

PHYSIOTHERAPY

TITLE PAGE

Informative Title: Does physical activity change following hip and knee replacement? Matched case-control study evaluating Physical Activity Scale for the Elderly data from the Osteoarthritis Initiative.

Concise Title: Physical activity post-hip and knee replacement

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ABSTRACT

Objectives: To determine whether physical activity measured using the Physical Activity Scale for the Elderly (PASE), changes during the initial 24 months post-total hip (THR) or knee replacement (TKR), and how this compares to a matched non-arthroplasty cohort.

Design: Case-controlled study analysis of a prospectively collected dataset.

Setting: USA community-based.

Participants: 116 people post-THR, 105 people post-TKR compared to 663 people who had not undergone THR or TKR, or had hip or knee osteoarthritis. Cohorts were age-, gender- and BMI-matched.

Main outcome measures: Physical activity assessed using the 12-item PASE at 12 and 24 months post-operatively.

Results: There was no significant difference in total PASE score between pre-operative to 12 months (mean: 136 vs. 135 points; $p=0.86$) or 24 months following THR (mean: 136 vs 132 points; $p=0.95$). Whilst there was no significant difference in total PASE score from pre-operative to 12 months post-TKR (126 vs. 121 points; $p=0.93$), by 24 months people following TKR reported significantly greater physical activity (126 vs. 142 points; $p=0.04$). There was no statistically significant difference in physical activity between the normative matched and THR ($p\geq 0.14$) or TKR ($p\geq 0.06$) cohorts at 12 or 24 months post-joint replacement.

Conclusions: Physical activity is not appreciably different to pre-operative levels at 12 or 24 months post-THR, but was greater at 24 months following TKR. Health promotion strategies are needed to encourage greater physical activity participation following joint replacement, and particularly targeting those who undergo THR.

CONTRIBUTION OF THE PAPER

- There is no significant change in physical activity from before to 24 months after THR.
- Physical activity following TKR increases from pre-operatively levels, but only after 24 months post-operatively.
- Physiotherapists should consider strategies to better support people, both those following THR and those without joint replacement, to be more physically active.

Keywords: Lower limb; joint replacement; physical activity; community; health promotion

INTRODUCTION

Total hip (THR) and knee (TKR) replacement are two of the most common orthopaedic surgery procedures undertaken worldwide [1]. These procedures are projected to increase annually to an estimated 95,877 THRs and 118,666 TKRs by 2035 in the United Kingdom alone [2]. Whilst a proportion of these procedures are performed for younger people, within the literature, the mean patient age ranges from 68 to 74 years [1,3]. The aim of both THR and TKR is to reduce the pain and disability associated with a degenerative joint pre-operatively, to facilitate greater quality of life and increased physical activity engagement [5].

Physical activity is a generic term which encompasses active living, active transport, and sports and exercise [5]. Active living includes the participation in household and social activities such as gardening, housework, shopping and recreational pursuits [6]. Active transport is defined as the expenditure of physical energy by an individual to move from one place to another [7]. Sports and exercise pursuits which are most commonly undertaken by this population post-joint replacement include walking, cycling, golf and swimming [8,9].

Physical inactivity is a leading cause of mortality worldwide [10]. It has been estimated that between 6% to 10% of all deaths from non-communicable diseases are attributed to physical inactivity [11]. There is an established body of literature supporting the adoption and maintenance of physical activity in individual's lifestyles. Physical and mental health benefits associated with undertaking regular physical activity have included reduced risk of cardiovascular diseases and diabetes, enhanced mental wellbeing with decreased anxiety and depressive symptoms, and lower risk of some cancers [10].

Hypothetically physical activity should increase following THR and TKR through pain relief [12]. However recent research suggests that this may not be the case [13-18]. Furthermore, individuals may have considerable reluctance to be more physically active following lower limb joint replacement [12,13]. However the current evidence-base has focused on assessing changing participatory levels of sports and exercise, using general physical activity questionnaires rather than tools which are directed

towards people aged 60 and older, or have assessed global physical activity with accelerometry, making it difficult to distinguish what forms of physical activity may (or may not) change [13-18]. It also remains unclear how physical activity relates to the normative, non-joint pathology population. As physiotherapists have a key role both in promoting physical activity [19] and in the rehabilitation of people post-joint replacement [20], it is important that these clinicians are aware whether (or not) people following THR or TKR are at risk of being insufficiently physically active.

The purpose of this study was to determine whether physical activity levels change from pre-operative to 24 months post-joint replacement when measured using the Physical Activity Scale for the Elderly (PASE) [21]. Secondly, we aimed to determine whether there was a difference in physical activity engagement between people who undergo THR or TKR (baseline, 12 months and 24 months post-operatively) and an age-, gender- and BMI-comparable cohort who have not joint pathology nor joint replacement, to ascertain whether there is a difference in physical activity compared to the normative population.

MATERIALS AND METHODS

Ethics approval

Ethical approval was granted by the Committee on Human Research, University of California, San Francisco (IRB approval number 10-00532; Approved 10th March 2015). All participants provided written informed consent prior to enrolling on the study.

Osteoarthritis Initiative Dataset

Data used in the preparation of this article were obtained from the Osteoarthritis Initiative (OAI) database. This is available for public access at <http://www.oai.ucsf.edu/>. The OAI is a large, multi-centre (four sites across the USA), longitudinal cohort study originally designed to investigate the role of biomarkers in the development and progression of knee osteoarthritis.

Baseline data were collected between February 2004 to May 2006 from community-dwelling volunteers who were considered at risk of developing knee osteoarthritis. Data were longitudinally collected at 12, 24, 30, 36, 48, 60, 72 and 84-month follow-up intervals. For this analysis, we identified data on: demographic characteristics, medical morbidities (prevalence of type two diabetes, Charleston Comorbidity Score [22]; Centre for Epidemiologic Studies depression (CES-D) score) [23], musculoskeletal health (joint pain), and the PASE [21] reported pre-THR and TKR, and then at 12 and 24-month follow-up intervals. These intervals were selected to ensure that it was possible to compare physical activity participation before joint replacement, at an early interval when recovery typically plateaus, and a later phase when post-operative recovery would have ceased [24]. The PASE is a self-administered questionnaire designed for people aged 65 years and over, and consists of 12 questions regarding the duration, frequency, exertion level, and amount of physical activity undertaken during a seven-day period [21]. It assesses a breadth of physical activity pursuits including household tasks, occupational activities, active transport and sports and exercise [26]. The specific subsections of the PASE are: muscle strength/endurance, strenuous sports, moderate sports, light sports, jobs involving standing or walking, walking, lawn work or yard care, caring for another person, home repairs, health housework, light housework and outdoor gardening [21]. It has demonstrated good validity to other forms of physical activity assessment in older people [25-28] and good test-re-test reliability when assessed as telephone and postal versions [21]. The minimal detectable change for the total PASE score is 87 points [29].

Participants

Using the OAI dataset, we identified all people who underwent a unilateral THR or TKR. We excluded participants who had undergone joint replacement for trauma. We excluded participants with missing data. We identified a 'control' cohort of participants who did not have a THR or TKR or a clinical diagnosis of hip or knee osteoarthritis before or during the follow-up assessments. Three controls were matched per case. Controls were matched to cases on: sex, date of birth (± 3 years) and BMI (± 2 kg/m²).

Data Analysis

Descriptive statistics were undertaken with frequencies and percentages or mean and standard deviation values for the THR, TKR and matched-control groups at each follow-up interval. The normality of the dataset was analysed using the Shapiro-Wilk test.

To determine whether there was a difference between the case and controls for PASE or PASE subsections, a multilevel model was constructed to compare the difference between the two groups at each assessment interval. To minimise the risk of multicollinearity and multiple testing, the PASE subsections of frequency of sports and recreational activities and duration of sports and recreational activity participation were combined to form two single variables for the model. Similarly the variables for house-based work and tasks including: caring for an individual at home, housework, home repairs and gardening were combined into a single variable for the model.

