LEVELS AND PATTERNS OF SELF-REPORTED AND OBJECTIVELY-MEASURED FREE-LIVING PHYSICAL ACTIVITY AMONG PROSTATE CANCER SURVIVORS: A PROSPECTIVE COHORT STUDY

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**ABSTRACT**

**Background**: No prior study has measured or compared self-reported and objectively-measured physical activity trajectories in prostate cancer survivors before and after treatment.

**Methods**: Clinically-localized prostate cancer patients treated with radical prostatectomy were recruited from 2011-2014. Of the 350 participants enrolled at the main site, 310 provided self-reported physical activity at baseline before radical prostatectomy, and 5 weeks, 6 months, and 12 months post-radical prostatectomy. A subset of participants (n=81) provided objectively-measured physical activity at all study time points by wearing an accelerometer for seven days each. Changes in activity over time were compared using Friedman’s test. Agreement between self-reported and objective measures was evaluated using Spearman’s rank correlation coefficient.

**Results**: Self-reported moderate-to-vigorous physical activity was high at baseline (median=32.1 minutes/day), followed by a decline at 5 weeks (15.0 minutes/day) and a recovery at 6 and 12 months (32.1-47.1 minutes/day). In contrast, objectively-measured moderate-to-vigorous physical activity was low at all four time points (median=0.0-5.2 minutes/day), with no overall change across study assessments (global p=0.29). Self-reported moderate-to-vigorous physical activity tended to be more closely related to objectively-measured light intensity physical activity (rho=0.29-0.42) than to objectively-measured moderate-to-vigorous physical activity (rho=0.07-0.27, p=0.009-0.32).

**Conclusions**: In our population of prostate cancer survivors with critically low moderate-to-vigorous physical activity levels, self-reported measures greatly overestimated moderate-to-vigorous physical activity and may have been more reflective of light intensity physical activity. As cancer survivor guidelines were derived from self-reported data, our findings may imply that intensities of physical activity below moderate, such as light intensity, still have health benefits.

**INTRODUCTION**

In cancer survivors (defined as anyone diagnosed with cancer),[1](#_ENREF_1) regular and sustained participation in physical activity is associated with reduced cancer recurrence and improved survival, as well as a range of physical and psychological outcomes, and health-related quality of life.[1-5](#_ENREF_1) The majority of knowledge about the benefits of physical activity among cancer survivors has been derived from self-reported,[1-4](#_ENREF_1) as opposed to objectively-measured,[6-8](#_ENREF_6) physical activity data. Although self-reported measures are useful for ranking participants by their relative physical activity levels and for monitoring changes in activity over time, they are less useful for estimating absolute levels of free-living physical activity. Self-reported measures of have lesser accuracy for measuring light intensity physical activity (e.g., routine domestic tasks) than objective measures, they require highly complex cognitive processing, and they are susceptible to social desirability and recall biases.[9](#_ENREF_9) Moreover, many of these factors may be more pronounced in cancer survivors. For example, cancer survivors in general may have greater difficulty recalling physical activity because of cancer- or therapy-related cognitive impairments, such as lack of concentration and short term memory loss.[10](#_ENREF_10), [11](#_ENREF_11) However, no study to date has compared self-reported to objectively-measured physical activity in cancer survivors to inform the degree of discrepancy between these two measures.

A key challenge for the development of cancer survivor physical activity guidelines is to identify the appropriate timing of physical activity engagement, as little is known about cancer survivors’ physical activity levels before and after therapy. Although a few studies have documented declined physical activity levels following a cancer diagnosis using self-reported measures,[12-15](#_ENREF_12) these may not reflect actual levels for the reasons described above. Moreover, discrepancies between self-reported and objective measures may be further exacerbated by the influence of therapy on survivors’ activity levels and cognitive function. A limited number of studies have collected repeated measures of objective physical activity in cancer survivors to inform actual trajectories, but most of these studies were small in size (e.g., <30 participants[16-20](#_ENREF_16)) or missing pre-treatment data.[21](#_ENREF_21), [22](#_ENREF_22) Therefore, additional studies of objectively-measured physical activity trajectories in cancer survivors are needed to document their actual physical activity levels throughout their survivorship.

To begin to address these gaps, we investigated and compared levels and patterns of self-reported and objectively-measured physical activity in a large cohort of men undergoing radical prostatectomy for clinically-localized prostate cancer, the most commonly diagnosed cancer in men in the US.

