variability in activity pattern assessed with the monitor has not been investigated so far.

In the present study it will be investigated whether differences in activities of daily living exist between CLBP patients and nonsymptomatic controls, using the Dynaport ADL Monitor. Based on the deconditioning syndrome, it is hypothesized that patients have a lower physical activity than controls. In addition, the day-to-day variability in activity pattern will be assessed. This to investigate whether one measurement gives a representative estimate of the activity level.

Methods

Subjects

Patients with CLBP on a waiting list for multidisciplinary treatment, mainly emphasizing physical aspects, in the rehabilitation centre ‘Het Roessingh’ in the Netherlands and ‘Klinik Münsterland’, Germany were selected. The inclusion criteria for patients were (1) age between 20 and 55 years, (2) low back pain for at least six months and (3) no structural pathology. Patients with disorders related to CLBP complaints, such as lumbar radicular syndrome, infections (e.g. tuberculosis, spondylodiscitis), malignity (e.g. metastasis, Kahler disease), spondylolisthesis (grade 2 or more) and diseases of the bowels with referred pain (e.g. pancreatitis, pyelitis), were excluded. However, patients with minor disorders, such as degenerative changes (maximal grade 2) or morbus Scheuermann, were not excluded.

All patients completed a Quebec Back Pain
Disability Scale, to get insight in the functional disability level of the patients with chronic back pain participating in this present study.\textsuperscript{14}

Healthy subjects with (1) age between 20 and 55 and (2) no CLBP during the last six months were used as a control group. Controls were selected in such a way that sex, age and work situation were equal in the patient and control group. All subjects signed a written informed consent prior to participation.

**Dynaport ADL Monitor**

The Dynaport ADL Monitor was used to assess activities of daily living. Figure 1 shows the monitor and how it is worn around the waist and the upper left leg. The monitor provides information about static and dynamic activities of the body using three accelerometers: one on the left leg and two on the trunk. Each accelerometer measures acceleration, including gravity, in the direction of its own axes. The monitor records the acceleration values with a frequency of 32 Hz.

During static activities like standing, sitting or lying, each accelerometer has a rather constant value, which is proportional to the accelerometer’s axes vector relative to gravity’s vector. Combination of the output of the three accelerometers is used to distinguish between the different static activities. For example, Figure 2 shows the orientation of the three accelerometers with corresponding values during two different static activities.

Dynamic activities like walking or bicycling have a pattern, which is repeated during a certain period of time. The shape, time and frequency characteristics of these patterns are used to distinguish between the different dynamic activities.\textsuperscript{11} Each static and dynamic activity is expressed in several parameters, e.g. the relative time spent in sitting, the intensity of trunk movements during locomotion and walking step frequency,\textsuperscript{12} which are described in more detail in the data analysis section.

**Measurements**

Measurements with the Dynaport ADL Monitor were performed in the subject’s own environment. The measurements in patients took
place prior to treatment in the rehabilitation centre.

To investigate the differences in daily activities between CLBP patients and nonsymptomatic controls, subjects were measured for 24 hours.

To assess the day-to-day variability of the 24-hour measurements, 10 controls and 7 patients were measured for five consecutive days and nights (Monday till Saturday). Only weekdays were included because weekends were considered to be more variable. In addition to the 24-hour measurements, each subject completed a checklist. In this it was asked whether the day of measurement was different from other days with respect to their activity pattern and if yes, what was the difference. The checklist also provided information about factors that influence the activity pattern, like the use of alcohol and drugs and the performance of unusual activities.

Days with strong deviations in activity pattern for 2 or more hours with respect to ordinary days were excluded from the data analysis.

**Data analysis**

The 24-hour measurements of the Dynaport ADL Monitor were analysed in steps of 60 minutes. For each hour the following parameters were assessed:

- relative time parameters
- walking step frequency
- physical activity level.

The relative time parameters represent the percentage time spent in lying ($T_{Li}$), sitting ($T_{Si}$), standing ($T_{St}$) or locomotion ($T_{Lo}$) each hour. These four parameters were used to investigate the hypothesis that CLBP patients have a lower level of physical activity than nonsymptomatic controls.

The walking step frequency (WS) is obtained from the frequency characteristics of walking and represents the average number of steps per minute for each hour. It was used to quantify fear of movement, which plays a relevant role in the process of the deconditioning syndrome.