For each reported analysis, the outcome was adjusted for in the statistical model by the explanatory variables age, gender, body mass index (BMI), self-reported depression, presence of low back or neck pain and the frequency of knee pain. Random intercept models were compared to random intercept and slope models. In all cases, the random intercept models were preferred (due to model parsimony/best fit tests). A $p < 0.05$ was deemed statistically significant. All analyses were performed in the R Statistics program (R Core Team (2015). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.) using the 'lmer' function in the 'lme4' package.

RESULTS

Cohort

From the 4796 participants in the OAI cohort, a total of 116 participants post-TKR, and 105 post-THR were eligible. These were compared to a matched cohort of 663 participants who had not undergone joint replacement.

The baseline/pre-operative characteristics are presented in **Table 1**. As this illustrates, the cohort characteristics across the three groups were similar. The exception to this was the prevalence of diabetes which was higher in the matched cohort (10%) compared to the THR (6%) or TKR (2%) cohorts.

Changes in physical activity over time within THR cases

There was no statistically significant difference in total PASE score between pre-operative to 12 month (mean: 136 vs 135 points; $p=0.86$) or 24 month intervals (mean: 136 vs 132 points; $p=0.95$). As demonstrated in **Table 2**, there was no difference between pre-operative to 12 month or 24 month follow-up assessments for PASE subsections including: frequency of sitting ($p=0.27$; $p=0.10$), duration of sitting time ($p=0.18$; $p=0.53$), frequency of walking ($p=0.38$; $p=0.44$), and duration of light, moderate and strenuous sports performed ($p=0.25$; $p=0.82$). Similarly, there was no significant difference for performing housework, home repairs, Lawn or garden work, gardening or caring for another person at 12 months or 24 months compared to pre-operatively ($p=0.88$; $p=0.18$). There was a significant difference for four subsections at 12 months which was not evident at 24 months. These included the number of people who worked being significantly lower at 12 months ($p=0.04$; $p=0.007$); the duration of walking ($p<0.01$; $p=0.86$), and the frequency to which people participated in light, moderate and strenuous sports ($p=0.02$; $p=0.35$). The frequency and duration to which people participated in muscle strengthening exercises was significantly greater 12 months post-operatively ($p=0.04$; $p=0.01$), but not different at 24 months ($p=0.56$; $p=0.82$). Whilst the duration to which people worked was not significantly different at 12 months post-THR compared to pre-operatively ($p=0.26$), this was lower by a statistically significant level at 24 months ($p<0.01$).

Comparison of physical activity levels between THR cases and controls

As **Figure 1** illustrates, there was no difference between the THR and control cohorts for total PASE score at 12 months (mean: 135 vs 152 points; $p=0.87$) or 24 months post-operatively (mean: 136 vs 147 points; $p=0.38$). As reported in **Supplementary Table 1**, there was no statistically significant difference

between cases and controls at 12 or 24 months for PASE subsections: frequency of work at home (p=0.73; p=0.23), frequency of sitting (p=0.63; p=0.19), duration of sitting (p=0.71; p=0.50), frequency of walking (p=0.67; p=0.05), duration of walking (p=0.79; p=0.14), frequency of light, moderate and strenuous sport participation (p=0.08; p=0.93) or duration of light, moderate or strenuous sports (p=0.78; p=0.25). Whilst at 12 months post-operatively there was a difference in physical activity, where the control cohort demonstrated higher physical activity levels as measured by frequency and amount of muscle strength exercises performed (p<0.01; p<0.01), this was not statistically significant at 24 months (p=0.42; p=0.93). Whilst there was no statistically significant difference in the number of participants in work (60% vs 70%; p=0.38) or duration of work per week (mean: 17 hours vs 17 hours; p=0.64) at 12 months, this was significantly greater in the control cohort at 24 months (43% vs 67%; p=0.01; 15 hours vs 16 hours; p<0.01).

Changes in physical activity over time within TKR cases

Whilst there was no statistically significant difference in total PASE score from pre-operative to 12 months (126 vs 121 points; p=0.93), by 24 months people following TKR reported significantly greater physical activity following TKR (126 vs 142 points; p=0.04). As presented in **Table 2**, there was a significant increase in physical activity between pre-operative to 12 months post-operatively when assessed by frequency of work at home (p<0.01), paid work (69% vs 52%; p=0.01), duration of work (35.2 hours vs 34.6 hours; p=0.02), frequency of walking (p<0.01), frequency of light, moderate and strenuous sports (p<0.01) frequency of muscle strengthening exercises (p<0.01), and the duration of muscle strengthening exercises performed (p=0.04). This difference was maintained at 24 months for frequency of work at home (p<0.01), frequency of walking (p=0.04), and frequency of light, moderate and strenuous sports (p=0.03). There was no statistically significant difference between pre-operative and 12 month or 24 month follow-up data for PASE subsections including: frequency of sitting (p=0.44 p=0.93), duration of sitting daily (p=0.30; p=0.60), duration of walking daily (p=0.91; p=0.79) or duration of light, moderate or strenuous sports performed daily (p=0.16; p=0.11).

Comparison of physical activity levels between TKR cases and controls

As **Figure 2** illustrates, there was no significant difference between the TKR case and control cohorts for total PASE score at 12 months (126 points vs 152 points; $p=0.16$) or 24 months post-TKR (144 points vs 147 points; $p=0.78$). As demonstrated in **Supplementary Table 2**, there was no statistically significant difference between cases and controls at 12 or 24 months post-operatively for the PASE subsections: frequency of work at home ($p=0.31$; $p=0.21$), frequency of sitting ($p=0.28$; $p=0.76$), duration of sitting ($p=0.45$; $p=0.88$), frequency of walking ($p=0.51$; $p=0.18$), duration of walking ($p=0.61$; $p=0.24$), duration of light, moderate and strenuous sports ($p=0.55$; $p=0.44$) or the duration ($p=0.05$; $p=0.14$) or frequency ($p=0.05$; $p=0.11$) of paid work. There was a difference in physical activity at 12 months post-operatively but not at 24 months, where those following TKR reported higher physical activity compared to controls when measured by frequency of participation in light, moderate and strenuous sports ($p=0.04$; $p=0.40$), and the frequency ($p<0.01$; $p=0.09$) and duration of muscle strength exercises performed ($p<0.01$; $p=0.64$). No PASE subsection measures were statistically different between the TKR and controls at the 24-month follow-up interval (**Supplementary Table 2**).

Explanatory variables for physical activity change within THR and TKR cases

Age was a consistent explanatory variable for physical activity where increasing age was significantly associated with lower total PASE score for THR and TKR ($p<0.01$), less frequent working at home for THR ($p=0.02$), less likelihood to work following THR or TKR ($p<0.01$), and fewer hours worked following THR or TKR ($p<0.01$). Gender was a significant explanatory variable for frequency of work at home where females returned to work less often and for a shorter period of time after TKR compared to males ($p=0.004$; $p=0.01$), and frequency of walking following TKR, where females walked less than males ($p=0.02$). Following TKR, women less frequently participated in sports ($p=0.007$), performed less sporting activities daily ($p=0.007$), performed muscle strengthening exercises less frequently and for less duration ($p<0.01$; $p<0.01$) and had lower total PASE score ($p<0.01$) compared to men. BMI was a significant explanatory variable for duration of sitting per day, where those with a higher BMI were more likely to sit for longer following THR and TKR ($p=0.02$; $p<0.01$). Self-reported depression was a significant explanatory variable for total PASE score and three subsections following THR. Those

who reported depressive symptoms were less likely to work ($p=0.004$), undertook fewer hours of work ($p<0.001$), less frequently participated in sports ($p=0.05$) and reported a lower total PASE score ($p=0.001$). The variables of presence of low back pain and the frequency of knee pain were not significant explanatory variables for total PASE score or PASE subsection outcomes following THR, although the presence of spinal pain was associated with a lower frequency of return to work following TKR ($p=0.04$).

DISCUSSION

These results of this study indicate that physical activity does not significantly change from pre- to 24 months post-THR. There was an overall increase in physical activity at 24 months post-TKR. There was no statistically significant difference in physical activity engagement between people following either THR or TKR compared to people who have not undergone a joint replacement. Accordingly the level of physical activity engagement may be interpreted as the same as expected with advancing age.

