Published in final edited form as:

Obesity (Silver Spring). 2015 March ; 23(3): 536–542. doi:10.1002/oby.20988.

Exercise improves quality of life in bariatric surgery candidates: Results from the *Bari-Active* trial

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Abstract

OBJECTIVE—To examine the impact of a pre-bariatric surgery physical activity intervention (PAI), designed to increase bout-related (10-minute) moderate-to-vigorous PA (MVPA), on health-related quality of life (HRQoL).

METHODS—Analyses included 75 adult participants (86.7% female; BMI=45.0±6.5 kg/m²) who were randomly assigned to 6 weeks of PAI (n=40) or standard pre-surgical care (SC; n=35). PAI received six individual weekly counseling sessions to increase walking exercise. Participants wore an objective PA monitor for 7 days and completed the SF-36 Health Survey at baseline and post-intervention to evaluate bout-related MVPA and HRQoL changes, respectively.

RESULTS—PAI increased bout-related MVPA from baseline to post-intervention (4.4±5.5 to 21.0±21.4 minutes/day) versus no change (7.9±16.6 to 7.6±11.5 minutes/day) for SC ($p=0.001$). PAI reported greater improvements than SC on all SF-36 physical and mental scales ($p<0.05$), except role-emotional. In PAI, better baseline scores on the physical function and general health scales predicted greater bout-related MVPA increases ($p<0.05$), and greater bout-related MVPA increases were associated with greater post-intervention improvements on the physical function, bodily pain, and general health scales ($p<0.05$).

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Competing interests statement

The authors have no competing interests.

CONCLUSIONS—Increasing PA preoperatively improves physical and mental HRQoL in bariatric surgery candidates. Future studies should examine whether this effect improves surgical safety, weight loss outcomes, and postoperative HRQoL.

Trial Registration—clinicaltrials.gov Identifier: NCT00962325

Keywords

intervention; bariatric surgery; physical activity; quality of life; behavioral strategies

Introduction

Health-related quality of life (HRQoL) is a multidimensional concept that encompasses components related to physical, mental, emotional, and social functioning [1]. HRQoL also serves as an important indicator of disease-related dysfunction and treatment efficacy [2]. For example, improvement of HRQoL impairments, along with substantial weight loss and resolution of comorbidities, is an essential criterion of success following bariatric surgery for patients with severe obesity [3–4]. In general, HRQoL is impaired in patients prior to bariatric surgery and improves dramatically during the first postoperative year [5–6]. However, not all patients achieve this immediate benefit and some patients experience gradual deterioration of HRQoL improvements after the most rapid phase of weight loss [4–5, 7]. Despite HRQoL impairments before bariatric surgery and variability in HRQoL outcomes after bariatric surgery, little attention has been given to behavioral interventions to increase HRQoL in this patient population.

One potential behavioral target for improving HRQoL in bariatric surgery patients is increased physical activity (PA). Most patients are inactive preoperatively, accumulate little if any moderate-to-vigorous PA (MVPA) in bouts ≥ 10 minutes, as per national guidelines [8], and remain insufficiently active postoperatively [9–11]. Additionally, research suggests that patients with lower PA and fitness levels preoperatively tend to have worse HRQoL [12–14], and that those who report being inactive preoperatively and remain inactive at 1-year postoperatively experience smaller HRQoL improvements than patients who become active [15]. While low PA is related to worse HRQoL both pre- and postoperatively, no study has examined whether increasing PA in bariatric surgery patients can improve HRQoL within a treatment-controlled framework.

We recently reported results from the *Bari-Active* trial, of which the primary aim was to test the effects of a 6-week preoperative PA intervention (PAI) versus a standard pre-surgical care control condition (SC) on post-intervention changes in daily MVPA performed in bouts ≥ 10 -minutes [16]. At post-intervention follow-up, participants randomly assigned to PAI on average achieved a near 5-fold increase in objectively-measured daily bout-related MVPA (from 4.4 to 21.0 minutes/day), whereas those assigned to SC demonstrated no change (from 7.9 to 7.6 minutes/day; $p=0.001$ for PAI vs. SC).

