# Five-year evolution patterns of physical activity and sedentary behavior in patients with lower-limb osteoarthritis and their sociodemographic and clinical correlates

**Running title**: Trajectories of physical activity in osteoarthritis

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**ABSTRACT**

**Objective:** The present study aimed to identify trajectories of physical activity (PA) components (frequency, duration, intensity, type) and screen-based sedentary behavior (SB) as well as baseline predictors of each trajectory in patients with hip and/or knee OA.

**Methods**: We included 878 patients with a 5-year follow-up from the KHOALA cohort. PA and SB were measured by the Modifiable Activity Questionnaire. We used group-based trajectory analysis to identify the trajectories of PA components and screen-based SB, and multivariable logistic regression to determine predictors of the identified trajectories.

**Results**: Two groups of trajectories were identified for each PA component and three for SB. High and decreasing PA duration was associated with female sex (odds ratio [OR]=0.3 [95% confidence interval [CI] 0.1-0.5]) as was low and stable than high and decreasing prevalence of weight-bearing activities (OR=0.6 [0.4-0.9]). Patients with impaired patient-reported outcome measure and obese patients often featured low versus high and decreasing prevalence of weight-bearing activities. Predictors of moderate and high versus low and slightly increasing screen-based SB trajectories were male sex, age < 60 years, single status (OR=1.5 [1.1-2.1]), obesity (OR=2.1 [1.4-3.1]), smoking (OR=2.0 [95% CI 1.1-3.7]), and less-physical jobs. Predictors of moderate and high versus low screen-based SB trajectories were all sociodemographic: male sex, age < 60 years, single status, obesity, smoking and less-physical jobs.

**Conclusion**: Sociodemographic and clinical predictors of trajectories vary between PA components: they are mainly associated with PA frequency and type. No clinical characteristics were associated with screen-based SB.

## 1. INTRODUCTION

Osteoarthritis (OA) is the most common form of arthritis, and knee and/or hip OA has been ranked as the 13$^{th}$ highest contributor to global disability in the recent Global Burden of Disease study (1,2). Being physically active and less sedentary plays a major role in reducing OA symptoms, physical function impairment and pain and can improve quality of life (3). Furthermore, regular PA is associated with decreased risk of cardiovascular mortality in this population (4). Despite these potential health benefits, several studies have shown that the recommended levels of PA are less likely to be met by adults with than without OA (5–7), and the former spend even more time in SB than the general population (8).

All the above-mentioned studies considered the average level of PA of the sample over a predefined time and so did not consider several distinct patterns that may be present within that sample or whether these behaviors change over time. However, several studies have reported the presence of various subgroups of PA trajectories in the general population (9), in specific populations such as women (10) and in certain diseases such as rheumatoid arthritis (11) or heart disease (12). Indeed, a recent systematic review including 27 longitudinal studies reported the presence of various PA subgroups in the general population, varying most commonly between three or four trajectory groups (9). Considering that the course of OA is heterogeneous, with some patients having stable or even improved disease over many years and others showing increasing pain, disability or structural damage (13), it is not surprising that PA practice and SB can vary across OA patients and over time.

However, to date, no studies have examined the presence of common trajectories of PA or SB across representative cohorts of people with OA. In this context, the aims of the present study were to identify and describe trajectories of PA components (i.e. frequency, duration, intensity and type) and screen-based SB over a 5-year follow-up period and to identify baseline predictors for each trajectory in a representative cohort of patients with symptomatic hip and/or knee OA.

## 2. MATERIALS AND METHODS

### 2.1. THE KHOALA COHORT

The Knee and Hip OsteoArthritis Longterm Assessment (KHOALA) (14) cohort is an ongoing, multiregional, population-based cohort. It included 878 patients aged 40 to 75 years old with uni- or bilateral symptomatic hip and/or knee OA (ACR criteria) and a Kellgren and Lawrence stage 2 or greater. Patients were recruited from a national prevalence survey conducted in France from April 2007 to March 2009 (15) and were followed up every year by use of a self-reporting questionnaire and by a clinical examination at baseline and at years 3 and 5. For the purpose of this study, we used data collected at inclusion and at each year of follow-up.

All patients gave their written informed consent to be in the KHOALA study. The ethics committee CPP Est III approved the cohort study (no. 07.01.01) registered at ClinicalTrials.gov (no. NCT00481338).

## 2.2. MEASURES

### 2.2.1. Outcomes

Physical activity and sedentary behavior

Patients self-reported PA and SB at inclusion and 1, 2, 3, 4 and 5 years' follow-up by using the validated French version Modifiable Activity Questionnaire (16). The questionnaire assesses leisure-time PA during the previous 12 months. Patients were asked to indicate the types of PA they had performed, the number of months, the average number of times per month and the number of minutes spent in an activity. The questionnaire also uses time spent daily for watching television and using a computer as an indicator of screen-based SB.