The results of this analysis agree with a recent systematic review investigating physical activity post-joint replacement [30]. This concluded no significant change occurs in physical activity levels pre- versus post-THR. Kahn and Schwarzkopf [18] reported similar findings following TKR. Conversely Jones et al [16] reported an increase in physical activity following joint replacement for 36 leisure activities. The difference between these findings may be attributed to the difference in type of physical activity pursuits measured. Whilst our cohort's physical activity engagement was measured by active living, active transport and sport and recreational pursuits, Jones et al [16] evaluated a wider range of sporting and leisure activities than those assessed in the PASE. Nonetheless, the weight of evidence previously represented appears to support the findings from this OAI cohort.

By analysing the THR and TKR results against a normative, matched cohort, it was possible to identify that whilst physical activity did not increase post-joint replacement, particularly THR, it was comparable to the normative population. This highlights two important points. Firstly, THR and TKR both demonstrated the capability to increase in some forms of physical activity compared to a matched

cohort. This therefore provides evidence that THR and TKR can improve people's physical activity capacity to those of their non-joint replacement/non-osteoarthritis peers. Secondly, whilst the results indicate that those post-joint replacement may be at greater risk of physical inactivity compared to the normative population, it is not possible to ascertain from the data whether either cohort met recommended public health levels of physical activity. In England alone, approximately 60% of men and 70% of women are insufficiently active to benefit their health [31]. Accordingly, whilst the THR and TKR cohorts returned to similar physical activity levels compared to the matched cohort, this population may still have significant need for support to increase physical activity. Given this, consideration should be made as to whether there is currently sufficient guidance provided to patients to be active post-operatively.

These results question the previously held belief that physical activity increases following joint replacement. Whilst THR and TKR can reduce pain and stiffness [32], these clinical improvements were not conferred with changes in all measures of physical activity either at home or within the community. Smith et al [12] explored why people following THR or TKR may not engage in physical activity post-operatively. The most widely reported barrier to physical activity was education on the levels of exercise and activity people could engage in without causing injury to themselves and, particularly, their joint replacement [12]. These results would suggest that interventions to encourage and maintain physical activity which could be delivered by physiotherapists, are still required and should have a functional-bias to physical activity pursuits.

There appears a difference in physical activity engagement between THR to TKR. Those who underwent THR demonstrated an initial increase in physical activity at 12 post-operative months for a small number of measures, whereas this was less evident in the TKR cohort. In contrast, there was evidence of an overall increase in physical activity following TKR, but only at 24 months post-operatively. This difference may be attributed to the difference in clinical outcomes between the two procedures where THR demonstrated better quality of life and functional outcomes compared to TKR [33]. Residual pain and subsequent reduced function reported in 20% to 30% of people following TKR,

may provide a major barrier to physical activity engagement within the first post-operative year [33,34]. Furthermore this could impact on expectations and capabilities which this population have to engage in activities, potentially accounting for the reported differences between these two procedures.

This analysis presented with four potential limitations. Firstly, whilst the OAI dataset provided detailed information on participant characteristics, it did not provide the date surgery was undertaken. Therefore surgery may have theoretically occurred anytime within the follow-up interval. This could not be controlled or accounted for in our analyses as this is the process by which the OAI data were reported. To mitigate this, we analysed data in two subsequent phases, to ensure that change over time did not significantly influence outcome given that functional recovery occurs within six to 12 months post-joint replacement [24]. Secondly, whilst the PASE is a reliable and valid measure of physical activity, it cannot distinguish between the ease to which and quality of movement undertaken during physical activity. Through this, participants may engage in the physical activity levels reported in the PASE, but the ease to which they can do these may substantially differ. Further analyses to verify the PASE findings to other measures of movement may therefore be indicated to explore this further. Thirdly, whilst the PASE has demonstrated good clinimetric properties in some evaluations [35,36], it has also been shown to have standard error of measurement of 31 and a large minimal detectable change of 87 in those with hip osteoarthritis [29] and even less favourable clinimetric properties in those following joint replacement [37,38]. Accordingly, with such a large measurement error for this detectable change, the PASE may not have distinguished measurement error from real change in physical activity for a proportion of the cohort even when one existed. Given that the PASE was the only physical activity measure consistently used in this dataset, and its particular relevance to the older population, this tool may be regarded as appropriate in this instance. Furthermore since the PASE is self-reported, there is a potential risk for the results to be influenced by social desirability bias and recall bias [39]. This may have been of greater effect since all participants with missing data were excluded. Accordingly, these analyses may not reflect the entire joint replacement population, but only those who were compliant in providing full data. Finally, data were collected from 2004 onwards. Whilst there have been advances with the use of accelerated post-operative rehabilitation during this time [40], the post-discharge

rehabilitation of people following joint replacement has not changed [41,42]. Accordingly no adjustment was made to account for this time period.

To conclude, there is limited evidence to suggest that physical activity increases following THR or TKR. However, the level of physical activity engagement is the same as expected with advancing age. Further study exploring interventions delivered by physiotherapists to encourage and maintain physical activity engagement in people following arthroplasty is warranted given the physical and mental health benefits it can offer.

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Conflict of Interest: The authors declare that they have no conflict of interest.

Patient consent Obtained.

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TABLE LEGENDS

Figure 1: Scatter-graph illustrating total PASE score between THR and non-joint replacement cohort pre-operatively, 12 months and 24 months assessments.

Figure 2: Scatter-graph illustrating total PASE score between TKR and non-joint replacement cohort pre-operatively, 12 months and 24 months assessments.

Table 1: Baseline demographic characteristics

Table 2: Frequency of PASE (subsection and total) scores between pre-, 12 and 24 months post-operative for the THR and TKR cohort.

Supplementary Table 1: Analysis results comparing the difference in physical activity change between people who undergo THR and a matched, normative cohort.

Supplementary Table 2: Analysis results comparing the difference in physical activity change between people who undergo TKR and a matched, normative cohort.