**MATERIALS AND METHODS**

*Study population and design*

The Prostatectomy Incontinence and Erectile function (PIE) study was a multi-center longitudinal clinical cohort study based at two US sites: Washington University School of Medicine and Brigham & Women’s Hospital. Men scheduled to undergo radical prostatectomy for clinically-localized prostate cancer were recruited between September 2011 and January 2014. All men undergoing prostatectomy were eligible except for those who had previously undergone treatment for prostate cancer, radiation treatment to the pelvic region (including bladder, rectum, or prostate), major pelvic surgery, or placement of a penile implant or artificial urinary sphincter. We also excluded men with known urethral stricture or colostomy, men who were unable to urinate and required chronic urinary catheterization, and men who did not speak English. In total, we enrolled 350 men at Washington University and 76 at Brigham & Women’s Hospital.

Before their surgery, participants were asked to complete a questionnaire that included questions on recent physical activity, weight history, insurance status, urinary and sexual function and bother, medications that can impact urinary and sexual function, and a range of socio-demographic characteristics. Participants completed a similar questionnaire 5 weeks, 6 months, and 12 months after surgery. Comorbidity data and clinical prostate cancer information (including stage, Gleason score, and pre-treatment prostate-specific antigen (PSA) levels) were abstracted from participants’ medical records. Baseline height and weight were measured at the pre-operative clinic visit by nursing staff. Participants enrolled at Washington University were also given the option of wearing an activity monitor. Those who agreed were asked to wear an Actigraph GT3X+ accelerometer for seven days at each of the study time points: baseline before radical prostatectomy, and 5 weeks, 6 months, and 12 months post-radical prostatectomy. Participants enrolled at Brigham & Women’s Hospital were not given the option of wearing an accelerometer and were thus not included in the present analyses. The PIE study was approved by the institutional review boards at Washington University School of Medicine and Brigham & Women’s Hospital. All participants provided informed consent.

*Self-reported physical activity*

Recent physical activity was assessed using the Community Healthy Activities Model Program for Seniors (CHAMPS) physical activity questionnaire for older adults. This instrument measures physical activities that participants may have engaged in “in a typical week in the past four weeks”. The CHAMPS instrument has been found to have good reproducibility in older men (Pearson’s r=0.58-0.67),[23](#_ENREF_23) and has been validated in racial/ethnic minorities.[24](#_ENREF_24), [25](#_ENREF_25) It was administered at all four study time points. We used this questionnaire to summarize the total daily self-reported amount of moderate-to-vigorous physical activity in minutes for each participant at each study assessment.

*Objectively-measured physical activity*

A sub-sample of participants agreed to wear a waist-worn accelerometer (Actigraph GT3X+, 1 second epochs) for 7 consecutive days to measure free-living physical activity objectively. The Actigraph GT3X+ is an extensively validated, small lightweight device that provides detailed information about the intensity, frequency, and duration of physical activity.[22](#_ENREF_22), [26-28](#_ENREF_26) The epoch length was set at 1 second, and the Actigraph recorded count data for physical activity in the form of counts per minute (cpm). Non-wearing time was defined as 60 minutes of consecutive zero counts with allowance for 1 or 2 minutes with <100 cpm. A recording of at least 10 hours of data (about 2/3 of waking hours per day) was defined as a valid day, and three or more valid days measured at any time during the 7-day wearing period were required for the analysis.[22](#_ENREF_22)

Actigraph data were processed using ActiLife software based on the Freedson equation[29](#_ENREF_29) to derive: 1) total wearing time, 2) “raw” minutes spent in moderate-to-vigorous physical activity bouts (>1951 cpm) of at least 10 minutes, and 3) sedentary behavior (<100 cpm). Raw minutes spent in light intensity physical activity were calculated by subtracting raw minutes spent in moderate-to-vigorous physical activity bouts of 1 minute and sedentary behavior from the total wearing time, namely 100 to 1951 cpm. Adjusted minutes were computed by dividing raw minutes by total wearing time and multiplying the resulting fraction by the average wearing time for all participants. We summarized the adjusted total daily amount of moderate-to-vigorous physical activity, light intensity physical activity, and sedentary behavior in minutes for each participant at all four study time points.