The current study examined, as a secondary aim of the *Bari-Active* trial, the impact of PAI versus SC on HRQoL. We hypothesized that PAI participants would report significantly greater baseline to post-intervention increases in HRQoL than SC participants. Additionally,

we predicted that among PAI participants, greater increases in bout-related MVPA from baseline to post-intervention would be associated with greater HRQoL improvements, independent of age, sex, degree of obesity, and baseline levels of bout-related MVPA and HRQoL. Finally, also in PAI, we examined whether baseline HRQoL was associated with baseline to post-intervention changes in bout-related MVPA.

Methods

Design

Participants were referred from 3 surgery clinics in Rhode Island, USA between April 2010 and January 2014. Potential participants were identified at an initial surgical consultation visit. Patients who provided written approval for their contact information to be faxed to the research center and received surgeon approval to adopt a walking exercise program were telephoned by research staff for eligibility screening. Eligible individuals were scheduled for an orientation/baseline visit, during which they provided informed consent, had their height and weight measured, completed a HRQoL survey, and were provided with an activity monitor to wear for 7 consecutive days. Participants returned the monitor 1 week later and were randomized to 6 weeks of preoperative PA intervention (PAI) or standard surgical care control (SC).

All participants completed the HRQoL survey and wore the activity monitor for another 7 days after the intervention period. Participants received a \$50 honorarium after returning the monitor. Study procedures were approved by the Institutional Review Board of The Miriam Hospital, Providence, Rhode Island USA. This trial was registered at clinicaltrials.gov (NCT00962325).

Participants

Participants were 80 ambulatory individuals aged 18–70 years old with severe obesity [body mass index (BMI) ≥ 35 kg/m²] who were seeking bariatric surgery. Participants had to report being able to walk 2 blocks unassisted, but report insufficient PA (i.e. <150 MVPA minutes/week accumulated in bouts ≥ 10 minutes as per national guidelines) [8]. Individuals were deemed ineligible if they were scheduled for a bariatric operation within 10 weeks of initial screening or during the intervention period, currently participating in another PA or weight loss program, intended to move to another geographic location during the course of the study, or had medical, psychiatric, or language barriers that would interfere with ability to participate in and follow the study protocol.

Randomization

Participants were randomly assigned 1:1 to PAI or SC between April 2010 and January 2014 using a computer-generated random sequence. Condition assignment was revealed to the participant after completion of the baseline assessment.

Physical Activity Intervention (PAI)

PAI consisted of 6 consecutive weekly individual face-to-face counseling sessions with the primary author at a single site (in addition to receiving standard pre-surgical care). Sessions

lasted 30–45 minutes, were conducted using a counselor manual and lesson handouts for participants, and included the following activities: reviewing participants' PA self-monitoring records; problem-solving barriers to achieving intervention goals; teaching behavioral and cognitive strategies to achieve intervention goals; setting weekly bout-related walking exercise and step goals; developing an action plan for *when*, *where*, and *how* the target amount of bout-related walking exercise would be achieved; and explaining homework assignments focusing on application of PA behavior change strategies. PAI strategies were drawn from the Diabetes and Prevention Program and Look AHEAD trials [17–18], and health behavior change theories that have been successfully applied to increase PA in obese individuals [19–24]. See Bond et al. [16] for a week-by-week description of topics, content, and strategies covered in each of the weekly sessions.

The primary goal of the intervention was to increase walking exercise performed at a moderate intensity and in bouts 10 minutes by 30 minutes/day. A secondary goal was to increase steps taken by 5,000/day. At the initial intervention session, participants received a monitoring log and pedometer to track and motivate progress towards the intervention goals. Participants recorded the number of bout-related walking exercise minutes performed and steps taken in the log at the end of each day over the 6-week intervention period. For the first week, participants were instructed to monitor, but not modify, their PA to establish a baseline for daily bout-related walking exercise and steps. These baseline values were used to determine goals and rate of progression in PA over the subsequent weeks of the intervention. For the second week, participants were instructed to add 10 minutes of bout-related walking exercise minutes/day and 1,000 steps/day to baseline levels. For each remaining week, 5 minutes of daily bout-related walking exercise and 1,000 daily steps were added to the prior week's prescription.