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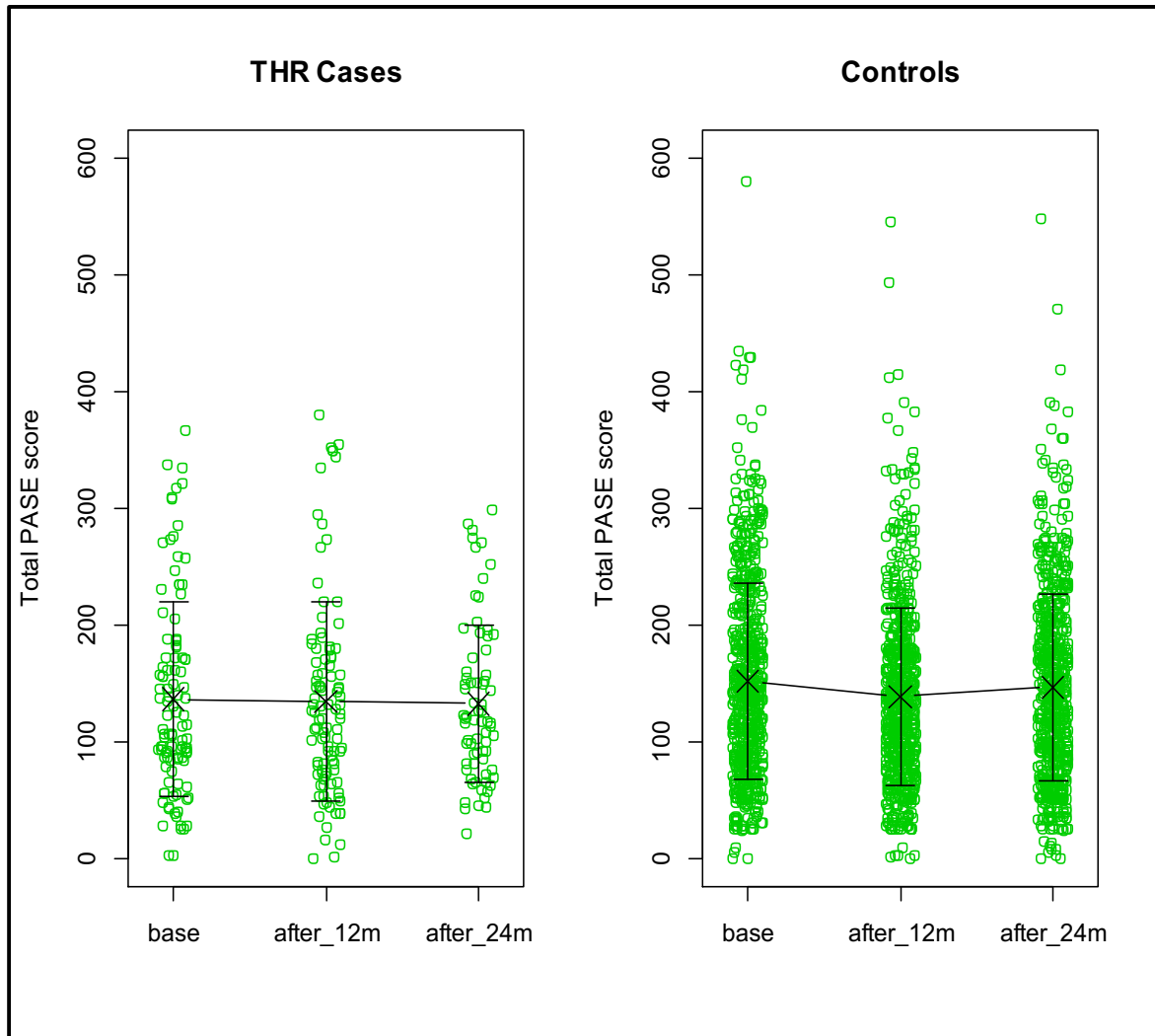
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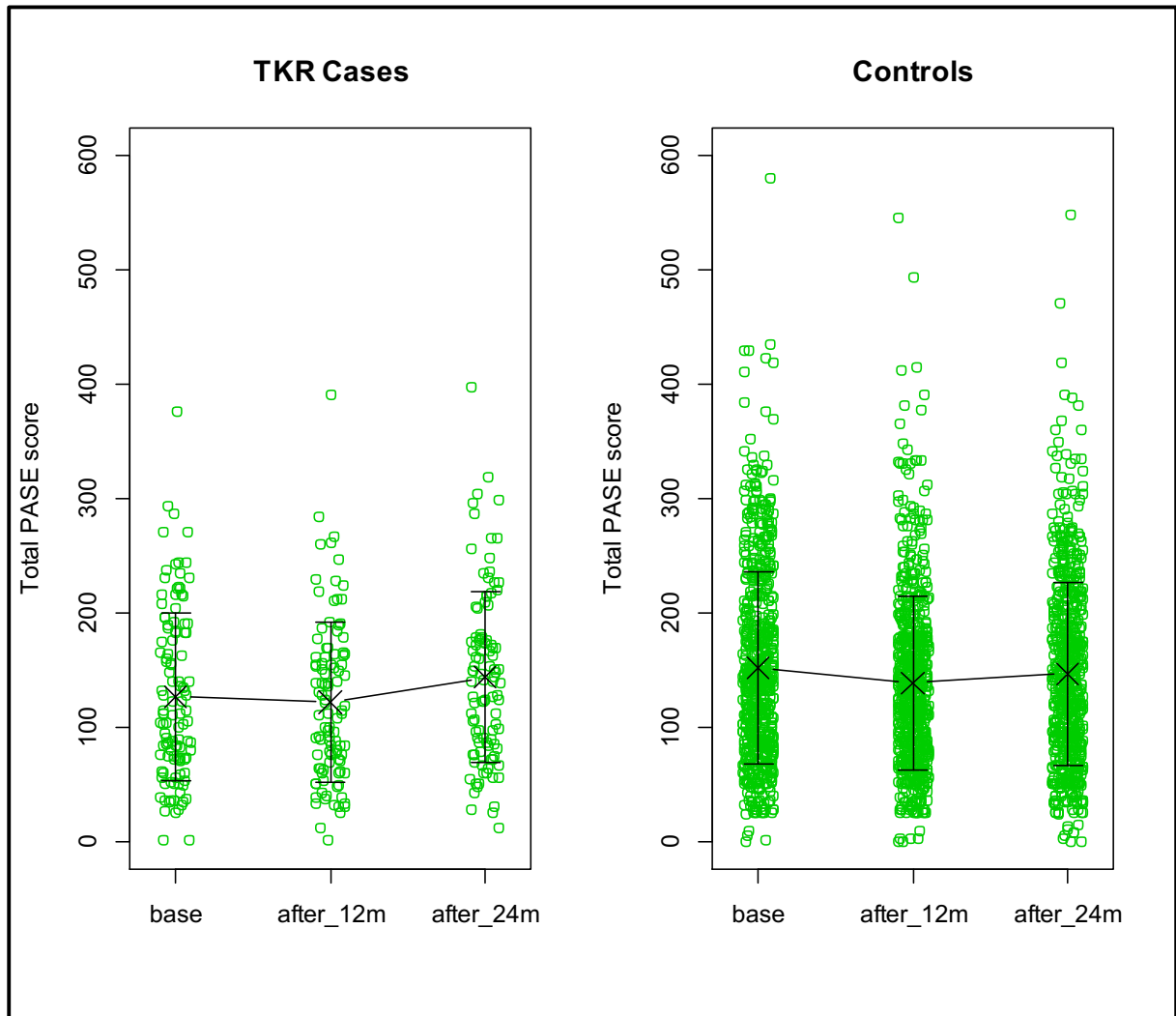
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Figure 1: Scatter-graph illustrating total PASE score between THR and non-joint replacement cohort pre-operatively, 12 months and 24 months assessments.



m – month; PASE – Physical Activity Scale for the Elderly; THR - Total Hip Replacement

Figure 2: Scatter-graph illustrating total PASE score between TKR and non-joint replacement cohort pre-operatively, 12 months and 24 months assessments.



m – month; PASE – Physical Activity Scale for the Elderly; THR - Total Hip Replacement

Table 1: Baseline demographic characteristics

	THR	TKR	Matched Cohort
N	105	116	663
Age (Mean; SD)	68.2 (9.3)	67.3 (8.3)	68.0 (7.3)
Gender (m/f; %)	45/60 (42.9/57.1)	48/68 (41.4/ 58.6)	277/385 (41.8/58.2)
Race (Y; %)			
1: Other non-white	0: 1 (1.0)	0: 2 (1.7)	0: 13 (2.0)
2: White or Caucasian	1: 87 (83.7)	1: 92 (80.0)	1: 538 (81.4)
3: Black or African American	2: 15 (14.3)	2: 19 (16.5)	2: 109 (16.5)
4: Asian	3: 1 (1.0)	3: 2 (1.8)	3: 1 (0.2)
BMI (Mean; SD)	28.8 (4.2)	30.1 (4.9)	28.8 (4.1)
Either Knee Pain (Y; %)	26 (24.8)	116 (100.0)	101 (15.3)
Either hip pain (Y; %)	105 (100.0)	42 (36.2)	457 (68.9)
Back Pain lasting a minimum of 30 days (Y; %)	69 (65.7)	55 (47.4)	371 (56.0)
Shoulder pain (Joints; %)	53 (25.2)	43 (18.5)	149 (22.5)
Elbow pain (Joints; %)	11 (5.3)	7 (3.0)	39 (5.9)
Wrist pain (Joints; %)	20 (9.5)	17 (7.4)	56 (8.4)
Hand pain (Joints; %)	56 (26.8)	64 (27.6)	161 (24.3)
Ankle pain (Joints; %)	14 (12.6)	20 (8.6)	60 (9.0)
Foot pain (Joints; %)	24 (11.5)	14 (6.0)	78 (11.8)
Neck pain (Y; %)	19 (18.1)	17 (14.7)	110 (16.6)
Diabetes (Y; %)	6 (5.7)	2 (1.7)	63 (9.8)
Charlson Comorbidity Score (Mean; SD)	0.51 (1.00)	0.42 (0.89)	0.49 (0.95)
CES-D Depression Score (Mean; SD)	8.95 (8.64)	6.09 (5.54)	5.57 (6.27)

BMI – body mass index; CES-D – Centre for Epidemiologic Studies Depression Scale; f – female; m – male; SD- standard deviation; THR – total hip replacement; TKR – total knee replacement; Y - Yes

Table 2: Frequency of PASE (subsection and total) scores between pre-, 12 and 24 months post-operative for the THR and TKR cohort.