For each participant and each year of follow-up, frequency of PA was defined as the number of times the patient participated in the PA per week, and duration as the number of hours per week of PA declared. The intensity was expressed by a continuous variable representing the average metabolic equivalent of task (MET) of PA declared based on the 2011 Compendium of PA. The type of PA was defined in two categories: patients practicing at least one weight-bearing

(WB) activity and patients practicing only reduced–weight-bearing (RWB) activities. WB activities such as running or playing tennis are defined as force-generating exercises placing higher mechanical stress on the human skeleton than daily living. RWB activities such as swimming or horseback riding generate load below that associated with activities of daily living. These are activities during which individuals do not support their own weight (17).

### 2.2.2. Potential predictors

Two different types of predictors were examined at baseline: sociodemographic factors and clinical and patient-reported outcome measure (PROm) factors.

The sociodemographic factors included sex (female, male), age (40 to 49, 50 to 59 and ≥ 60 years), education level (primary, secondary university), marital status (in couple, single), socioprofessional category (farmer, artisan, trader; executive, intellectual profession; intermediate occupation; employee; without professional activity), smoking status (yes, no), alcoholic status (yes, no), monthly income (low, intermediate, high), geographical zone in France (north, west, south) and size of the residential area (<2000, 2000 to 49 999, ≥ 50 000 inhabitants). All the pre-mentioned variables were treated as categorical variables.

Clinical and PROm factors consisted of affected joint; body mass index [BMI] < 25 kg/m$^2$), overweight BMI 25 to 29 kg/m$^2$) or obesity (BMI >30 kg/m$^2$) based on measured height/weight; the Kellgren and Lawrence grade (grade II, III, IV); and comorbidities (Comorbidities Functional Index) (18). Patients reported the date of first symptoms (month/year), and the duration between symptom onset and inclusion was calculated accordingly. The overall level of hip or knee pain was measured on a visual analog scale (VAS) with scores ranging from 0 (no pain) to 10 (unbearable pain) by answering the following question: What is the overall level of your hip/knee pain under any circumstances in the past 48 hours. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was used to measure physical function, pain and stiffness, with scores ranging from 0 (best state) to 100 (worst state) (19). Quality of life was measured by the vitality dimension of the Medical Outcomes Study Short Form (SF-36) and by the five dimensions of the OA Knee and Hip Quality of Life (OAKHQOL) questionnaire: physical activity, mental health, pain, social functioning and social support (20,21). Scores for both instruments range from 0 (worst state) to 100 (best state). The General Health Questionnaire 28 (GHQ28) (scores from 0 (best state) to 84 (worst state) was used to assess somatic symptoms, anxiety and insomnia, social dysfunction and severe depression (22). The environmental health domain of the World Health Organization Quality of Life (WHOQOL-BREF) scale was used to assess environmental factors (23).

### 2.3. Statistical Methods

Statistical analyses involved different steps. First, patient characteristics were described with mean (SD) for quantitative variables and number (percentages) for categorical variables. Second, a semiparametric, group-based trajectory model was used to evaluate subgroups that follow similar trajectories in each PA component and screen-based SB, based on identifying heterogeneous longitudinal polynomial trajectories using the TRAJ procedure of SAS v9.4 (SAS Institute Inc., Cary, NC) (24). The optimal number of groups and degree of polynomial function in each trajectory group were determined by using the Bayesian Information Criterion: a lower Bayesian Information Criterion value indicates a better fitting model. Other criteria such as the proportion of patients in each trajectory group (>5%) and the clinical interpretability of the identified trajectories were also considered. We fitted 5 models of trajectories: PA frequency, intensity, time, and type and screen-based SB. To check robustness of the final optimized models, we used the average of the posterior probabilities of group membership for individuals assessing the fit of the models (25). Description of missing data for PA components and SB are presented in table S1. Missing data were characterized by using the SAS macro %missingPattern (26), and their mechanism was assessed by searching for evidence of monotonicity and unit nonresponse. A sensitivity analysis using patients without missing data was also performed. Third, multivariable logistic regression analysis was used to identify baseline predictors of trajectory membership for each model, estimating odds ratios (ORs) and 95% confidence intervals (CIs). Factors including sex, age, education level, marital status, socioprofessional category, smoking status, alcoholic status, monthly income, geographical zone in France, size of the residential area, affected joint, duration between onset of symptoms and inclusion, BMI, Comorbidities Functional Index; WOMAC, SF-36, VAS and OAKHQOL questionnaires were tested in bivariate analysis. Because the linearity assumption for logistic regression was violated, data for WOMAC, SF-36, VAS and OAKHQOL questionnaires were categorized into tertiles. Only factors with a significant association at $p=0.2$ in bivariate models were entered into multivariable models. We used stepwise variable selection with significance level $p=0.1$ for entry into the model and $p=0.05$ for staying in the model. $P<0.05$ was considered statistically significant. Analyses involved use of SAS v9.4 (SAS Institute Inc., Cary, NC).