Standard Pre-Surgical Care Control (SC)

SC participants attended scheduled preoperative clinic visits and received standard preoperative care. Surgeons and support staff advised participants to adopt an active lifestyle but did not provide a formal prescription or behavioral tools (e.g., pedometer) and strategies to increase PA.

Measures

Objective measurement of MVPA—The SenseWear Armband (SWA; BodyMedia, Inc., Pittsburgh, PA) was used to objectively evaluate changes in daily bout-related and total MVPA minutes. The SWA is a wireless multi-sensor monitor worn on the upper right triceps muscle. This device integrates data from a triaxial accelerometer, multiple sensor-measured physiologic metrics, and manually entered anthropometric and demographic information via proprietary algorithms to estimate energy expenditure and time performing PA at different intensities. The SWA has been shown to have acceptable levels of agreement with criterion measures of energy expenditure in healthy and older adults [25–26]. This device also provides MVPA estimates that are similar to those from other objective monitors [27], and has previously been used to quantify MVPA in bariatric surgery patients [27–30].

Participants were asked to wear the SWA during waking hours for 7 consecutive days at baseline and post-intervention follow-up. SWA wear-time was assessed using the SenseWear Professional Software (Version 7.0). Metabolic equivalent (MET) values were used to determine daily minutes spent performing bout-related and total MVPA (i.e. 3 METs). No more than 1 continuous minute of interruption below the 3 METs threshold was allowed when calculating MVPA bouts. Using monitor wear-time rules employed in previous intervention studies that used objective measures to assess MVPA in overweight/obese individuals [31–32], participants' SWA data were only considered valid if they wore the SWA for 6 hours/day on 4 days during both the baseline and post-intervention follow-up assessments.

Health-related quality of life (HRQoL)—The Medical Outcomes Study Short Form-36 health survey (SF-36) was used to assess HRQoL [33]. The SF-36 is a generic HRQoL measure that yields scores from 8 scales relating to physical (i.e. physical function, role-limitations because of physical problems, bodily pain, general) and mental (vitality, social functioning, role-limitations because of emotional problems, and mental health) health. These domain scores are then individually weighted into physical component (PCS) and mental component (MCS) summary scales. Scale and component summary scores are transformed to a 0–100 scale and standardized to a population normal distribution (Mean=50, SD=10) with higher scores representing better HRQoL. The SF-36 is psychometrically sound, and demonstrates high internal consistency, reliability, and validity across general and clinical populations [34]. Additionally, the SF-36 is routinely used with bariatric surgery patients to measure the impact of severe obesity on HRQoL and to evaluate intervention-related changes [35–36].

Other Measures—A demographics (i.e. age, sex, race/ethnicity, marital status, educational level, employment) questionnaire was completed at baseline. Weight was measured in light street clothing, without shoes, on a calibrated scale at baseline and post-intervention follow-up.

Statistical Analysis

Analyses were conducted using SPSS Statistics for Windows (version 20.0; SPSS, IBM Corp, Armonk, NY). Descriptive statistics including means and standard deviations (SD) and frequency counts were calculated to describe participants' baseline characteristics and MVPA and HRQoL at baseline and post-intervention follow-up. T-test and chi-square were used to compare the baseline characteristics of the PAI and SC participants and of study completers versus non-completers. Comparison of changes in bout-related MVPA between the PAI and SC conditions were assessed via analysis of covariance (ANCOVA), adjusting for baseline values and SWA monitor wear time at both baseline and post-intervention follow-up. Comparison of changes in HRQoL (i.e. individual SF-36 scales and summary component scores) between the PAI and SC conditions were assessed via ANCOVA adjusting for baseline values. The standardized response mean (SRM; the ratio of individual change to the standard deviation of that change) was used to determine clinically meaningful change in each of the SF-36 scales and summary component measures (with SRM values of 0.20, 0.50, and 0.80 representing small, moderate, and large changes, respectively). SRM,