*Statistical analysis*

Descriptive statistics (means and percentages) were used to compare participants who did and did not provide valid objectively-measured physical activity data at the Washington University site. Participants were compared with respect to socio-demographic characteristics, prostate cancer-related factors, and surgery-related factors. Medians and inter-quartile ranges (IQRs) were used to summarize participants’ self-reported moderate-to-vigorous physical activity, and objectively-measured time spent in moderate-to-vigorous physical activity, light-intensity physical activity, and sedentary behavior. Changes in activity over time were compared using Friedman’s test. Post-hoc analyses using Wilcoxon’s signed-rank tests were performed to identify times when changes occurred. Finally, agreement between self-reported and objectively-measured physical activity was evaluated using Spearman’s rank correlation coefficient. Data analyses were conducted using STATA, SAS, and R.

**RESULTS**

In total, 350 participants completed the baseline survey before radical prostatectomy at the Washington University site, and 310 (88.6%) provided complete survey data at all four study time points. Of these men, 203 agreed to wear an accelerometer, and 193 provided valid objectively-measured physical activity data at baseline, 143 at 5 weeks, 119 at 6 months, and 108 at 12 months, for a total of 81 men with complete objectively-measured physical activity data at all four time points. These 81 participants were similar to those who did not provide valid objectively-measured physical activity data, with the exception of race, body mass index, marital status, pre-surgical PSA concentration, and possibly education. Of the 26 (8.4% of 310) African American participants who completed the study, only 1 (1.2% of 81) provided objectively-measured physical activity data (Table 1). In addition, men who did not provide valid objectively-measured physical activity data were more likely to be obese, to live alone, and to have a higher pre-surgical PSA concentration than participants who did provide valid objectively-measured physical activity data. They were also non-significantly less likely to have completed a graduate education. Overall, the majority of the 81 analyzed men were overweight (49.4%) or obese (35.8%), had completed a college education or more (50.3%), earned ≥$75,000 (52.6%), were married or living as married (82.6%), and had clinical stage T1 disease (76.8%), with a median pre-surgical prostate-specific antigen level of 5.2 ng/mL (IQR=4.1- 6.9).

*Self-reported physical activity*

At baseline, participants’ self-reported levels of daily moderate-to-vigorous physical activity were high (median=32.1 minutes), with 72.8% meeting general physical activity guidelines (i.e., 150 minutes/week of moderate-to-vigorous physical activity, Table 2). These levels declined 5 weeks post-radical prostatectomy (15.0 minutes; post-hoc p<0.001 compared to baseline; 38.3% meeting physical activity guidelines), followed by a recovery at 6 months (32.1 minutes; post-hoc p<0.001 compared to 5 weeks post-radical prostatectomy; 70.4% meeting physical activity guidelines). Self-reported physical activity levels remained stable at 12 months (47.1 minutes; post-hoc p=0.30 compared to 6 months post-RP; 71.6% meeting physical activity guidelines).

*Objectively-measured physical activity*

In contrast to self-reported moderate-to-vigorous physical activity, objective measures were low at all four time points (median=0.0-5.2 minutes/day; 6.2-11.1% meeting physical activity guidelines) and showed no overall change across study assessments (global p=0.29, Table 2). However, step-wise comparisons indicated a statistically significant but small decline in objectively-measured daily moderate-to-vigorous physical activity from 5 weeks (5.2 minutes) to 6 months post-radical prostatectomy (0.0 minutes; p=0.03).

With regards to objectively-measured light intensity physical activity, a similar pattern of findings was observed as for self-reported moderate-to-vigorous physical activity. Participants engaged in a median of 195.6 minutes of daily light intensity physical activity prior to radical prostatectomy, after which they experienced a significant decline 5 weeks post-radical prostatectomy (180.4 minutes; post-hoc p<0.001 compared to baseline). Levels of daily light intensity physical activity recovered 6 months post-radical prostatectomy (201.2 minutes; post-hoc p=0.01 compared to 5 weeks post-radical prostatectomy), and remained stable at 12 months (190.1 minutes; post-hoc p=0.61 compared to 6 months post-radical prostatectomy).

