

## OBJECTIVE MEASUREMENTS OF DAILY ACTIVITY PATTERNS OF 'SPORTIVE' KNEE OSTEOARTHRITIS (KOA) PATIENTS

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Knee osteoarthritis patients suffer from a painful disease but it has yet to be determined how their activities in daily life may be affected or whether they might still be able to engage in regular sports. To that effect, we measured and analyzed the physical activity patterns in a group of 15 self-reported sports-active KOA patients with accelerometric activity monitors.

**KEYWORDS:** Knee osteoarthritis, Quality of life, Physical activity assessment, Step count, Sedentary life-style

**INTRODUCTION:** Knee osteoarthritis (KOA) is one of the most common musculoskeletal disorders especially in the elderly, causing pain and thus potentially limiting mobility and independence in daily life. However, KOA patients may differ with respect to the cause of their disease and the symptoms they present so that their level of disability varies.

In the present study we focused on those patients who still reported regular, active sports participation in spite of their disease and investigated their daily-life behavior and activity pattern over the course of one week. It was the aim of the study to objectively assess the level of activity of KOA patients in daily life with objective measurement tools.

**METHODS:** A selected sub-sample of 15 patients from a cohort of >50 KOA patients (clinically diagnosed according to the American College of Rheumatology guidelines) who participated in regular sport sessions (at least once per week) was included after providing informed consent. Patients agreed to wear two activity monitors during the waking hours of seven consecutive days. One device was an ankle-worn accelerometer ('SAM' StepWatch Activity Monitor, Orthocare Innovations, USA) that detects steps when the sensor is accelerated upward-forward and stores the number and intensity of steps in one-minute intervals. The second device was a thigh-worn accelerometer (AX3, Axivity, Newcastle, UK) with custom-developed software able to distinguish body postures and a range of daily-life activities including going up- and down-stairs, and bicycling, based on the acceleration signal from the thigh-mounted sensor. Furthermore, the device uses phases of inactivity to describe sedentary behavior in more detail. Both devices were explained and given to the patients personally and they returned them after the 7-day wear period. Results were deemed representative for an average week if at least 4 valid days, with at least 10 hours of wear time, were recorded.

**RESULTS & DISCUSSION:** We assessed 15 patients (mean age  $57.3 \pm 8.7$  yrs., BMI  $27.2 \pm 4.5$  kg/m<sup>2</sup>) who reported some kind of regular sports activities with an average of  $2.3 \pm 0.7$  times per week (range 1-3 times). The most common activities were gym training (n=8) or tennis (n=6); other activities ranged from Nordic walking, jogging to volleyball, aqua-gymnastics and climbing. Four patients were retired; the remaining 11 were still working in various occupations such as teacher, farmer, sales-person, fire-fighter, civil servant, or chemist. For the observation period, patients reported an average level of pain of  $3.3 \pm 1.5$  (range 1-5) on a visual analogue scale from 0 (no pain) to 10 (max. pain).

For the SAM step activity, an average wear time of 14 hours resulted in  $12,758 \pm 2,808$  steps per day which is clearly above the recommendation of 10,000 daily steps for an active, healthy life-style [1-3]. This threshold was surpassed by 77% of the subjects. The wide range from 8,204 to 17,216 steps indicates the diversity of the population. When looking at the activity bout durations, patients achieved  $10.1 \pm 2.9$  daily bouts with a duration >10 minutes

and  $2.0 \pm 1.0$  bouts  $>30$  minutes which can be considered as health-relevant activities. The average bout duration was  $7.8 \pm 1.4$  minutes and the longest bout averaged  $55.1 \pm 16.7$  minutes. During the active time the average cadence was  $35 \pm 6$  steps/min.

The AX3 determined a posture/activity distribution of  $62 \pm 10\%$  sitting,  $26 \pm 9\%$  standing,  $11 \pm 3\%$  walking, and  $1.1 \pm 1.4\%$  cycling while wearing the monitor during the waking hours. Patients took an average  $380 \pm 298$  steps upstairs/uphill and  $360 \pm 297$  steps downstairs/downhill. The average cadence for continuous walking bouts was  $102 \pm 6.9$  steps/min.

The limitations of the study refer to the small number of included patients and the fairly crude (self-)assessment of their sports activity level. Nevertheless, the presented data indicate that patients with knee osteoarthritis can still lead a fairly active life-style in spite of experiencing knee pain due to their arthritic conditions. Those patients who were still working apparently managed to accomplish the activities required for their job.

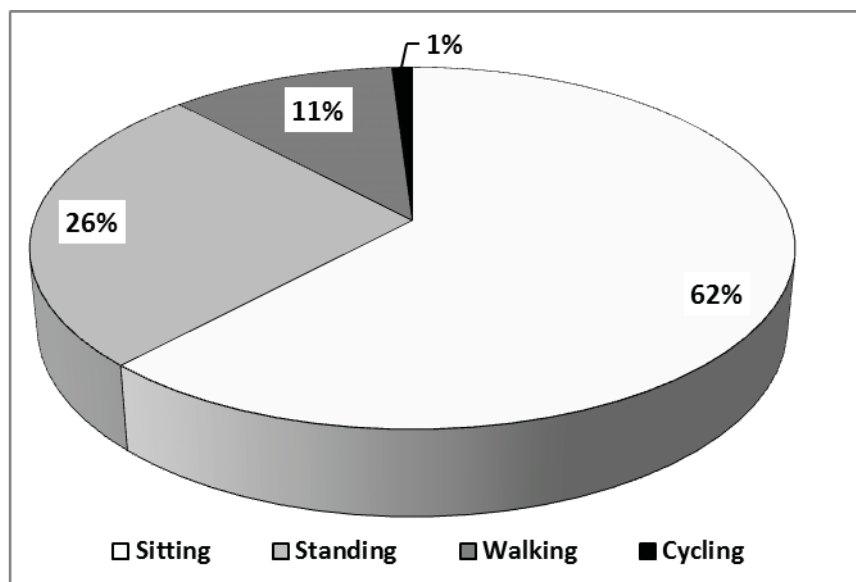
**CONCLUSION:** The present results demonstrate that knee osteoarthritis may be a painful disease affecting the patients' quality-of-life but it does not necessarily lead to an inactive or sedentary life-style. When patients consciously try to stay active, fairly normal activity levels and adherence to general health recommendations appear to be feasible in spite of the disease.

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**Fig. 1: Relative distribution of activities during the daily waking hours.**