## 3. RESULTS

### 3.1. Descriptive analysis

Sociodemographic and clinical data for the 878 patients included are in Table 1. At baseline, the mean (SD) duration of moderate intensity PA was 3.9 (4.5) hr/week, frequency 4.3 (3.6) times/week, and intensity 4.2 (0.8) METs (Table 1). The most frequent PA was walking for pleasure (29.7%), gardening (22.8%), bicycling for pleasure (8.2%) and swimming (7.9%).

### 3.2. Identified group-based trajectories

We observed no structured missing data pattern, such as monotonicity or unit nonresponse, for outcomes criteria. Accordingly, data were considered missing at random and were included in the analyses as allowed when using group-based trajectory modeling without requiring imputation, because this model handles missing data by using maximum likelihood estimation

(25). Restricting the analysis to patients with complete data did not alter the number or size of the observed trajectory pattern groups (figure S1 and S2).

Two trajectories were identified for each PA component and three for screen-based SB (**Figure 1 and Figure 2).** With this partition, the average posterior probability of group membership for individuals assigned to each trajectory was > 0.8 (0.82 to 0.98) (Table S1).

Trajectories of frequency: (1) **moderate and stable frequency** (n = 703; 80.1%) represented a mean PA frequency of 3 times/week and (2) **high and slightly decreasing frequency (**n = 175; 19.9%) a frequency of 8 times/week at inclusion, which decreased to 7 times/week at 5-year follow-up.

Trajectories of intensity: (1) **low and quasi-stable level of moderate intensity** (n = 773; 88%) represented a mean of 4 METS during follow up and (2) **moderate and slightly decreasing level of moderate intensity** (n = 105; 12%) represented intensity slightly decreased from 5.5 METS at inclusion to 5 METS at 5-year follow-up.

Trajectories of duration: (1) **moderate and stable duration** (n = 800; 91.1%) represented a mean duration of 3 hr/week and (2) **high and decreasing duration** (n = 78; 8.9%) represented a duration decreased from 12.9 hr/week at inclusion to 3 hr/week at 5-year follow-up.

Trajectories of type: (1) **low and stable frequency of WB activities** (n = 549; 62.5%) represented stable prevalence of weight-bearing activities at 9% during follow-up and (2) **high and decreasing frequency of WB activities** (n = 329; 37.5%) represented decreased prevalence from 89.7% at inclusion to 77.2% at 5-year follow up.

Trajectories of screen-based sedentary behavior: (1) **low and slightly increasing SB** (n = 500; 57.1%) represented screen-based SB slightly increased from 2.8 at inclusion to 3.2 hr/day at 5-year follow-up; (2) **moderate and slightly increasing SB** (n = 290; 33%) represented screen-based SB slightly increased from 4.9 at inclusion to 5.3 hr/day at 5-year follow-up; and (3) **high**

**and stable SB** (n = 88; 10%) represented screen-based SB stable at 8.4 hr/day during follow-up.

### 3.3. Predictors of physical activity and screen-based sedentary behavior trajectories

Results of bivariate associations are in tables S3 and S4. Predictors of PA components and SB from multivariable logistic regression are in Tables 2 and 3, respectively.

Trajectories of intensity: No sociodemographic or clinical factors were statistically significant in the multivariable logistic regression model.

Trajectories of duration: only sex was a predictor for duration trajectories: females belonged mostly to the **moderate and stable trajectories** than **high and decreasing** group (OR = 0.3 [95% CI 0.3-0.5], $p < 0.0001$).

Trajectories of frequency: the probability of belonging to **the high and slightly decreasing than moderate and stable trajectory** was associated with age ≥ 60 years, low monthly income level (OR = 0.5 [0.3-0.9], p = 0.02) and improved WOMAC physical function (OR = 0.4 [0.3-0.7], p = 0.0007).

Trajectories of type of PA: the probability of belonging to the **high and decreasing** versus **stable frequency of WB activities** was reduced with female sex (OR = 0.6 [95% CI 0.4-0.9] p=0.007) and obesity (OR = 0.5 [0.3-0.9] p = 0.007) and with better SF-36 vitality level (OR = 2.2 [1.3-3.8] p = 0.004), OAKHQOL physical function score (OR = 2.1 [1.1-3.9] p = 0.03), and WOMAC physical function score (OR = 0.5 [0.3-0.8] p = 0.02) and improved pain level (OR = 0.4 [0.3-0.7] p = 0.002)**.**

Trajectories of screen-based SB: the probability of belonging to the **high and stable versus low and slightly increasing trajectory** was associated with being single (OR = 1.8 [1.1-2.9] p = 0.02), a smoker (OR = 2.0 [1.1-3.7] p = 0.02) and age ≥ 60 years (OR = 0.4 [0.2-0.9] p =

0.01). As well, the probability of belonging to **the moderate and slightly increasing versus low and slightly increasing trajectory** was associated with being single (OR = 1.5 [1.1-2.1] p = 0.01) and was reduced with female sex (OR = 0.7 [0.5-1.0] p = 0.02) and obesity (OR = 2.1 [1.4-3.1] p = 0.002).