PASE Subsection Item or Total	THR					TKR				
	Pre-operative	12 months	P-Value	24 months	P-Value	Pre-operative	12 months	P-Value	24 months	P-Value
Sitting, past 7 days (N; %)										
0: Never	1 (1.0)	0 (0.0)	0.267	1 (1.4)	0.104	2 (1.7)	0 (0.0)	0.435	0 (0.0)	0.927
1: seldom (1-2 days)	0 (0.0)	4 (3.9)		1 (1.4)		2 (1.7)	1 (1.0)			
2: sometimes (3-4 days)	7 (6.7)	11 (10.8)		10 (13.9)		7 (6.0)	8 (7.8)			
3: Often (5-7 days)	97 (92.4)	87 (85.3)		60 (83.3)		105(90.6)	93 (91.2)			
Sitting, hours per day, past 7 days (N; %)										
1: less than 1 hour	1 (1.0)	0 (0.0)	0.176	0 (0.0)	0.532	2 (1.7)	1 (1.0)	0.304	2 (2.0)	0.603
2: 1 but less than 2 hours	15 (14.4)	15 (14.9)		14 (19.7)		21 (18.3)	13 (12.9)			
2: 2 to 4 hours	57 (54.8)	47 (46.5)		36 (50.7)		60 (52.2)	62 (61.4)			
4: more than 4 hours	31 (29.8)	39 (38.6)		21 (29.6)		31 (26.9)	24 (23.7)			
Walking, past 7 days (N; %)										
0: Never	27 (25.7)	22 (21.6)	0.379	14 (19.4)	0.445	40 (34.5)	20 (19.8)	<0.001	27 (26.2)	0.035
1: seldom (1-2 days)	14 (13.3)	20 (19.6)		19 (26.4)		24 (20.7)	14 (13.9)			
2: sometimes (3-4 days)	27 (25.7)	18 (17.6)		18 (25.0)		15 (12.9)	28 (27.7)			
3: Often (5-7 days)	37 (35.2)	42 (41.2)		21 (29.2)		37 (31.9)	39 (38.6)			
Walking, hours per day, past 7 days (N; %)										
1: less than 1 hour	50 (64.1)	45 (56.3)	0.001	34 (60.7)	0.855	46 (59.7)	48 (58.5)	0.913	40 (52.6)	0.791
2: 1 but less than 2 hours	21 (26.9)	19 (23.8)		16 (28.6)		25 (32.5)	27 (32.9)			
2: 2 to 4 hours	6 (7.7)	14 (17.5)		6 (10.7)		6 (7.8)	7 (8.6)			
4: more than 4 hours	1 (1.3)	2 (2.4)		0 (0.0)		0 (0.0)	0 (0.0)			
Light sport/recreation, past 7 days (N; %)										
0: Never	93 (88.6)	86 (84.3)	0.018	63 (87.5)	0.348	99 (86.1)	84 (82.4)	0.002	87 (84.5)	0.028
1: seldom (1-2 days)	7 (6.7)	12 (11.8)		7 (9.7)		12 (10.4)	13 (12.7)			
2: sometimes (3-4 days)	4 (3.8)	4 (3.9)		2 (2.8)		3 (2.6)	5 (4.9)			
3: Often (5-7 days)	1 (1.0)	0 (0.0)		0 (0.0)		1 (0.9)	0 (0.0)			
Light sport/recreation, hours per day, past 7 days (N; %)										
1: less than 1 hour	1 (8.3)	4 (25.0)	0.250	2 (22.2)	0.816	3 (17.6)	5 (27.8)	0.158	0 (0.0)	0.107
2: 1 but less than 2 hours	1 (8.3)	0 (0.0)		0 (0.0)		3 (17.6)	4 (22.2)			
2: 2 to 4 hours	6 (50.0)	7 (43.8)		6 (66.7)		8 (47.2)	6 (33.3)			
4: more than 4 hours	4 (33.4)	5 (31.2)		1 (11.1)		3 (17.6)	3 (16.7)			
Moderate sport/recreation, past 7 days (N; %)										
0: Never	92 (87.6)	97 (95.1)	0.018	68 (94.4)	0.348	101 (87.8)	96 (85.7)	0.002	90 (87.4)	0.028
1: seldom (1-2 days)	9 (8.6)	3 (2.9)		2 (2.8)		9 (7.8)	6 (5.4)			
2: sometimes (3-4 days)	3 (2.9)	2 (2.0)		1 (1.4)		4 (3.5)	0 (0.0)			

3: Often (5-7 days)	1 (0.9)	0 (0.0)		1 (1.4)		1 (0.9)	0 (0.0)		1 (0.9)	
Moderate sport/recreation, hours per day, past 7 days (N; %)										
1: less than 1 hour	1 (7.7)	0 (0.0)	0.250	1 (11.1)	0.816	5 (33.3)	1 (16.7)	0.158	5 (38.5)	0.107
2: 1 but less than 2 hours	6 (46.2)	3 (60.0)		1 (11.1)		6 (40.0)	2 (33.3)		2 (15.4)	
2: 2 to 4 hours	4 (30.8)	1 (20.0)		3 (33.3)		3 (20.0)	3 (50.0)		6 (46.1)	
4: more than 4 hours	2 (15.3)	1 (20.0)		4 (45.5)		1 (6.7)	0 (0.0)		0 (0.0)	
Strenuous sport/recreation, past 7 days (N; %)										
0: Never	80 (76.2)	67 (65.7)	0.018	53 (73.6)	0.348	87 (75.7)	64 (62.7)	0.002	68 (66.0)	0.003
1: seldom (1-2 days)	10 (9.5)	9 (8.8)		3 (4.2)		11 (9.6)	11 (10.8)		9 (8.7)	
2: sometimes (3-4 days)	9 (8.6)	17 (16.7)		10 (13.9)		11 (9.6)	18 (17.6)		19 (18.4)	
3: Often (5-7 days)	6 (5.7)	9 (8.8)		6 (8.3)		6 (5.1)	9 (8.9)		7 (6.9)	
Strenuous sport/recreation, hours per day, past 7 days (N; %)										
1: less than 1 hour	14 (56.0)	16 (47.1)	0.250	7 (36.8)	0.816	15 (53.6)	24 (63.2)	0.158	18 (51.4)	0.107
2: 1 but less than 2 hours	8 (32.0)	15 (44.1)		9 (47.4)		8 (28.6)	11 (28.9)		12 (34.3)	
2: 2 to 4 hours	2 (8.0)	3 (8.8)		3 (15.8)		5 (17.8)	3 (7.9)		5 (14.3)	
4: more than 4 hours	1 (4.0)	0 (0.0)		0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	
Muscle strength/endurance, past 7 days (N; %)										
0: Never	54 (51.4)	42 (41.2)	0.036	39 (54.2)	0.561	62 (53.4)	41 (40.2)	0.003	52 (50.5)	0.165
1: seldom (1-2 days)	17 (16.2)	13 (12.7)		10 (13.9)		16 (13.8)	15 (14.7)		9 (8.7)	
2: sometimes (3-4 days)	19 (18.1)	31 (30.4)		7 (9.7)		23 (19.8)	27 (26.5)		23 (22.3)	
3: Often (5-7 days)	15 (14.3)	16 (15.7)		16 (22.2)		15 (13.0)	19 (18.6)		19 (18.5)	
Muscle strength/endurance, hours per day, past 7 days (N; %)										
1: less than 1 hour	39 (76.5)	41 (68.3)	0.010	21 (55.3)	0.818	32 (59.3)	40 (65.6)	0.037	35 (68.6)	0.780
2: 1 but less than 2 hours	11 (21.6)	16 (26.7)		16 (42.1)		19 (35.2)	18 (29.5)		13 (21.3)	
2: 2 to 4 hours	1 (1.9)	3 (5.0)		1 (2.6)		3 (5.5)	3 (4.9)		3 (4.9)	
4: more than 4 hours	0 (0.0)	0 (0.0)		0 (0.0)		0 (0.0)	0 (0.0)		0 (0.0)	
Light housework, past 7 days (N; %)	95 (90.5)	95 (90.5)	0.882	76 (66.7)	0.183	109 (94.0)	86 (74.1)	0.001	96 (82.8)	0.009
Heavy housework, past 7 days (N; %)	66 (62.9)	61 (58.1)	0.882	50 (47.6)	0.183	77 (66.4)	63 (54.3)	0.001	67 (57.8)	0.009
Home repairs, past 7 days (N; %)	21 (20.0)	14 (13.3)	0.882	21 (20.0)	0.183	12 (10.3)	17 (14.7)	0.001	23 (19.8)	0.009
Lawn work or yard work, past 7 days (N; %)	51 (48.6)	46 (43.8)	0.882	31 (29.5)	0.183	54 (46.6)	44 (42.7)	0.001	52 (50.5)	0.009
Outdoor gardening, past 7 days (N; %)	43 (41.0)	43 (41.0)	0.882	25 (23.8)	0.183	44 (37.9)	39 (37.9)	0.001	48 (46.6)	0.009
Caring for another person, past 7 days (N; %)	20 (19.0)	27 (25.7)	0.882	22 (21.0)	0.183	26 (22.4)	18 (17.5)	0.001	30 (29.4)	0.009
Work for pay or volunteer, past 7 days (N; %)	68 (64.8)	63 (60.0)	0.036	45 (42.9)	0.068	69 (59.5)	52 (50.2)	0.009	59 (57.3)	0.806
Work for pay or volunteer, hours in past 7 days (Mean/SD)	33.0 (19.9)	36.0 (16.5)	0.256	27.8 (14.9)	0.002	35.2 (14.7)	34.6 (17.6)	0.019	35.8 (15.9)	0.657
Total PASE score (Mean/SD)	136.4 (83.5)	134.5 (85.2)	0.859	132.3 (67.8)	0.951	126.2 (74.0)	120.5 (69.6)	0.925	142.2 (74.2)	0.037