The physical activity level (PAL) represents an overall level of activity by combining several parameters: the static or dynamic activity, intensity of trunk movements and walking step frequency. PAL can vary between zero (inactive) and six (highly active) and is mainly determined by the performed activity: lying scores zero, sitting scores one, standing scores two and locomotion three to six, depending on the walking step frequency and the intensity of trunk movements. The latter parameter also influences the score during static activities. For each hour the average PAL is assessed.

To visualize the mean activity pattern over 24 hours, line graphs were made showing the average parameter value for each hour in both groups.

Three day-parts were discerned in the analysis of the 24 hours: night, day and evening. In order to avoid transient effects at the start or end of different day parts (e.g. the time a subject goes to bed), specific hours were excluded from analysis. The following time periods were used for the three day parts:

- night from 2.00 till 5.00
- day from 9.00 till 16.00
- evening from 18.00 till 22.00.

**Statistics**

Statistics were performed using SPSS 8.0 for Windows. All statistics were carried out for the three different day parts, separately. A significance level of $\alpha = 0.05$ was used. Differences between controls and CLBP patients were analysed by Student’s $t$-tests. When the data were not distributed normally, Mann–Whitney $U$-tests were carried out. The within-subject standard
deviation (SDₜ) over five consecutive 24-hour period measurements was used as index of day-to-day variability. The SDₜ can be derived from a one-way analysis of variance. The reliability analysis in SPSS calculates the within-subject variance. The square root of this variance represents the SDₜ. The SDₜ was expressed as a percentage of the mean value over five consecutive days, i.e. the coefficient of variation (CV). In the present study the CV was calculated for each subject and all individual CVs were subsequently averaged into a mean coefficient of variation (CVₘ).

**Results**

Forty-seven CLBP patients (27 male and 20 female) and 10 nonsymptomatic controls (4 male and 6 female) participated in this study. The mean age was 36.6 years (SD = 9.0) and 29.2 years (SD = 4.3) for patients and controls, respectively. The mean Quebec Back Pain Disability score of the patients was 38.1 (SD = 14.7).

**Differences in activities of daily living**

To assess differences between CLBP patients and nonsymptomatic controls, the 24-hour measurements of 38 patients and 10 controls over 24 hours were used. According to the checklist, measurements of 9 patients were excluded because their activity pattern deviated for 2 or more hours with respect to an ordinary day: 3 patients performed shiftwork, 4 patients performed unusual activities (e.g. wallpapering, visit to a beauty salon) and 2 patients had a day off.

The line graphs presented in Figure 3, show the mean parameter value of patients and controls during the total 24-hour measurement.

Figure 3a shows the relative time spent in locomotion (TₜLo). Note the higher values of TₜLo in patients compared with controls for the first hours of the day. After 12.00 TₜLo in patients decreases almost continuously. In controls three peaks are observed, probably reflecting the transfers from home to work and vice versa (8.00–9.00 and 17.00–18.00 respectively) and the lunch break (12.00–13.00). During the evening a decrease is shown in controls as well.

Figure 3b shows the relative time spent in standing (TₜSt). During the day no obvious differences are visible between both groups. From the beginning of the evening the TₜSt in patients shows a continuous decrease. The TₜSt values for controls increase at first during the evening and then show a steep decrease. In other words, controls spend more time in standing during the evening than patients.

Figure 3c shows the relative time spent in sitting (TₜSi). Note the higher values of TₜSi in controls compared with patients for almost all hours during the day. This indicates that controls spend more time in sitting during the day. During the evening the TₜSi decreases in controls and is comparable to the TₜSi in patients.

Figure 3d shows the relative time spent in lying (TₜLy). During the night and the first hours of the day, no differences are shown between both groups. Note that patients show an increase in TₜLy during the day and evening, starting at 12.00 hours. Controls show an increase much later, starting at 21.00 hours. So, during the day and evening patients spend more time in lying than controls.

Figure 4 shows the walking step frequency (WS) for the period from 7.00 till 24.00. Because WS is not relevant during the night, these hours are excluded. The figure shows that WS is lower for patients than for controls, indicating that patients walk slower than controls. After an increase in the first hours, patients show a continuous decrease of the WS, indicating that they walk slower as time goes on. This trend is also visible in controls, although less obvious.

Mean parameter values and results of Student’s t-tests and Mann–Whitney U-tests are presented in Tables 1, 2 and 3 for the night, day and evening, respectively. The three tables show high standard deviations for almost all parameters, reflecting a large variability between subjects. As expected, the postures or activities, that in general do not occur in the particular day part (e.g. relative time spent in locomotion during the night) show relatively high standard deviations.

During the night (Table 1) no significant differences in activity parameters are shown between groups.

