CHECK: Cohort Hip & Cohort Knee;
similarities and differences with the oa initiative.

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Keywords: early osteoarthritis; osteoarthritis, hip; osteoarthritis, knee; follow-up cohort

Word count: 2990
Abstract

Objective:
To describe the osteoarthritis (OA) study population of CHECK (Cohort Hip & Cohort Knee) in comparison with relevant selections of the study population of the OAI (OA Initiative) based on clinical status and radiographic parameters.

Methods:
In the Netherlands a prospective 10-year follow-up study was initiated by the Dutch Arthritis Association on participants with early OA related complaints of hip and/or knee: CHECK. Parallel in the US an observational 4-year follow-up study, the OAI, was started by the NIH, on patients with or at risk for symptomatic knee OA. For comparison with CHECK, the entire cohort and a subgroup of individuals excluding those with exclusively hip pain were compared with relevant subpopulations of the OAI.

Results:
At baseline, CHECK included 1002 participants with in general similar characteristics as described for the OAI. However, significantly less individuals in CHECK had radiographic knee OA, at baseline when compared to the OAI (p<0.0001). In contrast, at baseline, the CHECK cohort reported higher scores on pain, stiffness, and function disability (WOMAC) when compared to the OAI (all p<0.0001). These differences were supported by physical health status that in contrast to mental health (SF-36/-12) was at baseline significantly worse for the CHECK participants (p<0.0001).

Conclusion:
Although both cohorts focus on the early phase of OA, both cohorts differ significantly with respect to structural (radiographic) and clinical (health status) characteristics, CHECK expectedly representing participants in an even earlier phase of disease.
INTRODUCTION
Osteoarthritis (OA) is the most common diagnosis made in older patients with knee or hip pain. The diagnosis can be based on symptoms, signs, and radiographic findings and as such be defined by various sets and combinations of criteria. The prognosis of OA for the individual patient is uncertain: the course of symptoms, clinical signs, disability, and radiographic changes is difficult to predict. Besides, it is demonstrated that there is inconsistency between the radiographic change and severity of joint pain with accompanying disability. Clearly, to understand more about the disease and its course, large independent detailed observational studies starting (very) early in the stage of the disease are necessary.

Therefore, in the Netherlands, recently a prospective 10-year follow-up study was initiated by the Dutch Arthritis Association (DAA) in order to establish onset and progression of OA in participants with early complaints of hip and/or knee: CHECK (Cohort Hip & Cohort Knee), using the ICF (International Classification of Functioning, Disability and Health) as a conceptual framework. The ICF model provides an integrative framework, combining biological, psychological, and social aspects of health and disease. The objective of CHECK is to study the course of complaints, the mechanisms that cause joint damage, and to identify markers for diagnosis and course of joint damage, as well as to identify prognostic factors that predict and explain the course of OA. Parallel, an observational study on OA was initiated by the NIH: the Osteoarthritis Initiative (OAI). This 4-year follow-up study will create a public archive of data, biological samples, and joint images to study the natural history of, and risk factors for, the onset and progression of knee OA. In fact both initiatives, CHECK and the OAI, search answers to the same questions in comparable populations. In the present report the CHECK population is described at baseline and compared to relevant subpopulations of the OAI to provide a basis for further research and comparison of both cohorts in the future.

METHODS
CHECK cohort
Design
From October 2002 till September 2005 a cohort was formed of 1002 participants with pain and/or stiffness of knee and/or hip, which is to be followed prospectively for a period of at least 10 years. Nationwide, ten general and academic hospitals in the Netherlands are participating, located in urbanised and semi-urbanised regions. The study was approved by the medical ethics committees of all participating centres, and all participants gave their written informed consent before entering the study.

Study population
General practitioners in the surroundings of the participating centres were invited to refer eligible persons to these centres. All patients that visited the GP on their own initiative, potential fulfilling the inclusion criteria, were referred to one of the 10 participating centres. Additionally, participants were recruited through advertisements and articles in the local newspapers and on the DAA-website. The physicians in the participating centres checked whether referred patients as well as patients from their outpatient clinic fulfilled the inclusion criteria.

Inclusion criteria
Indviduals were eligible if they had pain and/or stiffness of knee and or hip, aged 45-65 years, and had never or not longer than 6 months ago visited the general practitioner for these symptoms for the first time.
Exclusion criteria were: any other pathological condition that could explain the existing complaints (e.g. other rheumatic disease, previous hip or knee joint replacement, congenital dysplasia, osteochondritis dissecans, intra-articular fractures, septic arthritis, Perthes’ Disease, ligament or meniscus damage, plicasyndrome, Bakers cyste) or co-morbidity that did not allow physical...
evaluation and/or follow-up of at least 10 years, malignancy in the last 5 years, and inability to understand the Dutch language.