unlike some other measures of effect size, takes into account variation in change [37]. All above analyses followed the intent-to-treat (ITT) principle in which missing HRQoL data at post-intervention follow-up was replaced by baseline values (assuming no change in the values). In PAI participants, two sets of multiple linear regression analyses were performed to examine associations between changes in bout-related MVPA and HRQoL. In the first analysis, baseline HRQoL was used to predict bout-related MVPA changes, adjusting for age, sex, BMI, and baseline bout-related MVPA. In the second analysis, bout-related MVPA changes were used to predict changes in HRQoL, adjusting for all of the aforementioned variables and baseline HRQoL. Significance tests were two-tailed, with $\alpha=0.05$. This trial was designed to have 80% power to detect significant between-group differences in bout-related MVPA of at least 10 minutes/day with a sample size of at least 75.

Results

Recruitment and Retention

The CONSORT diagram is shown in Figure 1. Of 343 patients referred, 293 were screened by telephone to determine initial eligibility. Of those, 213 were excluded, yielding a total of 80 participants randomized. Five participants were inactivated after randomization due to scheduling of surgery prior to study completion ($n=4$) and family emergency ($n=1$). Of the remaining 75 participants, 63 (84%) completed the post-intervention follow-up. All attrition was due to loss of contact with participants. Retention at post-intervention did not differ significantly between PAI and SC (82.5% in PAI vs. 85.7% in SC, $p=0.76$). Study completers were significantly older than non-completers (47.1 ± 8.4 vs. 40.3 ± 9.4 years old, $p=0.01$; there were no other significant differences in baseline measures).

Baseline characteristics of participants

Participants' baseline characteristics are shown in Table 1. Participants were severely obese and mostly women. Participants in both conditions performed approximately 30 minutes of MVPA per day; however only roughly 20% of MVPA was accumulated in 10-minute bouts.

Baseline SF-36 scores are shown in Table 2. PAI participants reported significantly higher baseline scores on the SF-36 role-physical ($p=0.003$), and bodily pain ($p=0.002$) scales, and on the PCS ($p=0.03$).

Changes in daily bout-related MVPA

On average, participants wore the SWA monitor for 11.4 ± 1.8 h/d on 6.5 ± 1.6 days during baseline and 12.3 ± 1.6 h/d on 6.4 ± 1.2 days during post-intervention follow-up. There were no statistically significant differences in wear time between the PAI and SC groups at baseline and post-intervention follow-up.

As previously reported [16], PAI was more effective than SC for increasing daily bout-related MVPA. PAI participants increased bout-related MVPA by an average of 16.6 ± 20.7 min/d, from 4.4 ± 5.6 at baseline to 21.0 ± 21.4 min/d. By contrast, SC participants on

average showed no change (-0.3 ± 12.7 min/d) from baseline to post-intervention follow-up (7.9 ± 16.6 to 7.6 ± 11.5 min/d).

Among completers only, 26 (78.8%) participants in the PAI condition increased daily bout-related MVPA from baseline to post-intervention (3.6 ± 4.9 min/d to 29.7 ± 21.9 min/d), 2 (6.1%) did not change (0 min/d to 0 min/d), and 5 (15.2%) decreased (9.1 ± 6.2 min/d to 6.6 ± 6.2 min/d). All PAI completers attended each of the 6 weekly intervention sessions. Among SC completers, 11 (36.7%) increased bout-related MVPA min/d from baseline to post-intervention (2.3 ± 2.5 min/d to 12.5 ± 12.2 min/d), 8 (26.7%) did not change (0 min/d to 0 min/d), and 11 (36.7%) decreased (18.4 ± 25.3 min/d to 7.0 ± 12.2 min/d).