During the day (Table 2) patients show a significantly higher mean value for TₜLy and a significantly lower mean value for WS. In other words,
Figure 3: Relative time spent in locomotion (a), standing (b), sitting (c), and lying (d) in CLBP patients and nonsymptomatic controls. Every hour represents the mean value over the previous 60 minutes. Interrupted lines indicate day parts: night (from 2.00 to 5.00), day (from 9.00 to 16.00), and evening (from 18.00 to 22.00).
Figure 4  Walking step frequency in CLBP patients and nonsymptomatic controls. Every hour represents the mean value over the previous 60 minutes. Interrupted lines indicate day parts: day (from 9.00 to 16.00) and evening (from 18.00 to 22.00). WS, walking step frequency.

Table 1  Mean, standard deviation and number of CLBP patients and nonsymptomatic controls during the night

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CLBP patients</th>
<th>Nonsymptomatic controls</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>N</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>T Lo</td>
<td>0.21 (0.59)</td>
<td>35</td>
<td>0.13 (0.41)</td>
</tr>
<tr>
<td>T St</td>
<td>1.06 (2.93)</td>
<td>35</td>
<td>0.43 (1.35)</td>
</tr>
<tr>
<td>T Si</td>
<td>2.06 (6.43)</td>
<td>35</td>
<td>0.41 (1.17)</td>
</tr>
<tr>
<td>T Ly</td>
<td>96.47 (9.88)</td>
<td>35</td>
<td>99.02 (2.96)</td>
</tr>
<tr>
<td>PAL</td>
<td>0.05 (0.14)</td>
<td>35</td>
<td>0.02 (0.05)</td>
</tr>
</tbody>
</table>

CLBP, chronic low back pain; SD, standard deviation; N, number of subjects. T, relative time (%); Lo, locomotion; St, standing; Si, sitting; Ly, lying; PAL, physical activity level.

Table 2  Mean, standard deviation and number of CLBP patients and nonsymptomatic controls during the day

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CLBP patients</th>
<th>Nonsymptomatic controls</th>
<th>Statistics</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>N</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>T Lo</td>
<td>11.43 (4.67)</td>
<td>38</td>
<td>9.72 (4.69)</td>
</tr>
<tr>
<td>T St</td>
<td>30.19 (14.74)</td>
<td>38</td>
<td>29.26 (14.58)</td>
</tr>
<tr>
<td>T Si</td>
<td>47.72 (17.08)</td>
<td>38</td>
<td>58.59 (18.54)</td>
</tr>
<tr>
<td>T Ly</td>
<td>8.97 (10.36)</td>
<td>38</td>
<td>1.40 (1.96)</td>
</tr>
<tr>
<td>WS</td>
<td>82.15 (6.79)</td>
<td>38</td>
<td>89.71 (5.45)</td>
</tr>
<tr>
<td>PAL</td>
<td>1.40 (0.26)</td>
<td>38</td>
<td>1.29 (0.20)</td>
</tr>
</tbody>
</table>

CLBP, chronic low back pain; SD, standard deviation; N, number of subjects. T, relative time (%); Lo, locomotion; St, standing; Si, sitting; Ly, lying; PAL, physical activity level; WS, walking step frequency (steps/minute).

*Significant p-value (α < 0.05).
Assessment of ADL with an ambulatory monitoring system

To get an insight in the day-to-day variability, the 24-hour measurements over five consecutive days of 10 nonsymptomatic controls and six CLBP patients were used. One patient was excluded because his work as an international truck-chauffeur made his daily activity pattern extremely variable.

The mean coefficients of variation (CV\textsubscript{m}), used as index for day-to-day variability, but also the mean parameter values and the SD\textsubscript{w} are presented in Table 4. Only parameters that are representative for the activity pattern in a particular day part have been included: T\textsubscript{Ly} and PAL during the evening (Table 3), a significantly lower WS is found in patients, again indicating that patients walk slower than controls. In addition, patients show a significantly higher mean value for T\textsubscript{Ly} and a significantly lower mean value for T\textsubscript{si} and PAL. In other words the overall physical activity is lower in patients; they spend more time in lying and less time in standing compared with controls.