Finally, the opposite pattern of findings was observed for sedentary behavior as for light intensity physical activity. Participants accumulated higher levels of sedentary behavior 5 weeks post-radical prostatectomy (median=511.5 minutes) compared to baseline (488.8 minutes; post-hoc p=0.001), after which their levels returned to the baseline (6 months post-radical prostatectomy: 489.3 minutes; post-hoc p=0.02 compared to 5 weeks post-radical prostatectomy; post-hoc p=0.84 compared to baseline; and 12 months post-radical prostatectomy: 501.5 minutes; post-hoc p=0.87 compared to baseline).

*Agreement between self-reported and objectively-measured physical activity*

Agreement between self-reported and objectively-measured moderate-to-vigorous physical activity was poor at all four time points (rho: 0.07-0.27; Table 3), as expected based on their differing patterns of findings over study follow-up. In contrast, self-reported moderate-to-vigorous physical activity and objectively-measured light intensity physical activity were in considerably better agreement (rho: 0.29-0.42, p=0.009-0.32 compared to self-reported and objectively-measured moderate-to-vigorous physical activity agreement).

**DISCUSSION**

Findings from our prospective cohort study of prostate cancer survivors show a disagreement between self-reported and objectively-measured levels of moderate-to-vigorous physical activity both before and after surgery. Whereas self-reported moderate-to-vigorous physical activity levels were high and generally above physical activity guidelines at all study time points except for 5 weeks post-radical prostatectomy, objectively-measured levels were low and generally below physical activity guidelines at all four study time points. Interestingly, similar patterns of change were observed for self-reported moderate-to-vigorous physical activity as for objectively-measured light intensity physical activity and a stronger correlation was observed between self-reported moderate-to-vigorous physical activity and objectively-measured light intensity physical activity than between self-reported and objectively-measured moderate-to-vigorous physical activity, suggesting that self-reported moderate-to-vigorous physical activity may have been more likely to capture physical activity at light intensity than moderate or vigorous intensities in this study population with critically low moderate-to-vigorous physical activity.

To the best of our knowledge, our study is the first to report trajectories of physical activity (either self-reported or objectively-measured) in prostate cancer survivors, precluding a comparison to previous studies. However, our findings for individual physical activity measures and values are consistent with those from previous studies. For example, our observed decline shortly after surgery is consistent with findings from a study of Australian breast and prostate cancer survivors in which participants reported a decline in self-reported weekly moderate-to-vigorous physical activity of 72 minutes in the 6 weeks after diagnosis.[12](#_ENREF_12) In addition, our findings of generally low objectively-measured moderate-to-vigorous physical activity at all time points after radical prostatectomy are consistent with those from a previous nationally representative cross-sectional sample of American prostate cancer survivors in various stages of their recovery that observed low levels of physical activity (6.0 minutes of moderate-to-vigorous physical activity, 4.0 hours of light intensity physical activity, and 9.9 hours of sedentary behavior) using the same *cpm* cut-offs for accelerometer data as our study.[30](#_ENREF_30) These values are within 10 minutes of our values and are thus likely clinically similar.[31](#_ENREF_31) Therefore, given these similarities in findings for individual physical activity measures, it is likely that our observed discrepancy between self-reported and objectively-measured moderate-to-vigorous physical activity (i.e., over-estimation of moderate-to-vigorous physical activity by self-report), and perhaps our better agreement between self-reported moderate-to-vigorous physical activity and objectively-measured light intensity physical activity, would also generalize to these study populations.

Self-reported measures may overestimate objectively-measured moderate-to-vigorous physical activity for several possible reasons. The first is the nature of the questionnaire design. For example, the CHAMPS questionnaire includes a few sets of different items that may in fact capture the same activity (for example, walking fast, walking leisurely, walking for errands, and walking uphill), which may lead to double counting and over-estimation of physical activity. This concern is particularly problematic for common activities, such as walking (prevalence in our sample: walking fast, 32%-42%; walking leisurely, 51%-69%; walking for errands, 44-48%; and walking uphill, 30-33%). It has also been found to be more common in men than in women.[32](#_ENREF_32) Another reason why self-reported moderate-to-vigorous physical activity may overestimate actual values, particularly in cancer survivors, is response bias.[33](#_ENREF_33) Unlike the general population, cancer survivors experience major changes in aerobic capacity, body composition, and mental burden from their cancer and its treatment, which may influence their perceptions of physical activity intensity dramatically. For example, we speculate that men who suffer from radical prostatectomy-related side-effects may perceive the same activity that was “light” pre-radical prostatectomy (e.g., “work on your car, truck, lawn mower or other machinery”) as “heavy” post-radical prostatectomy. Finally, it is also possible that men may report a longer duration of activity because of their strong desire to be active, an important component of perceived normalcy for men after prostate cancer treatment.[34](#_ENREF_34)