Changes in weight

Statistically significant weight change did not occur in either group. Weight change over the intervention period was similar in the PAI (-0.1 ± 2.4 kg) and SC (0.1 ± 2.3 kg) conditions ($p = 0.93$).

Changes in HRQoL

Changes in SF-36 scores from baseline to post-intervention follow-up, controlling for baseline values, are depicted in Figure 2 by condition. Results of intent-to-treat analyses with baseline value carried forward showed PAI participants reported significantly greater improvements than those in the SC condition on all of the individual SF-36 scales ($p < 0.05$), except for role-emotional ($p = 0.12$). Additionally, PAI participants had greater increases on the PCS and MCS measures ($p < 0.05$).

We next used the standardized response mean (SRM) to evaluate clinically meaningful change in SF-36 measured HRQoL. In the PAI group improvements on the role-physical (SRM=0.47), role-emotional (SRM=0.22) and mental health (SRM=0.46) scales and the MCS measure (SRM=0.47) were small in magnitude, while improvement on several other scales (physical function SRM=0.62, bodily pain SRM=0.58, general health SRM=0.59, social functioning SRM=0.55) and the PCS measure (SRM=0.61) was moderate, and improvement on the vitality scale was large (SRM=1.04). By contrast, in the SC group, changes on the SF-36 scales (physical function SRM=0.29, role-physical SRM=0.28, bodily pain SRM=0.49, general health SRM=0.01, vitality SRM=0.24, social functioning SRM=0.14, role-emotional SRM=0.14, mental health SRM=0.0) and on the PCS (SRM=0.40) and MCS (SRM=0.0) measures were all small in magnitude.

Associations between bout-related MVPA and HRQoL in PAI condition

We next examined, in the PAI condition, whether baseline SF-36 scores predicted change in daily bout-related MVPA minutes from baseline to post-intervention follow-up, adjusting for age, sex, BMI, and baseline bout-related MVPA. Higher baseline scores on only the SF-36 physical function ($\beta = 0.34$, $p = 0.002$) and general health ($\beta = 0.51$, $p < 0.001$) scales were independently associated with greater increases in bout-related MVPA from baseline to post-intervention.

We also examined whether changes in daily bout-related MVPA in the PAI condition were associated with changes in HRQoL, independent of all the aforementioned variables and baseline HRQoL. Larger increases in daily bout-related MVPA were independently associated with larger improvements on the SF-36 physical function ($\beta=0.43$, $p=0.04$), bodily pain ($\beta=0.39$, $p=0.03$), and general health ($\beta=0.56$, $p=0.048$) scales, and on the PCS measure ($\beta=0.43$, $p=0.02$).

Discussion

We previously reported that a 6-week behavioral PA intervention (PAI), compared to a standard pre-surgical care control condition (SC), produced significant increases in daily minutes of bout-related MVPA among severely obese patients seeking bariatric surgery [16]. The current study demonstrates that PAI also produced significant improvements in HRQoL.

At baseline, similar to previous research with bariatric surgery patients [12–14], both PAI and SC participants had low PA levels and impaired HRQoL at baseline. While, despite random assignment, PAI participants had higher levels of physical HRQoL than SC participants at baseline, most scores were still well below population norms indicating impaired physical health and functioning [33].

At post-intervention follow-up, PAI participants on average had significantly greater improvements on all but one of the SF-36 scales, after controlling for baseline differences. Additionally, improvements on many of the scales, particularly those that make up or are significantly correlated with the overall physical health component, were moderate (i.e., physical function, bodily pain, general health, and social functioning) to large (i.e., vitality) in magnitude. Further, multiple components of HRQoL (i.e. role-limitations due to physical problems, vitality, social functioning, and role-limitations due to emotional problems) that were impaired or below SF-36 population norms prior to PAI increased to levels that exceed population norms after PAI. By contrast, SC participants' scores on all SF-36 scales remained below population norms at post-intervention follow-up. Finally, we showed that PAI participants who achieved larger increases in MVPA also had greater improvements in physical function, bodily pain, general health, and overall physical health, regardless of age, sex, degree of obesity, and initial levels of MVPA and HRQoL. Taken together, these findings suggest that PAI can produce clinically meaningful improvements in many HRQoL dimensions, particularly those related to physical health, even within the context of severe obesity, low PA, and impaired HRQoL.