N – Number of cases; PASE – physical activity scale for the elderly; SD – standard deviation; THR – total hip replacement; TKR – total knee replacement–

NB: For each reported analysis, the outcome was adjusted for in the statistical model by the explanatory variables age, gender, body mass index (BMI), self-reported depression, presence of low back or neck pain and the frequency of knee pain.

Supplementary Table 1: Analysis results comparing the difference in physical activity change between people who undergo THR and a matched, normative cohort.

PASE Subsection Item or Total	Pre-Operative			12 Months Post-Operative			24 Months Post-operative		
	THR	Matched-Cohort	P-Value	THR	Matched-Cohort	P-Value	THR	Matched-Cohort	P-Value
Sitting, past 7 days (N; %)									
0: Never	0 (0.0)	4 (0.6)	0.368	0 (0.0)	5 (0.8)	0.632	1 (1.0)	1 (0.2)	0.190
1: seldom (1-2 days)	4 (3.9)	15 (2.3)		4 (3.9)	14 (2.1)		0 (0.0)	18 (2.7)	
2: sometimes (3-4 days)	11 (10.8)	56 (8.5)		11 (10.8)	56 (8.5)		7 (6.7)	54 (8.2)	
3: Often (5-7 days)	87 (85.3)	584 (88.6)		87 (85.3)	584 (88.6)		97 (92.3)	585 (88.9)	
Sitting, hours per day, past 7 days (N; %)									
1: less than 1 hour	0 (0.0)	24 (3.7)	0.791	0 (0.0)	27 (4.1)	0.705	1 (1.0)	19 (2.9)	0.495
2: 1 but less than 2 hours	15 (14.9)	99 (15.2)		15 (14.9)	119 (18.2)		15 (14.4)	125 (19.1)	
2: 2 to 4 hours	47 (46.5)	311 (47.6)		47 (46.5)	309 (47.3)		57 (54.8)	310 (47.4)	
4: more than 4 hours	39 (38.6)	219 (33.5)		39 (38.6)	198 (30.4)		31 (29.8)	200 (30.6)	
Walking, past 7 days (N; %)									
0: Never	22 (21.6)	124 (18.8)	0.256	22 (21.6)	118 (17.9)	0.674	27 (25.7)	130 (19.8)	0.054
1: seldom (1-2 days)	20 (19.6)	118 (17.9)		20 (19.6)	137 (20.7)		14 (13.3)	110 (16.8)	
2: sometimes (3-4 days)	18 (17.6)	136 (20.6)		18 (17.6)	140 (21.2)		27 (25.7)	149 (22.6)	
3: Often (5-7 days)	42 (41.2)	281 (42.6)		42 (41.2)	266 (40.2)		37 (35.2)	269 (40.8)	
Walking, hours per day, past 7 days (N; %)									
1: less than 1 hour	45 (56.3)	291 (54.4)	0.003	45 (56.3)	281 (51.7)	0.789	50 (64.1)	288 (54.5)	0.139
2: 1 but less than 2 hours	19 (23.8)	180 (33.6)		19 (23.7)	195 (35.9)		21 (26.9)	182 (34.5)	
2: 2 to 4 hours	14 (17.5)	47 (8.8)		14 (17.5)	48 (8.8)		6 (7.7)	50 (4.5)	
4: more than 4 hours	2 (2.5)	17 (3.2)		2 (2.5)	19 (3.5)		1 (1.3)	8 (1.5)	
Light sport/recreation, past 7 days (N; %)									
0: Never	86 (84.3)	587 (89.1)	0.264	86 (84.3)	578 (87.4)	0.083	93 (88.6)	584 (88.9)	0.925
1: seldom (1-2 days)	12 (11.8)	53 (8.0)		12 (11.8)	54 (8.2)		7 (6.6)	45 (6.8)	
2: sometimes (3-4 days)	4 (3.9)	15 (2.3)		4 (3.9)	21 (3.2)		4 (3.8)	24 (3.7)	
3: Often (5-7 days)	0 (0.0)	4 (0.6)		0 (0.0)	8 (1.2)		1 (1.0)	4 (0.6)	
Light sport/recreation, hours per day, past 7 days (N; %)									
1: less than 1 hour	4 (25.0)	10 (14.3)	0.389	4 (25.0)	19 (23.2)	0.783	1 (8.3)	11 (15.1)	0.246
2: 1 but less than 2 hours	0 (0.0)	15 (21.4)		0 (0.0)	17 (20.7)		1 (8.3)	11 (15.1)	
2: 2 to 4 hours	7 (43.8)	31 (44.3)		7 (43.8)	30 (36.6)		6 (50.0)	33 (45.2)	
4: more than 4 hours	5 (31.2)	14 (20.0)		5 (31.2)	16 (19.5)		4 (33.4)	18 (24.6)	
Moderate sport/recreation, past 7 days (N; %)									
0: Never	97 (95.1)	569 (86.3)	0.264	97 (95.1)	560 (84.7)	0.083	92 (87.6)	582 (88.9)	0.925
1: seldom (1-2 days)	3 (2.9)	62 (9.4)		3 (2.9)	65 (9.8)		9 (8.6)	49 (7.5)	