Considering our findings in light of cancer survivor physical activity guidelines – i.e., 150 minutes of weekly moderate-to-vigorous physical activity[35](#_ENREF_35) – our results for self-reported data tend to meet these guidelines but those for objectively-measured moderate-to-vigorous physical activity fall far short. However, as previous physical activity recommendations for prostate cancer survivors were derived from self-reported data,[36](#_ENREF_36) which appears to overestimate actual moderate-to-vigorous physical activity and may instead capture light intensity activity, it is possible that clinically relevant health benefits could still be accrued at intensities and durations of physical activity below currently recommended levels.[37](#_ENREF_37) This conclusion, which is in line with a growing body of research on the benefits of light intensity physical activity,[38](#_ENREF_38), [39](#_ENREF_39) would be helpful for prostate cancer survivors for several reasons. First, large amounts of moderate-to-vigorous physical activity may be difficult for prostate cancer survivors to achieve, particularly those who engaged in low levels of moderate-to-vigorous physical activity before surgery (i.e., the large majority of our cohort). This unrealistic increase in moderate-to-vigorous physical activity may partially explain the low adherence rates seen in many previous physical activity interventions.[40](#_ENREF_40) Second, increases in physical activity at light intensity rather than moderate or vigorous intensities may be more achievable because of their lesser physiological stress and ease of performance even in the presence of treatment side effects. This hypothesis is supported by our observation of a recovery in light intensity physical activity for prostate cancer survivors between 5 weeks and 6 months post-radical prostatectomy. Thus, given these potential benefits, both in terms of “achievability” and health, additional research is warranted examining the influence of light intensity physical activity on prostate cancer survival, particularly using measurement tools capable of capturing physical activities of various intensities accurately. Additionally, an in-depth understanding of the biological consequences of these activities, and perhaps more importantly the biological consequences of the energy expenditure associated with these activities, according to disease factors and personal characteristics is required. Such knowledge is critical to design effective physical activity interventions that are achievable in wider cancer survivor populations unlikely to engage in moderate-to-vigorous physical activity.

Our study population consisted of prostate cancer survivors with relatively high educational attainment and socioeconomic status who were treated for early-stage prostate cancer by minimally-invasive radical prostatectomy procedures. Therefore, our observed degree of discrepancy between self-reported and objectively-measured physical activity and our observed absolute physical activity levels may not generalize to men with lesser educational attainment or socioeconomic status, or men treated for later-stage prostate cancer or by open or different therapeutic procedures with a greater impact on physical and mental function. In fact, it is likely that a higher degree of discrepancy and lesser absolute physical activity levels would have been observed in these men. Nonetheless, we believe our overall conclusion of a possible benefit of light intensity physical activity might also apply to these men, as they are even less likely to engage in high levels of moderate-to-vigorous physical activity. .In addition, although our study population differs from the general population of prostate cancer survivors, it is similar to study populations in which the influence of physical activity on prostate cancer survival has been studied,[3](#_ENREF_3), [4](#_ENREF_4), [41](#_ENREF_41), [42](#_ENREF_42) possibly making our findings more relevant to the interpretation of these previous studies. Finally, given the potential implications of our findings – i.e., that light intensity physical activity may still be beneficial for cancer survival – researchers should explore the possible benefit of this intensity of physical activity for survivors of other cancers in older men, as well as those that affect women and younger individuals.