**Baseline Measurements**
Variables categorized according to the ICF model (table 1).

*Body function and structures: articular and kinesiologic factors*
To assess cartilage and bone at baseline, imaging techniques were employed and samples of blood and urine collected. During follow-up this is done at 2, 5, and 10 years as well. At baseline from all participants both knees and hips were analysed, independent of symptoms and signs. Radiographs of tibio-femoral (TF) joints were made by a weight-bearing (WB) posterioranterior (PA) view, semi-flexed (7-10°) according to Buckland-Wright.6-8 Radiographs of patellofemoral joints were made by a single standing mediolateral view in 30° flexion and a skyline (inferior superior) view in 30° flexion.9,10 For the hip, WB anterioposterior (AP) radiographs of the pelvis were made.11,12 In addition, a WB single faux profil radiograph of both hips was obtained.13 All radiographs were made without fluoroscopy, and were digitalised and centrally stored. Radiographs of PA TF joint and AP pelvic views at baseline were scored according to Kellgren & Lawrence (K&L).14 Blood and urine samples were collected, using a standardised protocol at all sites. Multiple aliquots of serum, plasma, and urine were centrally stored at -80ºC. DNA was collected at baseline and was stored at -20º C. Kinesiologic factors (table 1) were assessed each year by a protocol that was established to measure clinical features of knee, hip, and hands.

*Body function and structures: pain, stiffness, and fatigue*
Questionnaires were selected based on the following criteria: validated in participants with OA; demonstrated reliability, validity and- if applicable- responsiveness; the questionnaire is internationally accepted, is available in the Dutch language, and has a high feasibility. Questionnaires are administered annually. The WOMAC15 16,17, a questionnaire with well known and good clinimetric properties and recommended by OMERACT is utilized to measure pain (five items), stiffness (two items), and physical functioning (see below).18,19 The five point Likert version of the WOMAC was used; item responses range from ‘none’ to ‘extreme’ and are summed to produce subscales (pain 0-20, stiffness 0-8, functioning 0-68) with higher scores indicating worse health. Fatigue was assessed with the vitality subscale of the Short Form 36-item health status survey questionnaire (SF36). This questionnaire is a generic instrument yielding scores on eight scales, with two summary scores, the Physical Component Summary (PCS) and the Mental Component Summary (MCS). The physical functioning, role limitations due to physical health and bodily pain, scale contributes most to the scoring of the PCS. The mental health, role limitations due to emotional problems and social functioning scales contributes most to the MCS. These summary scores of the SF36 are equivalent to the summary scores of the SF-1220, as used in the OAI. Scores on the scales range from 0 to 100, with a higher score indicating a better health related quality of life.21
Table 1 The assessment of the variables, categorized according to the dimensions of the ICF, comparison of CHECK and OAI