## 4. DISCUSSION

In this current investigation of the trajectories of PA and SB over time in OA patients, we report two major findings. First, in general, OA patients were distributed between two distinct trajectories for each PA component: a low-moderate stable trajectory including most patients and a high decreasing trajectory with a few patients; and three distinct trajectories of SB: low, moderate and high level of screen-based SB. Second, determinants of trajectories differed according to the PA components, which confirms that PA is a complex and multidimensional behavior (4). These determinants were mostly predictors of the frequency and type of PA trajectories. The lack of significance for the association with PA duration despite a significant association in the bivariate analysis may be due to the small sample size of the high and decreasing duration trajectory versus the moderate and stable trajectory (9% vs 91%), and future studies investigating this association are needed to confirm our results. Patients with impaired PROm and obese patients more often featured lower prevalence of WB activities. Women more often showed moderate and stable PA duration and lower and stable prevalence of WB activities. Predictors of moderate and higher screen-based SB trajectories were all sociodemographic: male sex, age < 60 years, single status, obesity, smoking and less-physical jobs.

To our knowledge, this is the first study using longitudinal data to describe the trajectories of PA components and SB over a long time in a well-defined sample of people with hip and/or knee OA. The innovative method, group-based trajectory modeling, has been used in recent studies investigating PA level among the general adult population and in specific populations with heart disease and breast cancer but has not been used in OA (12,27,28).

Our results agree with previous findings for older adults showing the presence of stable and decreasing trajectories of PA, with stable trajectories more prevalent than change trajectories (9). However, our study adds to the existing knowledge by considering the different components of PA in OA patients.

PA is associated with reduced pain sensitivity among healthy adults (29). Despite the potential long-term benefits of PA for patients with knee or hip OA, it is often challenging for them to regularly practice because their symptoms can worsen (30,31). Our results showed that individuals with more impairment (self-reported pain, functional abilities, vitality) performed less WB PA. For most, this type of PA is unlikely to be a health professional recommendation because most of the KHOALA patients are followed up by primary care physicians who rarely give advice on the type of PA. The perceived functional ability was also a predictor of the frequency of PA, individuals with higher impairment practicing less frequently. In a systematic review, limited evidence was available to support the association between reduced functional impairment and lower level of PA in hip and knee OA. However, in this review, the PA level definition gave a major weight to intensity; as well, the authors did not study PA components and studies were cross-sectional (32). However, results of studies describing PA trajectories in the general population have shown that patients with physical difficulties, disabilities or poor self-rated health were less likely to follow a persistently active trajectory and more likely to follow a low-active or inactive trajectory (9). Our results complement these studies by showing that inactivity or low activity in the context of OA results in lower frequency of PA and less WB PA.

Previous studies describing PA trajectories in the general population have shown active trajectories more prevalent among males than females (33). Our results present new elements in OA patients showing that women more often practiced moderate and stable duration than other frequencies of PA and RWB PA. Thus, proposing moderate-duration and RWB PA could be appropriate for women and more successful.

Obese patients more often showed lower than higher prevalence of WB PA. In fact, RWB activities are selected by obese patients for being more tolerable then WB activities, which involve more loading on the joints (34).

Previous work has shown greater pain during PA among OA patients with higher levels of catastrophizing (35,36). Without measuring catastrophizing scores but with measuring related psychological measures (anxiety and depression), no relationship with PA components was found. Fatigue was the strongest predictor of reduced subsequent activity in patients with OA in one study (37). However, vitality, a close concept, did not differ between frequency, duration or intensity of PA trajectories but was associated with increased frequency of WB PA.

None of the factors predicted the intensity trajectories. Intensity expressed by the metabolic equivalent METs may explain this result. Indeed, METs are defined by the Compendium of Physical Activities (38); the compendium does not consider the individual energy cost of PA, which differs especially according to sex and BMI, but instead standardizes the intensities of each PA. However, PA intensity is often of major importance in the outcome criteria chosen to study factors associated with PA level.

SB is detrimental to health, even when recommended levels of PA are reached (15).Predictors of moderate and higher screen-based SB trajectories were all sociodemographic: male sex, age < 60 years, single status, obesity, smoking, and less-physical jobs. Some of these characteristics were similar to determinants of a sedentary lifestyle in older people without OA (39) and to those of inactive trajectories in the general population (40). Our PROms were not associated with screen-based SB trajectories. For older women, mobility impairment, depression and lack of energy were associated with SB (28). In OA, in a previous cross-sectional study, SB was related to worse physical function, but no longitudinal studies have explored the impact of PROm impairment on SB (42). Thus, symptoms and clinical severity do not seem to prevent individuals from being less sedentary.