There are a number of strengths to this study. These include its prospective study design, collection of objectively-measured physical activity data, moderate to high follow-up rate for accelerometer measures (5 weeks=74.1%, 6 months=61.7%, and 12 months=56.0%), and large sample size. In fact, our study is the largest study to date to collect repeated objective measures of physical activity before and after treatment. Nevertheless, our study also has some limitations. Lower limb movements, such as cycling, or strength training activities may be underestimated by hip-worn accelerometers, resulting in underestimated levels of objective physical activity. Although these types of activities are not expected to be prevalent in men 5 weeks after surgery, they may have been more common once participants recovered from their surgery at 6 and 12 months follow-up. Discrepancies between self-reported and objective measures of physical activity may have also been introduced by the possibly differing time frames of assessment of the CHAMPS questionnaire (activities in “a typical week during the past four weeks”, which participants may have interpreted as the most recent week) and accelerometers (activity over a 7-day period near in time to questionnaire completion). This concern may be especially problematic for the 5 week assessment when participants’ activity levels likely varied markedly from week to week as they recovered from their surgery. Nevertheless, our observed higher agreement at this time point suggests this may have been less of a concern, possibly because of participants’ overall low physical activity levels 5 weeks post-surgery. Finally, although the magnitude of our findings may not generalize to populations with different demographic or clinical characteristics as our study population, we believe the inferences of our findings have broader generalizability, as described earlier.

**CONCLUSIONS**

In this prospective study of prostate cancer survivors, objectively-measured moderate-to-vigorous physical activity levels were critically low from baseline before- to 12 months post-radical prostatectomy. In contrast, self-reported levels were considerably higher and above the physical activity guidelines at all four time points for a large proportion of men, potentially reflecting light intensity rather than moderate-to-vigorous physical activity levels. As physical activity guidelines were derived from self-reported moderate-to-vigorous physical activity, it is possible that these guidelines may be too high for many men and that lower intensities of physical activity may still be beneficial. Therefore, additional research into the potential benefits of physical activity at light intensity is warranted. Such research could lead to interventions that are achievable in a wider survivor population challenged to engage in physical activity at moderate or vigorous intensities.

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Table 1. Baseline characteristics of participants in the Prostatectomy, Incontinence and Erectile Function (PIE) Study, recruited 2011-2014, by whether or not they provided valid objectively-measured physical activity data.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Provided valid objectively-measured physical activity data |  |
| Sociodemographic | Total Population(n=310) | No (n=229) | Yes(n=81) | p |
| Age (years, mean, SD) | 61.1 | 6.9 | 60.8 | 7.0 | 61.9 | 6.4 | 0.27 |
| Race (N, %) |  |  |  |  |  |  | 0.02 |
| White  | 283 | 91.3 | 203 | 88.7 | 80 | 98.8 |  |
| African American | 26 | 8.4 | 25 | 10.9 | 1 | 1.2 |  |
| Asian | 1 | 0.3 | 1 | 0.4 | 0 | 0 |  |
| Body Mass Index (kg/m2, N, %) |  |  |  |  |  |  | 0.005 |
| Normal weight (18.5-24.9) | 46 | 14.8 | 27 | 11.8 | 19 | 23.5 |  |
| Overweight (25.0-29.9) | 153 | 49.4 | 110 | 48.0 | 43 | 53.1 |  |
| Obese (≥ 30) | 111 | 35.8 | 92 | 40.2 | 19 | 23.4 |  |
| Education (N, %) |  |  |  |  |  |  | 0.12 |
| High school degree or less | 56 | 18.1 | 46 | 20.1 | 10 | 12.3 |  |
| Some college | 98 | 31.6 | 76 | 33.2 | 22 | 27.2 |  |
| College degree | 75 | 24.2 | 54 | 23.6 | 21 | 25.9 |  |
| Post graduate | 81 | 26.1 | 53 | 23.1 | 28 | 34.6 |  |
| Household income (N, %) |  |  |  |  |  |  | 0.38 |
| $50,000 - < $75,000 | 147 | 47.4 | 112 | 48.9 | 35 | 43.2 |  |
| ≥ $75,000 | 163 | 52.6 | 117 | 51.1 | 46 | 56.8 |  |
| Marital status (N, %) |  |  |  |  |  |  | 0.02 |
| Married or living with partner | 256 | 82.6 | 182 | 79.5 | 74 | 91.4 |  |
| Living alone | 54 | 17.4 | 47 | 20.5 | 7 | 8.6 |  |
| Cigarette smoking status (N, %) |  |  |  |  |  |  | 0.30 |
| Never smoked | 179 | 57.8 | 132 | 57.7 | 47 | 59.3 |  |
| Former smoker | 108 | 34.8 | 77 | 33.6 | 31 | 34.2 |  |
| Current smoker | 23 | 7.4 | 20 | 8.7 | 3 | 5.5 |  |
| T1 stage – pre-surgery (N, %) | 238 | 76.8 | 173 | 75.6 | 65 | 82.3 | 0.39 |
| PSA level – pre-surgery (median, IQR) | 5.2 | 4.1 – 6.9 | 5.4 | 4.3 – 7.2 | 4.6 | 3.9 – 5.8 | 0.04 |
| Surgical procedure (N, %) |  |  |  |  |  |  | 0.20 |
| Laparoscopic | 150 | 48.4 | 117 | 51.1 | 33 | 40.7 |  |
| Open | 18 | 5.8 | 14 | 6.1 | 4 | 5.0 |  |
| Robotic | 142 | 45.8 | 98 | 42.8 | 44 | 54.3 |  |