This study has several strengths including use of empirically-validated behavioral strategies for increasing PA, objective PA measurement, use of a validated HRQoL measure, and high retention rate at post-intervention follow-up. Also, importantly, while both observational and uncontrolled studies have previously reported that higher levels of PA and fitness are related to better HRQoL before bariatric surgery [12–14, 38], the present study is the first to provide evidence that an intervention aimed at increasing objectively-measured bout-related MVPA can produce favorable changes in HRQoL preoperatively compared to standard care.

Certain limitations should also be considered. The post-intervention assessment occurred immediately after PAI and prior to surgery. Clearly, more research is needed to evaluate whether PAI-related increases in PA and HRQoL achieved during the preoperative period are maintained postoperatively and contribute to better surgical outcomes. Given the unequal amount of therapist contact time between the PAI and SC arms, we cannot rule out that social factors related to attention, interest, and encouragement may have contributed in part to the observed differences in PA and HRQoL between PAI and SC participants. Despite randomization, PAI participants reported better physical HRQoL at baseline. However, most physical HRQoL aspects were still impaired in PAI participants and intent-to-treat analyses were adjusted for baseline differences. Given that most patients who were contacted opted not to participate in this study, generalizability of the results to the larger bariatric surgery population may be limited. Similarly, participants were mostly female and Non-Hispanic White, and thus it is unclear whether similar outcomes would be observed in patients who are male and more racially and ethnically diverse. Given that higher physical function and general health scores before PAI were associated with larger increases in bout-related MVPA after PAI, it is unclear whether patients with poorer health and physical functioning would realize the same increases in bout-related MVPA, and thus HRQoL. While baseline levels of MVPA and most aspects of HRQoL in this sample were comparable to previous observational studies involving larger samples [10, 14, 39], participants reported comparatively lower bodily pain which may reflect that those who were willing to participate in the PAI had lower pain on average than the typical bariatric patient population. Finally, the HRQoL measure used in this study was subjective. Future studies should examine changes on objective measures of health-related functioning, such as physical performance and cognitive tests.

In conclusion, previous research has shown that bariatric surgery patients have both low PA and HRQoL levels preoperatively. The present study is the first to show that with behavioral intervention, patients can make substantial changes in MVPA and experience corresponding improvements in HRQoL even before the surgery is performed and weight loss and improvements in comorbidities are achieved. Future research is needed to examine whether this effect can be maintained postoperatively and helps to optimize and maintain surgical outcomes.

Acknowledgments

Conceived and designed the experiments: DSB, SV, JT, BAR, DP, GDR, HCS, RRW. Performed the experiments: DSB, JT, JLU. Analyzed the data: DSB, JGT. Interpreted the data: DSB, JGT, WCK. Wrote the paper: DSB JGT WK RRW. Read and approved the paper for submission: DSB, JGT, WC, SV, JT, JLU, BAR, DP, GDR, HCS, RRW. Obtained research funding: DSB, RRW, SV, HCS.

This research was supported by a grant from the National Institutes of Health/National Institute of Diabetes & Digestive & Kidney Diseases (DK083438, PI: Bond). The authors would like to thank the *Bari-Active* subjects for their participation.

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What is already known about this subject?

- Improving health-related quality of life (HRQoL), a major goal of bariatric surgery, may be undermined by low physical activity (PA).
- Previous observational studies have shown that low PA in bariatric surgery patients is associated with worse HRQoL preoperatively and smaller HRQoL improvements postoperatively.
- No experimental trial has tested whether an intervention to increase PA in bariatric surgery patients can improve HRQoL.

What this study adds?