**Limitations**

PA was assessed with a self-reporting questionnaire, which may have introduced some measurement error. Although in general our results show compliance with recommendations for PA components, results from other studies using accelerometers showed reduced level of PA (43). However, accelerometers are not proper for long-term measurements, and they are not suitable to measure some PA such as water-based activities (44). As well, SB measured only the time spent in front of the TV and computer and may therefore underestimate the real sedentary time of patients. However, SB is not a single construct; it involves different types of behavior, and screen time is the most-used type of SB studied.

## 5. Conclusion

Identifying diverse trajectory groups using group-based trajectory modeling adds to previous knowledge by providing evidence of the heterogeneity of PA and SB. Thus, this study allowed for understanding the variation that occurs in the frequency, duration, intensity, types of PA and SB during a 5-year follow-up and the factors relating to membership in specific trajectory classes. Our results allowed for identifying sociodemographic and clinical predictors mainly of PA frequency and type of PA trajectories as well as sociodemographic predictors of SB trajectories. This information can help in planning tailored and well-targeted PA promotion strategies and interventions for the OA population, especially those who are sedentary.

<u>**Contributions:**</u>

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(1) conception and design

(2) analysis and interpretation of data

(3) drafting of the article

(4) critical revision of the article for important intellectual content

(5) final approval of the version to be submitted

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**Conflict of interest disclosures:**

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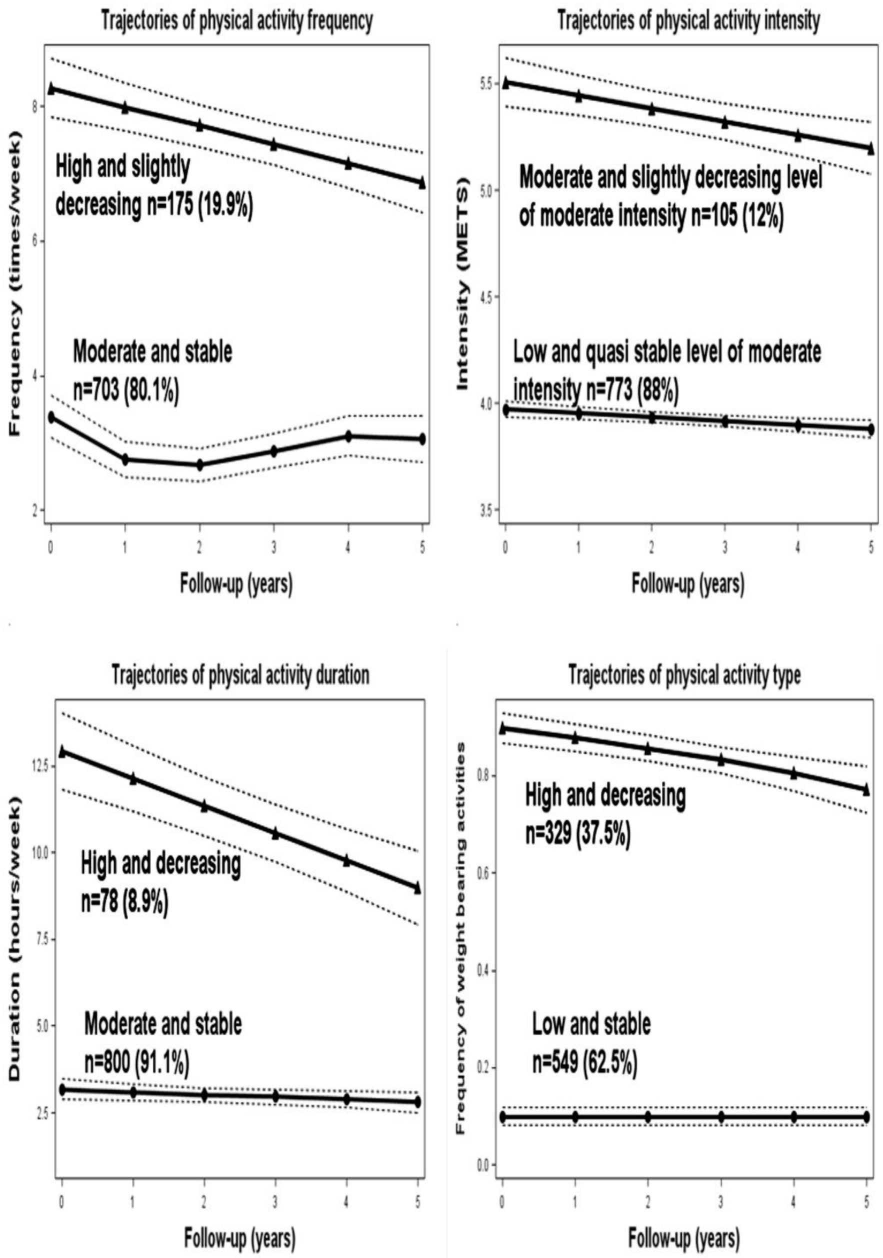
**Figure 1. Identified trajectories of physical activity components.**
**Figure 2. Identified trajectories of sedentary behavior.**