### Table 3

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CLBP patients</th>
<th>Nonsymptomatic controls</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD) N</td>
<td>Mean (SD) N</td>
<td>t-value</td>
</tr>
<tr>
<td>T\textsubscript{Lo}</td>
<td>7.04 (6.60) 38</td>
<td>6.61 (4.23) 10</td>
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</tr>
<tr>
<td>T\textsubscript{St}</td>
<td>21.39 (18.26) 38</td>
<td>40.49 (23.52) 10</td>
<td>2.34</td>
</tr>
<tr>
<td>T\textsubscript{si}</td>
<td>43.40 (21.50) 38</td>
<td>48.41 (24.93) 10</td>
<td>0.64</td>
</tr>
<tr>
<td>T\textsubscript{Ly}</td>
<td>25.52 (25.50) 38</td>
<td>2.86 (4.15) 10</td>
<td>3.48</td>
</tr>
<tr>
<td>WS</td>
<td>76.22 (6.73) 37</td>
<td>82.43 (7.94) 10</td>
<td>2.49</td>
</tr>
<tr>
<td>PAL</td>
<td>1.08 (0.45) 38</td>
<td>1.30 (0.26) 10</td>
<td>2.78</td>
</tr>
</tbody>
</table>

CLBP, chronic low back pain; SD, standard deviation; N, number of subjects. T, relative time (%); Lo, locomotion; St, standing; Si, sitting; Ly, lying; PAL, physical activity level; WS, walking step frequency (steps/minute).

*Significant p-value (α < 0.05).

### Table 4

<table>
<thead>
<tr>
<th>Day part</th>
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<th>Nonsymptomatic controls</th>
<th>Statistics</th>
</tr>
</thead>
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<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD\textsubscript{w}</td>
<td>CV\textsubscript{m} (%)</td>
</tr>
<tr>
<td>Night</td>
<td>T\textsubscript{Ly}</td>
<td>98.89</td>
<td>2.90</td>
<td>1.9</td>
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<td></td>
<td>PAL</td>
<td>0.01</td>
<td>0.02</td>
<td>54.8</td>
</tr>
<tr>
<td>Day</td>
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<td>2.16</td>
<td>24.2</td>
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<tr>
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<td>T\textsubscript{St}</td>
<td>27.76</td>
<td>5.69</td>
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<tr>
<td></td>
<td>T\textsubscript{si}</td>
<td>48.14</td>
<td>7.62</td>
<td>18.2</td>
</tr>
<tr>
<td></td>
<td>WS</td>
<td>79.35</td>
<td>4.53</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>PAL</td>
<td>1.35</td>
<td>0.15</td>
<td>9.8</td>
</tr>
<tr>
<td>Evening</td>
<td>T\textsubscript{Lo}</td>
<td>5.52</td>
<td>3.34</td>
<td>55.0</td>
</tr>
<tr>
<td></td>
<td>T\textsubscript{St}</td>
<td>16.19</td>
<td>6.23</td>
<td>64.8</td>
</tr>
<tr>
<td></td>
<td>T\textsubscript{si}</td>
<td>48.84</td>
<td>15.93</td>
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<td></td>
<td>WS</td>
<td>76.81</td>
<td>8.22</td>
<td>7.4</td>
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<td></td>
<td>PAL</td>
<td>0.98</td>
<td>0.28</td>
<td>33.0</td>
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CLBP, chronic low back pain; SD\textsubscript{w}, within-subject standard deviation; CV\textsubscript{m}, mean coefficient of variation. T, relative time (%); Lo, locomotion; St, standing; Si, sitting; Ly, lying; PAL, physical activity level; WS, walking step frequency (steps/minute).
ing the night and $T_{Lo}$, $T_{St}$, $T_{Si}$, PAL and WS during the day and evening.

Table 4 shows that the values for the $CV_m^m$ are relatively comparable in both groups. Small $CV_m^m$ values are found for WS during the day and evening, PAL during the day and $T_{Ly}$ during the night, ranging from 1.9% to 9.8%. For the other parameters relatively large values for $CV_m^m$ are found, between 15.5% and 64.9%, indicating a large variability within individual subjects for consecutive measurements and consequently a low reproducibility. This large variability is illustrated by Figure 5, showing large within-subject standard deviations of $T_{Si}$ during the evening in both groups.

During the evening the values of the $CV_m^m$ are larger than during the day. This increase is most marked for the PAL, but is also found for the parameters $T_{Lo}$, $T_{St}$ and $T_{Si}$.

**Discussion**

A number of patients with CLBP develop a deconditioning syndrome, which is characterized by a decrease in activities of daily living. In general, treatment of CLBP patients is directed towards normalizing these daily activities. The Dynaport ADL Monitor provides information about a subject’s activities of daily living, so it is a promising instrument in clinical practice with respect to back pain patients.