2: sometimes (3-4 days)	2 (2.0)	23 (3.5)		2 (2.0)	26 (3.9)		3 (2.8)	16 (2.4)	
3: Often (5-7 days)	0 (0.0)	5 (0.8)		0 (0.0)	10 (1.5)		1 (1.0)	10 (1.2)	
Moderate sport/recreation, hours per day, past 7 days (N; %)									
1: less than 1 hour	0 (0.0)	22 (24.4)	0.389	0 (0.0)	30 (30.0)	0.783	1 (7.7)	13 (17.3)	0.246
2: 1 but less than 2 hours	3 (60.0)	34 (37.8)		3 (60.0)	34 (34.0)		6 (46.1)	28 (37.3)	
2: 2 to 4 hours	1 (20.0)	30 (33.3)		1 (20.0)	30 (30.0)		4 (30.8)	28 (37.3)	
4: more than 4 hours	1 (20.0)	4 (4.5)		1 (20.0)	6 (6.0)		2 (15.4)	6 (8.1)	
Strenuous sport/recreation, past 7 days (N; %)									
0: Never	67 (65.7)	472 (71.6)	0.264	67 (65.7)	471 (71.3)	0.083	80 (76.2)	448 (68.2)	0.925
1: seldom (1-2 days)	9 (8.8)	89 (13.5)		9 (8.8)	69 (10.4)		10 (9.5)	90 (13.7)	
2: sometimes (3-4 days)	17 (16.7)	64 (9.7)		17 (16.7)	76 (11.5)		9 (8.6)	75 (11.4)	
3: Often (5-7 days)	9 (8.8)	34 (5.2)		9 (8.8)	45 (6.8)		6 (5.7)	44 (6.7)	
Strenuous sport/recreation, hours per day, past 7 days (N; %)									
1: less than 1 hour	16 (47.1)	89 (47.6)	0.389	16 (47.1)	102 (53.7)	0.783	14 (56.0)	116 (55.1)	0.246
2: 1 but less than 2 hours	15 (44.1)	77 (41.2)		15 (44.1)	70 (36.8)		8 (32.0)	67 (31.9)	
2: 2 to 4 hours	3 (8.8)	18 (9.6)		3 (8.8)	16 (8.4)		2 (8.0)	23 (11.0)	
4: more than 4 hours	0 (0.0)	3 (1.6)		0 (0.0)	2 (1.1)		1 (4.0)	4 (2.0)	
Muscle strength/endurance, past 7 days (N; %)									
0: Never	42 (41.2)	397 (60.2)	0.246	42 (41.2)	382 (57.8)	<0.001	54 (51.4)	354 (53.8)	0.422
1: seldom (1-2 days)	13 (12.7)	106 (16.1)		13 (12.7)	94 (14.2)		17 (16.2)	111 (16.9)	
2: sometimes (3-4 days)	31 (30.4)	92 (14.0)		31 (30.4)	128 (19.4)		19 (18.1)	115 (17.4)	
3: Often (5-7 days)	16 (15.7)	64 (9.7)		16 (15.7)	57 (8.6)		15 (14.3)	78 (11.9)	
Muscle strength/endurance, hours per day, past 7 days (N; %)									
1: less than 1 hour	41 (68.3)	192 (73.6)	0.991	42 (41.2)	382 (57.8)	<0.001	39 (76.4)	220 (72.6)	0.930
2: 1 but less than 2 hours	16 (36.7)	55 (21.1)		13 (12.7)	94 (14.2)		11 (21.6)	77 (25.4)	
2: 2 to 4 hours	3 (5.0)	14 (5.3)		31 (30.4)	128 (19.4)		1 (2.0)	6 (2.0)	
4: more than 4 hours	0 (0.0)	0 (0.0)		16 (16.7)	57 (8.6)		0 (0.0)	0 (0.0)	
Light housework, past 7 days (N; %)	95 (90.5)	611 (92.2)	0.720	95 (90.5)	609 (91.9)	0.733	76 (66.7)	617 (93.1)	0.233
Heavy housework, past 7 days (N; %)	66 (62.9)	464 (70.0)	0.720	61 (58.1)	460 (69.4)	0.733	50 (47.6)	453 (68.3)	0.233
Home repairs, past 7 days (N; %)	21 (20.0)	122 (18.4)	0.720	14 (13.3)	136 (20.5)	0.733	21 (20.0)	110 (16.6)	0.233
Lawn work or yard work, past 7 days (N; %)	51 (48.6)	304 (45.9)	0.720	46 (43.8)	307 (46.3)	0.733	31 (29.5)	309 (46.6)	0.233
Outdoor gardening, past 7 days (N; %)	43 (41.0)	228 (34.4)	0.720	43 (41.0)	227 (34.2)	0.733	25 (23.8)	241 (36.3)	0.233
Caring for another person, past 7 days (N; %)	20 (19.0)	193 (29.1)	0.720	27 (25.7)	204 (30.8)	0.733	22 (21.0)	192 (29.0)	0.233
Work for pay or volunteer, past 7 days (N; %)	68 (64.8)	408 (61.5)	0.022	63 (60.0)	467 (70.4)	0.381	45 (42.9)	446 (67.3)	0.011
Work for pay or volunteer, hours in the past 7 days (Mean/SD)	33.0 (19.9)	31.8 (17.0)	0.013	36.0 (16.5)	36.5 (16.6)	0.639	27.8 (14.9)	35.1 (15.9)	0.002
Total PASE score (Mean/SD)	134.5 (76.1)	138.5 (85.2)	0.113	134.5 (85.2)	152.1 (83.9)	0.874	136.4 (83.5)	146.5 (80.6)	0.382

N – Number of cases; PASE – physical activity scale for the elderly; SD – standard deviation; THR – total hip replacement

NB: For each reported analysis, the outcome was adjusted for in the statistical model by the explanatory variables age, gender, body mass index (BMI), self-reported depression, presence of low back or neck pain and the frequency of knee pain.

Supplementary Table 2: Analysis results comparing the difference in physical activity change between people who undergo TKR and a matched, normative cohort.

PASE Subsection Item or Total	Pre-Operative			12 Months Post-Operative			24 Months Post-operative		
	TKR	Matched-Cohort	P-Value	TKR	Matched-Cohort	P-Value	TKR	Matched-Cohort	P-Value
Sitting, past 7 days (N; %)									
0: Never	0 (0.0)	4 (0.6)	0.697	2 (1.7)	5 (0.8)	0.281	1 (1.0)	1 (0.2)	0.760
1: seldom (1-2 days)	1 (1.0)	15 (2.3)		2 (1.7)	14 (2.1)		1 (1.0)	18 (2.7)	
2: sometimes (3-4 days)	8 (7.8)	56 (8.5)		7 (6.0)	56 (8.5)		10 (9.7)	54 (8.2)	
3: Often (5-7 days)	93 (91.2)	584 (88.6)		105 (90.6)	584 (88.6)		91 (88.3)	585 (88.9)	
Sitting, hours per day, past 7 days (N; %)									
1: less than 1 hour	1 (1.0)	24 (3.7)	0.764	2 (1.8)	27 (4.2)	0.445	2 (2.0)	19 (2.9)	0.881
2: 1 but less than 2 hours	13 (13.0)	99 (15.2)		21 (18.4)	119 (18.2)		17 (16.7)	125 (19.1)	
2: 2 to 4 hours	62 (62.0)	311 (47.6)		60 (52.6)	309 (47.3)		59 (57.8)	310 (47.4)	
4: more than 4 hours	24 (24.0)	219 (33.5)		31 (27.2)	198 (30.3)		24 (23.5)	200 (30.6)	
Walking, past 7 days (N; %)									
0: Never	20 (19.8)	124 (18.8)	<0.001	40 (34.5)	118 (17.9)	0.506	27 (26.2)	130 (19.8)	0.175
1: seldom (1-2 days)	14 (13.9)	118 (17.9)		24 (20.7)	137 (20.7)		20 (19.4)	110 (16.7)	
2: sometimes (3-4 days)	28 (27.7)	136 (20.6)		15 (12.9)	140 (21.2)		22 (21.4)	149 (22.6)	
3: Often (5-7 days)	39 (38.6)	281 (42.6)		37 (31.9)	266 (40.2)		34 (33.0)	269 (40.9)	
Walking, hours per day, past 7 days (N; %)									
1: less than 1 hour	48 (77.4)	291 (54.4)	0.002	45 (59.2)	281 (51.7)	0.608	40 (52.6)	288 (43.8)	0.239
2: 1 but less than 2 hours	7 (11.3)	180 (33.6)		25 (32.9)	195 (35.9)		28 (36.8)	182 (27.7)	
2: 2 to 4 hours	7 (11.3)	47 (8.8)		6 (7.9)	48 (8.8)		6 (7.9)	50 (7.6)	
4: more than 4 hours	0 (0.0)	17 (3.2)		0 (0.0)	19 (3.6)		2 (2.7)	8 (1.2)	
Light sport/recreation, past 7 days (N; %)									
0: Never	84 (82.4)	587 (89.1)	0.199	99 (86.1)	578 (87.4)	0.039	87 (84.5)	584 (88.9)	0.398
1: seldom (1-2 days)	13 (12.7)	53 (8.0)		12 (10.4)	54 (8.2)		14 (13.5)	45 (6.8)	
2: sometimes (3-4 days)	5 (4.9)	15 (2.3)		3 (2.6)	21 (3.2)		1 (1.0)	24 (6.7)	
3: Often (5-7 days)	0 (0.0)	4 (0.6)		1 (0.9)	8 (1.2)		1 (1.0)	4 (0.6)	
Light sport/recreation, hours per day, past 7 days (N; %)									
1: less than 1 hour	5 (27.8)	10 (14.3)	0.852	3 (17.6)	19 (23.2)	0.552	0 (0.0)	11 (15.1)	0.442
2: 1 but less than 2 hours	4 (22.2)	15 (21.4)		3 (17.6)	17 (20.7)		2 (11.8)	11 (15.1)	
2: 2 to 4 hours	6 (33.3)	31 (44.3)		8 (47.2)	30 (36.6)		9 (52.9)	33 (45.2)	
4: more than 4 hours	3 (16.7)	14 (20.0)		3 (17.6)	16 (19.5)		6 (35.3)	18 (24.6)	
Moderate sport/recreation, past 7 days (N; %)									
0: Never	96 (94.1)	569 (86.3)	0.199	101 (87.8)	560 (84.7)	0.039	90 (87.4)	582 (88.6)	0.398
1: seldom (1-2 days)	6 (5.9)	62 (9.4)		9 (7.8)	65 (9.8)		7 (6.8)	49 (7.5)	