Trajectories of physical activity frequency
Frequency (times/week)
High and slightly decreasing n=175 (19.9%)
Moderate and stable n=703 (80.1%)
Follow-up (years)
Trajectories of physical activity intensity
Intensity (METS)
Moderate and slightly decreasing level of moderate intensity n=105 (12%)
Low and quasi stable level of moderate intensity n=773 (88%)
Follow-up (years)
Trajectories of physical activity duration
Duration (hours/week)
High and decreasing n=78 (8.9%)
Moderate and stable n=800 (91.1%)
Follow-up (years)
Trajectories of physical activity type
Frequency of weight bearing activities
High and decreasing n=329 (37.5%)
Low and stable n=549 (62.5%)
Follow-up (years)

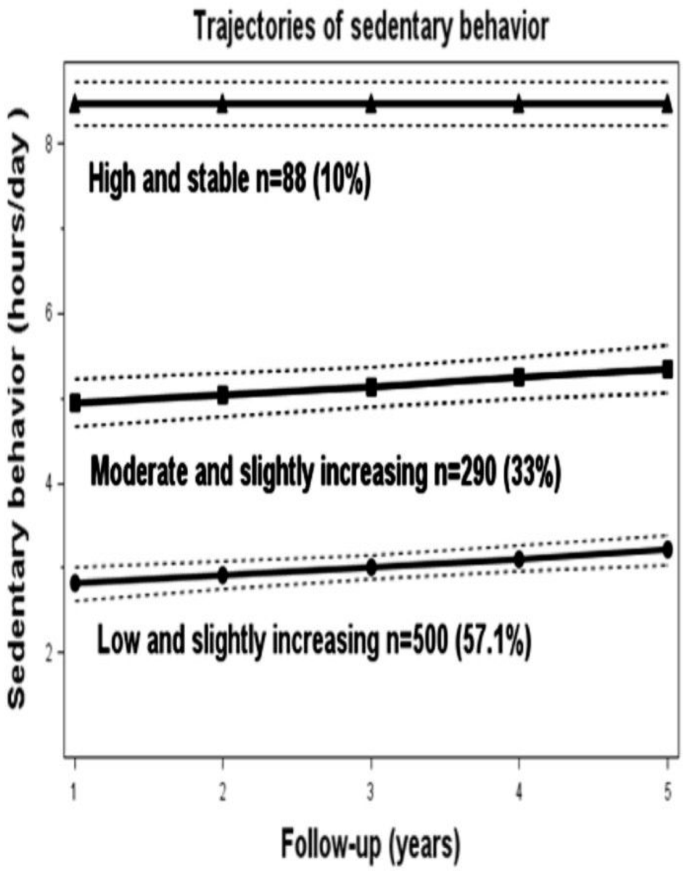

Trajectories of sedentary behavior
Sedentary behavior (hours/day )
8
6
4
2
High and stable n=88 (10%)
Moderate and slightly increasing n=290 (33%)
Low and slightly increasing n=500 (57.1%)
1
2
3
4
5
Follow-up (years)