- This study is the first to show that a preoperative intervention aimed at increasing bout-related moderate-to-vigorous physical activity (MVPA) can produce favorable changes in physical and mental HRQoL, even before surgery is performed and weight loss and improvements in comorbidities are achieved.
- Larger intervention-related increases in objectively-measured bout-related MVPA were associated with larger improvements in overall physical HRQoL and specific HRQoL components related to physical limitations, bodily pain, and mental health, independent of age, sex, BMI, and initial levels of PA and HRQoL.
- Results provide support for the greater role of exercise professionals and implementation of adjunctive preoperative physical activity interventions within the context of multidisciplinary bariatric surgery programs.

Figure 1.
Flow of participants through the trial

Figure 2.

Comparison of baseline to post-intervention changes in SF-36 scores between participants randomized to the Physical Activity Intervention (PAI) and Standard Pre-Surgical Care Control (SC) conditions

Note. Mean ± Standard Error (SE) values shown; PF = Physical Function, RP = Role-physical, BP = Bodily Pain, GH = General Health, VT = Vitality, SF = Social Functioning, RE = Role-Emotional, MH = Mental Health, PCS = Physical Component Summary, MCS = Mental Component Summary; For comparison of PAI and SC, * $p < 0.05$ ** $p < 0.01$ *** $p < 0.005$ **** $p < 0.001$

Table 1

Baseline characteristics of participants randomized to the Physical Activity Intervention (PAI) and Standard Surgical Care Control (SC) conditions

	Full Sample (N = 75)	PAI Condition (N = 40)	SC Condition (N = 35)
Sex (%)			
Men	13.3	15.0	11.4
Women	86.7	85.0	88.6
Age, mean (SD), years	46.0 (8.9)	44.2 (9.2)	48.1 (8.1)
Race (%)			
American Indian	2.7	5.0	0.0
Black	5.3	5.0	5.7
White	78.7	77.5	80.0
Other	13.3	12.5	14.3
Ethnicity (%)			
Hispanic	12.0	12.5	11.4
Non-Hispanic	88.0	87.5	88.6
Marital status (%)			
Single	20.6	23.1	17.6
Married	49.3	48.7	50.0
Separated/Divorced/Widowed	30.1	28.2	32.4
Education (%)			
High school or less	26.6	17.5	37.1
Some college	45.3	55.0	34.3
College or University Degree	21.3	20.0	22.9
Graduate Degree	6.8	7.5	5.7
Body Mass Index, mean (SD), kg/m ²	45.0 (6.5)	45.6 (7.0)	44.4 (5.8)
Total MVPA minutes/day, mean (SD)	32.2 (27.3)	30.1 (21.1)	33.7 (33.2)
Bout-related MVPA minutes/day, mean (SD)	6.0 (12.1)	4.4 (5.5)	7.9 (16.6)

Table 2

Baseline SF-36 scores of participants assigned to the Physical Activity Intervention (PAI) and Standard Pre-Surgical Care Control (SC) conditions

SF-36 Domain/Component Summary	Full Sample (N = 75)	PAI Condition (N = 40)	SC Condition (N = 35)
Physical Function	41.1 (9.9)	42.8 (9.6)	39.3 (10.3)
Role-Physical	43.7 (11.4)	47.2 (10.3)*	39.7 (11.4)
Bodily Pain	49.1 (8.0)	51.7 (7.0)*	46.1 (8.2)
General Health	40.7 (9.3)	41.4 (8.6)	39.9 (10.2)
Vitality	42.0 (9.8)	42.6 (9.6)	41.4 (10.1)
Social Functioning	46.1 (10.4)	47.2 (10.6)	44.8 (10.1)
Role-Emotional	47.2 (11.9)	49.3 (10.1)	44.8 (13.5)
Mental Health	48.8 (11.1)	50.1 (7.5)	47.3 (14.1)
Physical Component Summary	42.1 (9.4)	44.3 (9.1)*	39.6 (9.2)
Mental Component Summary	48.5 (11.6)	49.2 (10.1)	47.7 (13.3)

Note. Mean (SD) presented;

* For comparison of PAI and SC, $P < 0.05$