<table>
<thead>
<tr>
<th>Body function and structures</th>
<th>CHECK</th>
<th>OAI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articular factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physiological functions of body systems and anatomical part of the body</td>
<td>Single PA view TFJ, mediolateral view TFJ, bilateral skyline view PFJ, AP pelvis view, faux profil view of hip</td>
<td>Bilateral PA view TFJ, AP view pelvis, PA view dominant hand</td>
</tr>
<tr>
<td>Articular factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee</td>
<td>Palpable warmth, refill-test, bony tenderness, crepitus, patello-femoral grinding test</td>
<td>Effusion, bony tenderness, crepitus, patellar tenderness, alignment, medial-lateral laxity</td>
</tr>
<tr>
<td>Hip</td>
<td>Sign of Thomas</td>
<td>Na</td>
</tr>
<tr>
<td>Hand</td>
<td>DIP and PIP bony enlargements</td>
<td>DIP bony enlargements</td>
</tr>
<tr>
<td>Pain</td>
<td>Pain scale WOMAC, Knee/ hip pain intensity 0-10 rating scale</td>
<td>Pain scale WOMAC, Knee pain 0-10 rating scale, KOOS knee pain and symptoms</td>
</tr>
<tr>
<td>Stiffness</td>
<td>Stiffness scale WOMAC</td>
<td>Stiffness scale WOMAC</td>
</tr>
<tr>
<td>Other joint symptoms</td>
<td>Hip pain, stiffness, Foot/ toe symptoms</td>
<td>Symptoms of hip, shoulder, elbow, wrist, hand/finger, ankle, foot/toe</td>
</tr>
<tr>
<td>Fatigue</td>
<td>vitality scale of the Short Form 36-item health status survey questionnaire (SF36)</td>
<td>na</td>
</tr>
<tr>
<td>Activities</td>
<td>Execution of a task or action by an individual</td>
<td></td>
</tr>
<tr>
<td>Limitations in activity</td>
<td>Functioning scale WOMAC</td>
<td>Functioning scale WOMAC</td>
</tr>
<tr>
<td>Participation</td>
<td>Involvement in life situation</td>
<td></td>
</tr>
<tr>
<td>Working status</td>
<td>Employment, current and past, Participants with paid employment were asked whether they would like to change their working environment</td>
<td>Employment, current and past, Work disability due to health problems</td>
</tr>
<tr>
<td>Environmental and Personal factors</td>
<td>Complete background of an individual’s life and living situation</td>
<td></td>
</tr>
<tr>
<td>Socio-demographic characteristics</td>
<td>Age, sex, ethnicity, marital status, household composition, Height, weight, education</td>
<td>Age, sex, ethnicity, marital status, residency, income, Height, weight, education</td>
</tr>
<tr>
<td>Utility</td>
<td>EuroQol</td>
<td>SF-12, KOOS Quality of life</td>
</tr>
<tr>
<td>Quality of life</td>
<td>SF36</td>
<td>SF-12, KOOS Quality of life</td>
</tr>
<tr>
<td>Co-morbidity</td>
<td>List of complaints and diseases</td>
<td>Comorbidity Index</td>
</tr>
<tr>
<td>Psychological factors</td>
<td>Pain Coping Inventory (PCI), Scale form the SF36: emotional role-functioning, Social Support Scale (SOS)</td>
<td>na, CES-D (depressive symptoms), na</td>
</tr>
<tr>
<td>Physical workload</td>
<td>Based on the Dutch Musculoskeletal Questionnaire</td>
<td>Frequent knee bending activities</td>
</tr>
<tr>
<td>Physical activity during leisure</td>
<td>Physical activity, qualitative and quantitative</td>
<td>KOOS sport, recreation, Physical activity (PASE), Limitation of activity due to knee Sx</td>
</tr>
<tr>
<td>Health care use</td>
<td>Medical consumption, to have and use aids</td>
<td>Medication consumption</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>Tobacco, alcohol use, Changes in feeding habits</td>
<td>Tobacco, alcohol use, Dietary nutrient intake</td>
</tr>
</tbody>
</table>

WOMAC: Western Ontario and McMaster Osteoarthritis Index; KOOS: Knee Outcomes in Osteoarthritis Survey; SF-12: Medical Outcome Study Short Form; PASE: Physical Activity Scale for the Elderly; na: not available
Activities
The WOMAC was used to assess physical functioning (17 items).\textsuperscript{18,19}

Participation:
To assess the involvement in life situation, the employment and the leisure activities were measured with the questionnaire from the Patient Panel Chronic Diseases (NIVEL) and the questionnaire ‘Economic Aspects in Rheumatoid Arthritis.’\textsuperscript{22}

Environmental factors and personal factors
Table 1 provides an overview of the environmental and personal factors collected at baseline. Co-morbidity was assessed with a standard consensus based list.\textsuperscript{23} Pain coping behaviour was measured with the Pain Coping Inventory, assessing both behavioural and cognitive coping strategies.\textsuperscript{24} To assess a person’s distress and fear, a subscale of the SF36 was used. Social support was measured with the Dutch ‘Social support scale’.\textsuperscript{25} Physical load and economic consequences were assessed with the Dutch Musculoskeletal Questionnaire and the questionnaire ‘Economic Aspects in Rheumatoid Arthritis, respectively.\textsuperscript{26,22}

Each three months, the 10 institutes were visited by a single central coordinator to support complete and accurate data gathering.