2: sometimes (3-4 days)	0 (0.0)	23 (3.5)		4 (3.5)	26 (3.9)		5 (4.9)	16 (2.4)	
3: Often (5-7 days)	0 (0.0)	5 (0.8)		1 (0.9)	10 (1.6)		1 (0.8)	10 (1.5)	
Moderate sport/recreation, hours per day, past 7 days (N; %)									
1: less than 1 hour	1 (16.7)	22 (24.4)	0.852	5 (33.3)	30 (30.0)	0.552	5 (38.5)	13 (17.4)	0.442
2: 1 but less than 2 hours	2 (33.3)	34 (37.8)		6 (40.0)	34 (34.0)		2 (15.4)	28 (37.3)	
2: 2 to 4 hours	3 (50.0)	30 (33.4)		3 (20.0)	30 (30.0)		6 (46.1)	28 (37.3)	
4: more than 4 hours	0 (0.0)	4 (4.4)		1 (6.7)	6 (6.0)		0 (0.0)	6 (8.0)	
Strenuous sport/recreation, past 7 days (N; %)									
0: Never	64 (62.7)	472 (71.6)	0.199	87 (75.7)	471 (71.3)	0.039	68 (66.1)	448 (68.2)	0.398
1: seldom (1-2 days)	11 (10.8)	89 (13.5)		11 (9.6)	69 (10.4)		9 (8.7)	90 (13.7)	
2: sometimes (3-4 days)	18 (17.6)	64 (9.7)		11 (9.6)	76 (11.5)		19 (18.4)	75 (11.4)	
3: Often (5-7 days)	9 (8.8)	34 (5.2)		6 (5.1)	45 (6.8)		7 (6.8)	44 (6.7)	
Strenuous sport/recreation, hours per day, past 7 days (N; %)									
1: less than 1 hour	24 (63.2)	89 (47.6)	0.852	15 (53.6)	102 (53.7)	0.552	18 (51.4)	116 (55.2)	0.442
2: 1 but less than 2 hours	11 (28.9)	77 (41.2)		8 (28.6)	70 (36.8)		12 (34.3)	67 (31.9)	
2: 2 to 4 hours	3 (7.9)	18 (9.6)		5 (17.8)	16 (8.4)		5 (15.3)	23 (11.0)	
4: more than 4 hours	0 (0.0)	3 (1.6)		0 (0.0)	2 (1.1)		0 (0.0)	4 (1.9)	
Muscle strength/endurance, past 7 days (N; %)									
0: Never	41 (40.2)	397 (60.2)	0.456	62 (53.4)	382 (57.8)	<0.001	52 (50.5)	354 (53.8)	0.090
1: seldom (1-2 days)	15 (14.7)	106 (16.1)		16 (131.8)	94 (14.2)		9 (8.7)	111 (16.9)	
2: sometimes (3-4 days)	27 (26.5)	92 (14.0)		23 (19.8)	128 (19.4)		23 (22.3)	115 (17.4)	
3: Often (5-7 days)	19 (18.6)	64 (9.7)		15 (13.0)	57 (8.6)		19 (18.5)	78 (11.9)	
Muscle strength/endurance, hours per day, past 7 days (N; %)									
1: less than 1 hour	40 (65.6)	192 (73.6)	0.343	32 (59.3)	190 (68.6)	<0.001	35 (68.6)	220 (72.6)	0.635
2: 1 but less than 2 hours	18 (29.5)	55 (21.0)		19 (35.2)	76 (27.4)		13 (25.5)	77 (25.4)	
2: 2 to 4 hours	3 (4.9)	14 (5.4)		3 (5.5)	9 (3.2)		3 (5.9)	6 (2.0)	
4: more than 4 hours	0 (0.0)	0 (0.0)		0 (0.0)	2 (0.8)		0 (0.0)	0 (0.0)	
Light housework, past 7 days (N;%)	109 (94.0)	611 (92.2)	0.022	86 (74.1)	609 (91.9)	0.314	96 (82.8)	617 (93.1)	0.210
Heavy housework, past 7 days (N;%)	77 (66.4)	464 (70.0)	0.022	63 (54.3)	460 (69.4)	0.314	67 (57.8)	453 (68.3)	0.210
Home repairs, past 7 days (N;%)	12 (10.3)	122 (18.4)	0.022	17 (14.7)	136 (20.5)	0.314	23 (19.8)	110 (16.6)	0.210
Lawn work or yard work, past 7 days (N;%)	54 (46.6)	304 (45.9)	0.022	44 (42.7)	307 (46.3)	0.314	52 (50.5)	309 (46.6)	0.210
Outdoor gardening, past 7 days (N;%)	44 (37.9)	228 (34.4)	0.022	39 (37.9)	227 (34.2)	0.314	48 (46.6)	241 (36.3)	0.210
Caring for another person, past 7 days (N;%)	26 (22.4)	193 (29.1)	0.022	18 (17.5)	204 (30.8)	0.314	30 (29.4)	192 (29.0)	0.210
Work for pay or volunteer, past 7 days (N;%)	69 (59.5)	408 (61.5)	0.002	52 (50.2)	467 (70.4)	0.045	59 (57.3)	446 (67.3)	0.111
Work for pay or volunteer, hours in the past 7 days (Mean/SD)	35.2 (14.7)	31.8 (17.0)	0.001	34.6 (17.6)	36.5 (16.6)	0.050	35.8 (15.9)	35.1 (15.9)	0.135
Total PASE score (Mean/SD)	121.7 (69.95)	138.5 (76.07)	0.004	126.3 (74.00)	152.1 (83.89)	0.156	143.6 (74.52)	146.5 (80.56)	0.780

N – Number of cases; PASE – physical activity scale for the elderly; SD – standard deviation; TKR – total knee replacement

NB: For each reported analysis, the outcome was adjusted for in the statistical model by the explanatory variables age, gender, body mass index (BMI), self-reported depression, presence of low back or neck pain and the frequency of knee pain.