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Physical Activity and Sedentary Behavior in Older Gastrointestinal Cancer Survivors: Need and Acceptability of Digital Health Interventions

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Abstract

Purpose: This study aimed to characterize physical activity (PA) and sedentary behavior (SB) profiles in older gastrointestinal (GI) cancer survivors, assess their interest in interventions to modify these behaviors, and evaluate the acceptability of digital tools for delivering interventions to modify these behaviors.

Methods: Survivors (M = 65 years) from an outpatient survivorship clinic at the Penn State Cancer Institute completed a questionnaire during a clinic appointment.

Results: Most survivors failed to attain the recommended level of PA (79%) or exceeded an average of 8 hours of daily SB (42%). Access to internet and text messaging capabilities were high (70%), yet few survivors had access to smartphones or tablets (<40%) or reported interest in using digital tools to improve PA or reduce SB (<30%). Digital PA and SB interventions were more acceptable to younger survivors, survivors reporting more SB and survivors engaging in more PA. The monetary value ascribed to digital health interventions did not differ as a function of mode of delivery (i.e. text messages, web, email, tablet computer apps or smartphone apps).

Conclusions: Older GI cancer survivors can benefit from interventions to increase PA and decrease SB. Interest in such interventions was moderate and the acceptability of digital health tools for these interventions was limited. At the present time, behavioral interventions for older GI cancer survivors should not be delivered exclusively through digital tools and strategies to improve adoption of various technologies should be implemented when using these tools to modify PA and SB.

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The authors have no conflicts to declare.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Keywords

Lifestyle; Survivorship; Needs Assessment; Mobile Health

Over one million gastrointestinal (GI) cancer survivors live in the United States and an estimated 230,000 new cases will be diagnosed in 2017 [1–3]. Physical activity (PA) reduces risk for many GI cancers, and can improve a variety of survivorship and aging outcomes [4,5]. Although less widely-investigated, excessive sedentary behavior (SB) has emerged as an independent risk factor for some forms of cancer that may also compromise survivorship and aging outcomes [6]. Most of the available evidence about these health behaviors (and interventions to modify them) has focused on samples of breast and colorectal cancer survivors. Less is known about these behaviors in older survivors with a variety of GI cancers. This study assessed the normative need for interventions to promote PA or limit SB among older survivors of GI cancers.

Regular PA following cancer treatment is safe, can improve survival rates and positively impacts a variety of physical and psychological survivorship outcomes including quality of life (QoL), anxiety, fatigue, pain and emotional well-being [5,7–10]. Limiting SB (i.e., sitting) is emerging as another important component of cancer survivorship because it also appears to be associated with improved QoL and reduced mortality for survivors [8,11].

A number of PA and SB interventions exist but access to those supports is limited for many older survivors who live in rural areas without specialty care [12]. Digital interventions for lifestyle behavior change show promise for increasing PA in cancer survivors and represent a potential solution for reaching survivors without access to specialty care [13]. Interest in digital interventions among cancer survivors is generally positive, with a recent study finding 97% of survivors expressed interest in mobile and internet technologies [14]. Yet technology adoption rates are limited among older adults so it is not clear whether older cancer survivors would accept digital tools for modifying activity-related behaviors [15]. The purpose of this study was to characterize PA and SB profiles in older GI cancer survivors, assess interest in interventions to modify these behaviors, and evaluate the acceptability of digital tools for modifying these behaviors.

Methods

Participants

Informed consent was obtained from all individual participants included in the study. Participants were recruited from an outpatient survivorship clinic at the Penn State Cancer Institute, a tertiary care center serving a largely rural, 28-county catchment area. A research assistant recruited eligible survivors individually after the survivor completed check in for a post-treatment follow-up care visit.

Participants completed Research Electronic Data Capture (REDCap) surveys on a tablet computer in the waiting or examination room while waiting for the oncologist. Study data were collected on tablet computers and managed using REDCap electronic data capture tools hosted at the Penn State Milton S. Hershey Medical Center and College of Medicine.

REDCap is a secure, web-based application designed to support data capture for research studies [16].

Measures

Demographic information was collected via nine questions assessing race, ethnicity, employment status, marital status, parental status, family income and education level. Medical histories included both cancer-specific (e.g., type of cancer, time of diagnosis, type of treatment, time since treatment completion) and other health characteristics (e.g., comorbid chronic diseases, smoking).

PA and SB were recalled for the past seven days using the International Physical Activity Questionnaire-Short form (IPAQ-short) [17]. Participants reported the frequency and average daily duration of vigorous-intensity PA, moderate-intensity PA, and walking over the past 7 days. Responses at each intensity were weighted by intensity and summed to estimate PA volume. A separate score was calculated for moderate and vigorous intensity PA to determine whether participants met national PA guidelines. Survivors also reported the average duration of daily SB (i.e., time spent sitting) on weekdays and weekend days. Responses were weighted and summed to estimate average daily SB sitting time. Survivors also reported how many days they spent 8+ waking hours seated or reclined (a level of SB associated with elevated health risks) [18,19].