Osteoarthritis Initiative
All details of the OAI are available on the internet (\url{http://www.oai.ucsf.edu}). In short: Individuals were eligible if they had or were at risk for symptomatic TF knee OA and aged between 45 and 79 years. Subjects with Inflammatory arthritis, bilateral end stage knee OA, inability to walk, and contraindication for MRI were excluded. Recruitment of 4796 individuals was realised from March 2004 to May 2006. At baseline the cohort was divided into two subcohorts, one with symptomatic knee OA (defined as: in at least one knee frequent knee symptoms and radiographic TF knee OA, defined as K&L \geq 2) (progression cohort) and a second cohort of 3285 individuals without symptomatic knee OA, selected on the basis of having specific characteristics which give them an increased risk of developing symptomatic knee OA (incidence cohort). For the incidence cohort age-specific eligibility criteria were defined. Subjects aged 45-49 were eligible when they had frequent knee symptoms, or made frequent use of medication for treatment of knee symptoms or had infrequent knee symptoms, and in addition had one or more other eligible risk factor such as knee injury, knee surgery, overweight, positive family history, etc. Subjects aged 50-69 were eligible if they had frequent knee symptoms, or made frequent use of medication for treatment of knee symptoms, or were overweight, or had two or more of the eligible risk factors.

At baseline materials for identification of joint imaging, biomarkers, and genetic markers were collected. Also data on the clinical and joint status of subjects and on risk factors for the progression and development of knee OA were collected by questionnaires and examination (categorised according to the dimensions of the ICF depicted in table 1).

In the present report baseline CHECK data of the entire cohort were compared to data of the OAI incidence cohort. To make the cohorts more comparable, additionally, CHECK participants with knee problems (excluding those with exclusively hip problems; n=829) were compared with participants of the OAI incidence cohort within the same age range (45-65 years) which had at least frequent or infrequent knee symptoms excluding those that e.g. just had overweight without symptoms and excluding those that had previous knee surgery (n=1578).

Statistical analyses
Baseline characteristics of both cohorts are presented using descriptive statistics: median and 25th-75th percentiles or percentages. Differences between groups are analysed using Mann Whitney U-tests or Chi-Square test, where appropriate.
Results
More than 75% of participants were selected based on advertisement including website. Baseline characteristics of the participants from CHECK and the relevant populations of the OAI are presented in table 2. With respect to radiological OA (K&L score) and health status there were some striking differences between both cohorts.

Radiographic joint damage was clearly more outspoken in the OAI compared to CHECK (table 2). In Figure 1 the percentage of participants with a knee K&L grade 0-1 and ≥2 is depicted. Based on the definition of K&L grade ≥2, at baseline only 7% of CHECK participants had radiographic knee OA compared to 40% in the OAI incidence cohort (P>0.0001). Evidence for radiographic hip OA was only present in 7% of the participants of CHECK. The significant difference in knee K&L grade was also clear when the subgroups of both cohorts were compared (8% and 32%; p<0.0001). Even when the participants with K&L grade 4 were omitted from the calculations, the difference in severity of radiographic joint damage between both cohorts remains evidently significant. This difference in severity of joint damage between both cohorts was not based on differences in gender (data not shown).

Despite the limited number of participants with radiographic knee OA in CHECK, 76% of the patients with knee symptoms could be diagnosed as OA according to the clinical ACR criteria for classification of OA. Only a minority of CHECK participants with hip symptoms (24%) fulfilled the clinical classification criteria of hip OA.

The evident difference in radiographic joint damage between both cohorts was not accompanied by a similar difference in pain and physical function. On the contrary, as shown in figure 2, on each of the WOMAC subscales participants of CHECK presented more pain, stiffness, and problems in function than patients in the OAI. This was observed for the whole cohorts as well as the subgroups of both cohorts (all p<0.0001). Women reported more pain and functional disability than men which was almost identical with the OAI (all p<0.05; data not shown)

The specific difference in physical function, contrasting the radiographic difference between both cohorts, was underscored by the difference in PCS in contrast to MCS of the SF36/12 scale (figure 3); CHECK participants scoring less than patients from the OAI (p>0.0001) for the PCS but not for the MCS (ns). Also for these scales, in both cohorts women scored worse compared to men (all p<0.05; data not shown).
Table 2: Demographic and disease characteristics in CHECK and selections of the OAI

<table>
<thead>
<tr>
<th></th>
<th>CHECK</th>
<th>OAI-incidence cohort</th>
<th>CHECK-knee subgroup</th>
<th>OAI incidence subgroup *</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1002</td>
<td>3285</td>
<td>na</td>
<td>829</td>
</tr>
<tr>
<td>Age in years</td>
<td>56 (52-60)</td>
<td>61 (53-69)</td>
<td>0.0001</td>
<td>56 (52-60)</td>
</tr>
<tr>
<td>Gender, female</td>
<td>79%</td>
<td>59%</td>
<td>0.0001</td>
<td>80%</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>26 (23-28)</td>
<td>28 (25-31)</td>
<td>0.0001</td>
<td>26 (24-28)</td>
</tr>
</tbody>
</table>