PSA=Prostate-specific antigen.

Table 2. Median and interquartile range of activity patterns among prostate cancer survivors in the Prostatectomy, Incontinence and Erectile function (PIE) study at baseline (before radical prostatectomy), and 5 weeks, 6 months and 12 months post-radical prostatectomy (n=81)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Baseline** | **5 weeks** | **6 months** | **12 months** | **p-valuea** |
| Questionnaire (CHAMPSb) |
|  |  |  |  |  |
| **Moderate-to-vigorous intensity physical activity** |  |  |  |  |
|  | Daily minutes | 32.1 (15.0-77.1) | 15.0 (0.0-32.1) | 32.1 (15.0-64.3) | 47.1 (15.0-79.3) | <0.001 |
|  | Meeting physical activity guideline | 72.8% | 38.3% | 70.4% | 71.6% |  |
|  | Post-hoc p-valuec |  | <0.001 | <0.001 | 0.30 |  |
| Accelerometer (Actigraph GTX 3) |
|  |
| **Moderate-to-vigorous intensity physical activity** |
|  | Daily minutes | 3.9 (0.0-11.5) | 5.2 (0.0-11.4) | 0.0 (0.0-7.5) | 3.1 (0.0-11.1) | 0.29 |
|  | Meeting physical activity guideline | 11.1% | 11.1% | 8.6% | 6.2% |  |
|  | Post-hoc p-valuec |  | 0.96 | 0.03 | 0.45 |  |
|  |
| **Light intensity physical activity** |
|  | Daily minutes | 195.6 (159.7-240.6) | 180.4 (141.1-214.3) | 201.2 (161.5-244.9) | 190.1 (165.9-243.6) | 0.008 |
|  | Post-hoc p-valuec |  | <0.001 | 0.01 | 0.61 |  |
|  |  |  |  |  |
| **Sedentary behavior** |  |  |  |  |
|  | Daily minutes | 488.8 (448.8-529.3) | 511.5 (467.3-554.8) | 489.3 (445.7-525.3) | 501.5 (439.2-529.1) | 0.02 |
|  | Post-hoc p-valuec |  | 0.001 | 0.02 | 0.58 |  |

aP-value for Friedman’s test.

bCHAMPS: Community Healthy Activities Model Program for Seniors.

cPost-hoc analyses using Wilcoxon’s signed-rank tests to compare the change to the previous data point.

Table 3. Agreement (rho) of self-reported moderate to vigorous physical activity with accelerometer measured moderate to vigorous physical activity and light-intensity physical activity, respectively in prostate cancer survivors in the Prostatectomy, Incontinence and Erectile function (PIE) study at baseline (before radical prostatectomy), and 5 weeks, 6 months and 12 months post-radical prostatectomy (n=81)

|  |  |
| --- | --- |
|  | Accelerometer measured (minutes/day) |
| Moderate-to-vigorous physical activity | Light intensity physical activity |
| Self-reported moderate-to-vigorous physical activity (minutes/day) | Baseline | 0.22 | 0.29 |
| 5 weeks post-RP | 0.27 | 0.39 |
| 6 months post-RP | 0.07 | 0.42 |
| 12 months post-RP | 0.16 | 0.35 |

Figure 1. Flow diagram illustrating prostate cancer survivors in the Prostatectomy, Incontinence and Erectile function (PIE) study population and analyzed sample

PIE overall enrollment

(n=426)

Brigham & Women’s Hospital site enrollment

(n=76)

Washington University School of Medicine site enrollment

(n=350)

Provided complete survey data at four study time points (n=310)

Agreed to wear an accelerometer

(n=203)

Provided valid accelerometer data at four study time points

(n=81)