Impact of cancer diagnosis on survivors' ability to engage in moderate–to-vigorous intensity PA was assessed with one question rated on a scale ranging from 0 (*strongly disagree*) to 100 (*strongly agree*). Motivation to participate in PA and limit SB was assessed by asking survivors to report the number of days they lacked motivation to engage in each behavior. Interest in future PA and SB interventions was measured with two questions; survivors reported either that they would or would not sign up for each intervention.

Finally, the acceptability of digital tools was measured with questions about access to different technologies (i.e., internet, smartphone, text messaging), whether survivors would use a digital tool to promote PA or limit SB, and the perceived value of potential digital tools used to modify those behaviors (i.e., email, web page, tablet or smartphone app, text messaging).

Data Analysis

Descriptive statistics were estimated for participants' demographic characteristics and medical histories. Bivariate correlations estimated relations between scores. Paired t-tests were used to test for differences in the monetary value of the various digital health tools.

Results

The sample comprised male (57%) and female (43%) survivors of pancreatic (29%), colorectal (27%), esophagogastric (22%), and hepatobiliary (21%) cancers. Survivors ranged from 32 to 91 years with a mean age of 64.9 years (SD = 11.1). Over 70% were aged 60 or older, and 75% had children. The sample was almost exclusively Caucasian (95%) and not Hispanic/Latino (99%). Table 1 summarizes additional demographic characteristics for the

sample. Approximately 70% of the sample reported having both internet access at home and the capacity to receive text messages on their phone. Yet few had access to smartphones (39%) or tablet computers (22%).

Most survivors underwent surgery as their only treatment (55%) but some received both surgery and chemotherapy (34%). A small percentage of survivors received either chemotherapy alone or radiation as part of a multi-component treatment plan (9%). Survivors had an average BMI of 28.2 km/m^2 (SD = 6.4) and included participants classified as obese (31%), overweight (37%) normal weight (24%) and underweight (3%). Few survivors reported prior diagnoses of obesity (5%), depression (14%), diabetes (20%), or cardiovascular disease (23%). A limited number of survivors were currently being treated for cardiovascular disease (18%), diabetes (18%), depression (13%), or obesity (<1%), but nearly half of the survivors (40%) were currently receiving treatment for at least one of these conditions. Most survivors had smoked in the past (57%) but few were current smokers (18%).

Behavioral Characteristics

Following screening, 47 cases were identified as outliers (±3 SD) on self-reported PA and SB. Subsequent results are based on the subset of survivors (N=103) without outlying values. As seen in Table 2, PA was limited in frequency and duration, regardless of intensity level; however, light-intensity was most common, averaging about 30 min/day and 4.5 days/week. Based on the reported frequency and duration of moderate- and vigorous-intensity PA, the majority of survivors failed to achieve the recommended amount in national PA guidelines (79%). Survivors perceived that their cancer diagnosis had a limited impact on their ability to engage in moderate-intensity PA for 2.5 hrs/week (M = 34.8/100; SD = 31.9). Survivors reported engaging in less PA than desired on an average of 1.2 days in the past week (SD = 2.2).

Table 2 also shows that survivors reported over 7 hours/day of SB. Daily SB did not vary between weekdays and weekends ($p > .05$). Across the entire week, 42% of survivors reported averaging 8+ hours of sedentary time/day. Survivors reported spending more than 8 waking hours on an average of 2.2 days in the past week (SD = 3.1) and wanting to limit or interrupt their SB but lacking the motivation to do so on 1.0 days in the past week (SD = 2.1).

Table 3 summarizes joint behavioral profiles in relation to recommended levels of PA (compared to national guidelines) and SB (compared to 8 hours/day of sedentary time). Only 17% of survivors reported attaining the recommended level of weekly PA and limiting their SB to less than 8 hrs/day. Insufficient PA was more common than excessive SB.

Interest in Lifestyle Interventions

Notwithstanding the normative need for behavioral interventions, survivors had moderate interest in interventions to promote PA (50%) or limit SB (47%). Age was not associated with interest in PA interventions ($p > .05$); however, older participants were less likely to be interested in SB interventions ($r = -.21$, $p < .05$). Interest in PA and SB interventions did not vary as a function of survivors' sex, BMI, type of cancer, PA, or SB (all $p > .05$).

Acceptability of Digital Intervention Tools

Approximately 25% of the sample reported they would use a digital health tool to improve PA. Digital PA interventions were more acceptable to younger survivors ($r = -.30$, $p < .01$) and survivors reporting more SB ($r = -.23$, $p < .05$); however, no differences existed as a function of sex, BMI, type of cancer, or PA. Ascribed monetary value did not differ as a function of whether digital PA interventions were delivered via text messages, web, email, tablet computer apps, or smartphone apps (all $p > .05$). On average, digital PA intervention tools were ascribed more value by survivors who engaged in more PA ($r = .38$, $p < .05$); ascribed value did not differ by type of cancer, age, BMI, or SB ($p \geq .05$).