**Educational level:**
- Primary school: 3% 3% 0.1 3% 2% 0.006
- Secondary school: 70% 65% 0.1 71% 65% 0
- High prof. education/ univ.: 27% 32% 0.1 26% 33% 0

**Site of pain:**
- Knee only: 41% 37% 50% 43%
- Hip only: 17% 7% Na Na 0.002
- Knee and hip: 42% 48% 50% 57%
- No hip or knee pain: Na 37% Na Na Na
- Pain intensity (range 0-10): 3 (3-5) 2 (0-3) 0.0001 3 (2-5) 2 (0-4) 0.0001

**K&L rating score for knee:**
- Grade 0: 68% 14% 65% 19%
- Grade 1: 25% 46% 27% 50%
- Grade 2: 6% 16% 7% 16%
- Grade 3: 1% 19% 1% 13%
- Grade 4: Na 5% Na 2%

**K&L rating score for hip:**
- Grade 0: 79% na na 83% na na
- Grade 1: 15% na na 13% na na
- Grade 2: 5% na na 4% na na
- Grade 3: 1% na na 0% na na

**WOMAC subscales:**
- Pain (range 0-20): 5 (2-7) 1 (0-3) 0.0001 5 (2-7) 1 (0-3) 0.0001
- Stiffness (range 0-8): 3 (2-4) 1 (0-2) 0.0001 3 (2-4) 1 (0-2) 0.0001
- Physical function (range 0-68): 14 (7-24) 2 (0-8) 0.0001 14 (7-24) 3 (0-9) 0.0001

**Present employment**
- Paid job/volunteer: 53% 70% 0.0001 52% 79% 0.0001
- no paid job: 47% 30% 0.0001 48% 21%

**SF-36 subscales (range 0-100):**
- Physical function: 80 (65-90) na na 75 (65-85) na na
- Physical role: 100 (50-100) na na 100 (38-100) na na
- Bodily pain: 67 (57-80) na na 67 (57-80) na na
- Fatigue: 65 (55-75) na na 65 (55-75) na na
- Social function: 88 (63-100) na na 88 (63-100) na na
- Fear and depression: 100 (100-100) na na 100 (100-100) na na
- Mental health: 80 (68-88) na na 80 (68-88) na na
- PCS: 47 (40-51) 53 (46-56) 0.0001 47 (40-51) 53 (46-56) 0.001
- MCS: 55 (50-59) 55 (50-58) 0.4 55 (50-59) 55 (49-58) 0.3
- EuroQol Utility: 0.7 (0.7-0.8) na na 0.7 (0.7-0.8) na na

Median values with 25th-75th percentiles between brackets and categorical variables as percentages (%) are given
BMI: body mass index, K&L: Kellgren and Lawrence grade, WOMAC: Western Ontario and McMaster Universities OA index
with higher scores indicating worst health, SF36: Short Form 36-item health status survey questionnaire with higher score indicating a better health related quality of life. PCS: Physical Component Scale, MCS: Mental Component Scale (in CHECK both scales calculated without general health scale) na: not available /applicable-braces indicates statistical differences between the distribution of a parameters between both cohorts. P values are given.
Discussion

The CHECK study is the first prospective 10 year follow-up study of OA in an early phase of the disease that combines biological, psychological, and social aspects of OA. Radiographic knee OA was present only in a small number of the CHECK participants when compared to the OAI. In contrast, the participants in CHECK had more pain, more stiffness, more limitations in activities, and a worse health status. The worse clinical health status is supported by the use of pain medication: At baseline, only 9% of the participants in OAI had taken any pain medication, whereas this was 46% for CHECK (data not shown). Other characteristics such as BMI or gender appeared not explanatory for this observed characteristic difference between both cohorts (data not shown). It could be that the difference in radiographic joint damage between both cohorts is due to differences in implementation of the K&L grading method. However, grading of a random sample of the OAI knee radiographs by those who performed the grading for CHECK, excluded this possibility (data not shown). Although not expected to be explanatory, it should be kept in mind that radiographs were taken, although according to standard protocols, in 10 different centres, while in the OAI only 4 centres are involved. It can not be ruled out that the social, cultural, and health care system differences between the US and Europe, specifically the Netherlands, account for (part of) the difference in reported health status. Also differences in inclusion between both cohorts can not be ruled out.