**Table 1. Baseline patient characteristics (n=878)**

| | N | %/mean (SD) |
|---|---|---|
| **Joint** | | |
| Hip | 222 | 25.3 |
| Knee | 607 | 69.1 |
| Hip and knee | 49 | 5.6 |
| **Sex** | | |
| Male | 269 | 30.6 |
| Female | 609 | 69.4 |
| **Age at inclusion (years)** | 878 | 62.0 (8.5) |
| **Education level** | | |
| Primary | 200 | 22.9 |
| Secondary | 457 | 52.3 |
| University | 216 | 24.8 |
| **Kellgren-Lawrence grade** | | |
| Grade II | 443 | 50.5 |
| Grade III | 259 | 29.5 |
| GradeIV | 176 | 20.0 |
| **Marital status** | | |
| In a couple | 601 | 68.7 |
| Single | 273 | 31.3 |
| **Geographical zone** | | |
| North France | 560 | 67.9 |
| West France | 111 | 13.4 |
| South France | 153 | 18.7 |
| **Size of the residential area** | | |
| <2000 inhabitants | 305 | 34.7 |
| 2000 to 49 999 inhabitants | 377 | 42.9 |
| ≥50 000 inhabitants | 196 | 22.3 |
| **Socio-professional category** | | |
| Farmer, artisan, trader | 119 | 13.6 |
| Executive, intellectual professional | 127 | 14.5 |
| Intermediate occupation | 185 | 21.1 |
| Employee | 378 | 43.1 |
| Without professional activity | 69 | 7.9 |
| **Retired (yes)** | 546 | 62.4 |
| **Smoking status (yes)** | 135 | 15.5 |
| **Alcoholic status (yes)** | 523 | 61.7 |
| **BMI, kg/m²** | | |
| Normal (< 25) | 212 | 24.1 |
| Overweight (25 to 29) | 329 | 37.5 |
| Obese (> 30) | 337 | 38.4 |
| **PA Frequency (times/week)** | 745 | 4.3 (3.6) |
| **PA Intensity (METs)** | 770 | 4.2 (0.8) |
| **PA Duration (hr/week)** | 625 | 3.9 (4.5) |
| **PA Type** | | |
| Non-weight-bearing activities | 459 | 59.6 |
| Weight-bearing activities | 311 | 40.4 |
| **Sedentary behavior (hr/day)** | 644 | 4.1 (2.3) |

PA=physical activity; BMI=body mass index; METs=metabolic equivalent task

**Table 2. Factors associated with physical activity frequency and type trajectories derived from the multivariable logistic regression**

| | Frequency | | | | Type | | | |
|---|---|---|---|---|---|---|---|---|
| | MSFreq N=703 (80.1%) | HDFreq N=175 (19.9%) | HDFreq (vs MSFreq) | | LSWB N=549 (62.5%) | HDWB N=329 (37.5%) | HDWB (vs LSWB) | |
| | % | % | OR [95% CI] | P* | % | % | OR [95%CI] | P* |
| **Sex** | | | | | | | | **0.007** |
| Male | 77.3 | 22.7 | | | 52.4 | 47.6 | 1 | |
| Female | 84.1 | 15.9 | | | 69.5 | 30.5 | **0.6 [0.4-0.9]** | |
| **Age at inclusion** | | | | **0.01** | | | | |
| 40 to 49 | 91.7 | 8.3 | 1 | | 52.8 | 47.2 | | |
| 50 to 59 | 85.2 | 14.8 | 2.2 [0.8-5.9] | | 65.8 | 34.2 | | |
| ≥ 60 years | 79.2 | 20.8 | **3.3 [1.3-8.5]** | | 64.9 | 35.1 | | |
| **BMI,** kg/m$^2$ | | | | | | | | **0.007** |
| Normal (<25) | 82.5 | 17.5 | | | 55.2 | 44.8 | 1 | |
| Overweight (25 to 29) | 79.6 | 20.4 | | | 55.6 | 44.4 | 1.0 [0.7-1.6] | |
| Obese (> 30) | 84.0 | 16.0 | | | 78.3 | 21.7 | **0.5 [0.3-0.9]** | |
| **Monthly income** | | | | **0.02** | | | | |
| Low <1220euros | 75.7 | 24.3 | 1 | | 75.7 | 24.3 | | |
| Intermediate 1220 to 2440 euros | 82.8 | 17.2 | **0.6 [0.4-0.9]** | | 67.2 | 32.8 | | |
| High ≥2440euros | 84.2 | 15.8 | **0.5 [0.3-0.9]** | | 56.6 | 43.4 | | |
| **WOMAC Function** | | | | **0.0007** | | | | **0.02** |
| 1st tertile [0-20] | 80.2 | 19.8 | 1 | | 50.5 | 49.5 | 1 | |
| 2nd tertile [21-44] | 77.7 | 22.3 | 1.0 [0.7-1.6] | | 61.9 | 38.1 | 0.8 [0.6-1.3] | |
| 3rd tertile [45-100] | 88.0 | 12.0 | **0.4 [0.3-0.7]** | | 80.6 | 19.4 | **0.5 [0.3-0.8]** | |
| **WOMAC Pain** | | | | | | | | **0.003** |
| 1st tertile [0-20] | 79.6 | 20.4 | | | 56.0 | 44.0 | 1 | |
| 2nd tertile [21-40] | 79.5 | 20.5 | | | 57.0 | 43.0 | **1.7 [1.1-2.7]** | |
| 3rd tertile [41-100] | 86.9 | 13.1 | | | 81.6 | 18.4 | 1.0 [0.5-1.9] | |
| **SF36 Vitality** | | | | | | | | |
| 1st tertile [0-40] | 87.2 | 12.8 | | | 80.7 | 19.3 | 1 | |
| 2nd tertile [40-60] | 80.4 | 19.6 | | | 60.6 | 39.4 | **2.2 [1.3-3.6]** | |
| 3rd tertile [60-100] | 78.1 | 21.9 | | | 52.7 | 47.3 | **2.2 [1.3-3.8]** | |
| **Pain VAS** | | | | | | | | **0.002** |
| 1st tertile [0-21] | 81.1 | 18.9 | | | 51.5 | 48.5 | 1 | |
| 2nd tertile [21-48] | 81.7 | 18.3 | | | 64.9 | 35.1 | **0.6 [0.4-0.9]** | |
| 3rd tertile [48-100] | 82.0 | 18.0 | | | 77.9 | 22.1 | **0.4 [0.3-0.7]** | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **OAKHQOL** | | | | | | | **0.03** |
| **Physical activity** | | | | | | | |
| 1st tertile [0.625-58] | 84.7 | 15.3 | | 81.1 | 18.9 | 1 | |
| 2nd tertile [58.1-78.75] | 80.8 | 19.2 | | 64.1 | 35.9 | 1.2 [0.7-2.1] | |
| 3rd tertile [79-100] | 79.8 | 20.2 | | 47.9 | 52.1 | **2.1 [1.1-3.9]** | |