The aim of the present study was to investigate whether differences exist in activities of daily living between CLBP patients and nonsymptomatic controls. In addition, the day-to-day variability in activity pattern in individual subjects was assessed to investigate whether one 24-hour measurement gives a representative estimate of the activity level.

**Clinical messages**

Comparison of low back pain patients (CLBP patients) with nonsymptomatic controls shows:

- A lowered activity level in CLBP patients, especially during the evening.
- A large but similar day-to-day variability in activity pattern, which does not support the clinical findings of ‘bad days’ in CLBP patients and suggests the need for repeated measures.
Assessment of ADL with an ambulatory monitoring system

Differences in activities of daily living between patients and nonsymptomatic subjects

The results of this study show that CLBP patients have a lower level of physical activities compared with nonsymptomatic controls. This is in accordance with the characteristics of the deconditioning syndrome and corresponds with the results of multiple studies also showing lower levels of physical activity for CLBP patients as compared with healthy subjects by using questionnaires.15–17

In the present study the lower activity is especially reflected in the lower walking step frequency, more time spent in lying during the day and evening, a lower physical activity level during the evening and less time spent in standing during the evening. That differences between patients and controls are found for the evening might be a consequence of an imbalance between the capacity of patients and the capacity they need to function adequately in everyday life.18 To be able to work or to live independently from others, the two components in the model have to be in balance with each other.9,18,19

It might be possible that CLBP patients need all their physical capacity to perform the tasks imposed by work and household activities during the day. As a consequence of this, they have less capacity left to perform activities in their leisure time, in general the evening. In the present study this is reflected in a lower physical activity level, less standing time and more lying time during the evening.

The lower walking step frequency indicates that patients walk slower than controls during the day and the evening. Because of pain on the one hand and fear of movement on the other hand, patients are probably more careful and consequently move slower. This finding fits in the cognitive-behavioural model of fear of movement/(re)injury of Vlaeyen et al.,20 who also showed that patients with CLBP, who report a high degree of fear of movement, avoid motoric activities more than patients who reported a low degree of kinesiophobia.8

Results of this study also indicate that patients spend less time in sitting during the day (Figure 3c). A possible explanation given in the literature might be that low back pain commonly reduces tolerance for prolonged sitting.21,22 Patients who experience difficulties with prolonged sitting, e.g. working at a desk, might alternate this with movement. This could explain the longer time which patients spend in locomotion during the first hours of the day (Figure 3b). Another possibility might be that patients exchange sitting for lying because they need a restoration of their physical capacity. This is supported by the longer time spent in lying in patients during the day.

Day-to-day variability in activity pattern

The coefficient of variation (CV m) was used as an index for the day-to-day variability. With the exception of walking step frequency during the day and evening, physical activity level during the day and time spent in lying during the night, the results, based on only a limited sample size show relatively large values for the CV m in both CLBP patients and nonsymptomatic controls. The large values for the CV m indicate a low reproducibility of consecutive measurements within individual subjects and probably reflect the rather natural variability of activities of daily living.

The large CV m for PAL during the night can probably be explained by the rather minimal level of activity. In general the PAL will show values of zero, with the exception for nights where individuals get out of bed, e.g. to use the bathroom. This leads to a low mean value and consequently to a high value of the CV m.

During the evening the CV m values are larger than during the day. A possible explanation is that during the day the activity pattern is largely determined by fixed working and household tasks, which are probably comparable over different days. The evening is in general characterized by leisure time, in which subjects are free to choose their activities and will result in larger variability between days.

Results also show that the CV m are comparable between both groups. This indicates that the activities of daily living are not more variable in patients than in controls. These results seem not to support the phenomenon of ‘good and bad days’ in CLBP patients, which is a well-known concept in the clinical setting.

The large variability in activity pattern between consecutive days indicates that it is difficult to obtain a representative picture of the activity pattern of individual patients using only
one measurement. For this purpose repeated measures are needed. In contrast, discriminating between a group of patients of CLBP patients and nonsymptomatic controls seems possible using the Dynaport ADL Monitor. This means that the monitor can be used to identify the deconditioning syndrome at group level.

Whether the Dynaport ADL Monitor can be used for evaluation purposes needs to be further investigated. The large day-to-day variability found in the present study indicates that the difference has to be relatively large to be sure that it represents a real change in the activity pattern, i.e. larger than $\sqrt{2} \times 1.96 \times$ within-subject standard deviation. To investigate whether the changes found in clinical practice are larger than the natural variability, measurements before and after treatment should be performed.

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References