The OAI incidence cohort is recognized as an early OA cohort. Taking the radiological findings into account, we conclude that CHECK was started in an even earlier phase of the disease compared to the OAI. Although this is apparently in discordance with the more severe clinical symptoms, the relation between radiographic damage and clinical symptoms has never been clear and is subject of study in both cohorts. Therefore, it is hypothesized that in the early phase of OA pain, stiffness, and disability (of still unknown origin) are prominent, and, not yet accompanied by radiographic findings of OA (CHECK). In the subsequent phase (OAI) patients are coping with the pain and physical disability, leading to a decrease in report of these characteristics, while independently (or maybe as a consequence) structural changes, visible on radiographs, develop. In other words earlier recruitment of patients may carry more perceived symptoms of OA (as also seen in RA), while in a later stage coping with a new disease may ameliorate symptoms (figure 4). In the final course of the disease the structural (radiographic) changes progress and lead to further pain and disability. It should be taken into account that additionally, several other factors, as described in the ICF model, may add to the apparent discrepancy observed between pain and structural joint damage over time. Our hypothesis can be tested in future follow-up of patients in both cohorts, specifically those with the more severe complaints (still) without radiographic joint damage. If it appears that the CHECK population with respect to pain and joint damage, independent of factors like, social background, health care system differences, cultural difference, variance in methodology etc, follows the OAI population, then our hypothesis may hold true. Of course other factors, independent of symptoms and joint damage, need to be evaluated regarding observed differences between both cohorts, as such giving both cohorts their surplus value.

Acknowledgement

The authors thank all participants of the CHECK cohort and all collaborators of the different sites for their initial and still continuing efforts.

CHECK is funded by the Dutch Arthritis Association on the lead of a steering committee comprising 16 members with expertise in different fields of OA chaired by Prof. Dr. J.W.J. Bijlsma and coordinated by Drs. J. Wesseling. Involved are: Academic Hospital Maastricht; Erasmus Medical Center Rotterdam; Jan van Breemen Institute /VU Medical Center Amsterdam; Kennemer Gasthuis Haarlem; Martini Hospital Groningen /Allied Health Care Center for Rheumatology and Rehabilitation Groningen; Medical Spectrum Twente Enschede /Twenteborg Hospital Almelo; St. Maartenskliniek Nijmegen; Leiden University Medical Center; University Medical Center Utrecht and Wilhelmina Hospital Assen.
The OAI is a public-private partnership comprised of 5 contracts (N01-AR-2-2258; N01-AR-2-2259; N01-AR-2-2260; N01-AR-2-2261; N01-AR-2-2262) funded by the National Institutes of Health, and conducted by the OAI Study Investigators. This manuscript was prepared using an OAI public use data set and does not necessarily reflect the opinions or views of the OAI investigators, the NIH, or the private funding partners.

**Figure 1.** Comparison of radiographic joint damage between CHECK and OAI and their subpopulations at baseline. The bars depict the percentage of knees with a Kellgren and Lawrence (K&L) score of 0-1 and a K&L ≥ 2. P values for statistical comparison are given.

**Figure 2.** Comparison of the three WOMAC subscales for pain, stiffness and functional disability between CHECK and OAI and their subpopulations at baseline. Box-whisker plot (median and 25th-75th percentiles) and p values are given. A higher score indicates more pain, stiffness, and problems in physical functioning.

**Figure 3.** Comparison of the PCS (physical component summary scale) and MCS (mental component summary scale) of the SF36/12 between CHECK and OAI and their subpopulations at baseline. Box-whisker plot (median and 25th-75th percentiles) and p values are given. A higher score indicates a better health related quality of life.

**Figure 4.** Schematic presentation of the hypothesis as put forward in the discussion explaining the (apparent) discrepancy between both cohorts with respect to pain and joint damage.

References

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Figure 2. Comparison of the three WOMAC subscales for pain, stiffness and functional disability between CHECK and OAI and their subpopulations at baseline. Box-whisker plot (median and 25th-75th percentiles) and p values are given. A higher score indicates more pain, stiffness, and problems in physical functioning.
Figure 3. Comparison of the PCS (physical component summary scale) and MCS (mental component summary scale) of the SF36/12 between CHECK and OAI and their subpopulations at baseline. Box-whisker plot (median and 25th-75th percentiles) and p values are given. A higher score indicates a better health related quality of life.
Figure 4. Schematic presentation of the hypothesis as put forward in the discussion explaining the (apparent) discrepancy between both cohorts with respect to pain and joint damage.