***Abbreviations:*** *MSFreq=moderate and stable frequency; HDFreq=high and slightly decreasing frequency; LSWB=low and stable prevalence of weight-bearing activities; HDWB=high and decreasing prevalence of weight-bearing activities; VAS=visual analog scale; CI=confidence interval; WOMAC=Western Ontario and McMaster Universities Osteoarthritis* Index, 0 (best state) to 100 (worst state); *OAKHQOL=OsteoArthritis Knee and Hip Quality Of Life questionnaire, 0 (worst state) to 100 (best state); SF36=Medical Outcomes Study Short Form 36, 0 (worst state) to 100 (best state).*

** Only factors with a significant association at p=0.2 on bivariate analysis were entered into a multivariable model. Stepwise variable selection with significance level for entry into the model at p=0.1 and with significance level for staying in the model at p=0.05 was used.*

**Table 3. Factors associated with sedentary behavior trajectories derived from the multivariable logistic regression**

| | LISB N=500 (57.1%) | MISB N=290 (33%) | HSSB N=88 (10%) | MISB (vs LISB) | | HSSB (vs LISB) | |
|---|---|---|---|---|---|---|---|
| | % | % | % | OR [95% CI] | P* | OR [95% CI] | P* |
| **Gender** | | | | | **0.02** | | |
| Male | 58.0 | 33.1 | 8.9 | 1 | | | |
| Female | 64.2 | 26.6 | 9.2 | **0.7 [0.5-1.0]** | | | |
| **Age at inclusion, years** | | | | | | | **0.01** |
| 40 to 49 | 55.6 | 27.8 | 16.7 | | | 1 | |
| 50 to 59 | 57.4 | 29.7 | 12.9 | | | 0.8 [0.4-1.9] | |
| ≥ 60 | 65.5 | 28.2 | 6.3 | | | **0.4 [0.2-0.9]** | |
| **Marital status** | | | | | **0.01** | | **0.02** |
| In couple | 65.9 | 26.3 | 7.7 | 1 | | 1 | |
| Single | 55.9 | 32.5 | 11.6 | **1.5 [1.1-2.1]** | | **1.8 [1.1-2.9]** | |
| **Socio-professional category** | | | | | | | **0.01** |
| Farmer, artisan, trader | 52.8 | 31.5 | 15.7 | | | 1 | |
| Executive, intellectual professional | 62.2 | 27.6 | 10.3 | | | **11.2 [2.5-50.5]** | |
| Intermediate occupation | 62.4 | 29.1 | 8.5 | | | **5.6 [1.2-25.3]** | |
| Employee | 69.7 | 28.6 | 1.7 | | | **5.3 [1.2-22.7]** | |
| Without professional activity | 66.7 | 23.2 | 10.1 | | | **6.3 [1.2-32.5]** | |
| **Smoking status (yes)** | 51.9 | 32.6 | 15.6 | | | **2.0 [1.1-3.7]** | **0.02** |
| **Alcoholic status (yes)** | 61.6 | 28.7 | 9.8 | | | | |
| **BMI,** kg/m$^2$ | | | | | **0.002** | | |
| Normal (<25) | 72.2 | 20.3 | 8.2 | 1 | | | |
| Overweight (25 to 29) | 61.4 | 28.9 | 9.3 | 1.6 [1.0-2.4] | | | |
| Obese (> 30) | 57.0 | 33.5 | 10.2 | **2.1 [1.4-3.1]** | | | |

***Abbreviations***: LISB =*low and slightly increasing sedentary behavior;* MISB =*moderate and slightly increasing sedentary behavior; HSSB=high and stable sedentary behavior;*

* *Only factors with a significant association at p=0.2 in bivariate model were entered into multivariable model. Stepwise variable selection with significance level for entry into the model at p=0.1 and with significance level for staying in the model at p=0.05 was used.*