Only 27% of the sample reported they would use a digital health tool to reduce SB. There were no differences in perceived monetary value of a monthly subscription for interventions delivered via text messages, web, email, tablet computer apps, or smartphone apps (all $p > .05$). Digital SB intervention tools were ascribed more value by younger survivors ($r = -.22$, $p < .05$) and survivors who engaged in more PA ($r = .38$, $p < .05$); ascribed value did not differ by type of cancer, BMI, or SB ($p > .05$).

Discussion

This study characterized PA and SB profiles in older GI cancer survivors and assessed this population's interest in interventions to modify these behaviors and the acceptability of digital health tools for these behavior changes. The majority of older GI cancer survivors either did not meet PA national guidelines, reported excessive SB or both. Insufficient levels of PA were more common than excessive SB among older GI cancer survivors. This health behavior profile mirrors results from related populations. For example, midlife and older adult survivors of lung, breast, prostate, colon and a variety of less prevalent, unspecified cancers reported insufficient moderate and vigorous PA (41%) more frequently than excessive SB (30%) [8]. Similarly, among older adults not diagnosed with cancer, insufficient PA was more common than excessive SB when objectively measuring PA and SB in older adults over the age of 60 [20,21]. A similar needs assessment on breast cancer survivors revealed that excessive SB was more common than lower PA levels but many survivors still failed to meet PA recommendations [22]. This lack of PA in older adults with and without a cancer diagnosis is alarming considering the rapidly aging population and increased life expectancy of cancer survivors [23]. Lifestyle interventions involving PA can improve cancer-related symptoms and protect cancer survivors from a variety of comorbidities related to both a cancer diagnosis and aging in general. Yet older adults continue to be understudied and underserved, and older cancer survivors are often left out of interventions and clinical trials [23]. Our results indicate that there is a normative need for behavioral interventions to increase PA in older GI cancer survivors.

Although older GI cancer survivors need interventions to modify PA and SB, they reported only moderate interest in these types of interventions. Interest in PA interventions has been higher among other cancer survivor populations. For example, a cross-sectional study of breast, colorectal and prostate survivors revealed about 67% were at least somewhat interested in using an exercise program to get in shape [24]. On the other hand, a large percentage (89%) of older adults believe that participating in PA would help them feel better

and remain independent yet still expressed a lack of interest in PA [25]. It is possible that a negative health outcome such as a cancer diagnosis leads to older adults becoming interested in regular PA but, despite their diagnosis, the present sample of older GI cancer survivors were not interested in lifestyle interventions.

Research with other cancer survivor populations (e.g. breast) has indicated that a cancer diagnosis can motivate survivors to participate in PA, even if they were inactive prior to diagnosis [26]. In some cases, PA levels can increase as much as 31% following a cancer diagnosis [27]. However, in a sample of mixed adult cancer survivors over half reported not changing their exercise behaviors following a cancer diagnosis, while approximately 30% reported exercising less [28]. The present sample of older GI cancer survivors were not motivated to increase PA following their diagnosis. Future research should determine why older GI cancer survivors are not interested in behavioral interventions for PA and SB. PA interventions for this survivor population should address this motivational deficit early in the process of behavior change.

Less than half of the present sample reported having access to either a tablet computer or smartphone. National rates of digital technology adoption by older adults are similar [15]. One can expect adoption rates to increase as younger cohorts who have already adopted this technology age. Approximately a quarter of the sample reported interest in digital health tools for both PA and SB. Consistent with our results, younger survivors from other cancer survivor populations have expressed greater interest than older survivors in digital health interventions [14]. At present, it appears that digital tools should not be used as a sole behavioral intervention modality with older GI cancer survivors.

When digital tools are used, increasing adoption of a variety of technologies may be the first step in improving acceptability of digital health interventions in this population. Increasing adoption could involve breaking down some of the barriers to using technology. Future studies should assess whether this survivor population would increase technology adoption if cost was not an issue and the technology was provided to them. Researchers may need to consider providing the technology in future interventions, particularly if cost is identified as a barrier among GI cancer survivors.

Digital tools were also more acceptable for survivors who engaged in more PA or reported higher levels of SB. These participants may accumulate SB in occupational settings that promote technology adoption. Oncologists may be able to use high SB as a trigger to query older cancer survivors' interest in digital tools for health behavior change.

This needs assessment was based on self-reported behavioral data which can be vulnerable to bias [29,30]. Future studies should incorporate device-based measures of these behaviors as well as clinician ratings and medical records to improve understanding of lifestyle influences on survivorship outcomes. The demographic profile of survivors in this sample was representative of the catchment area but was homogeneous and conclusions may not generalize to more diverse populations. Future studies should include older GI cancer survivors from diverse ethnic and racial backgrounds. Finally, this study used a cross-sectional design so inferences cannot be drawn about how this population's behavior or

attitudes would change over time. It is likely that technology adoption and acceptability of digital health tools will improve as younger cohorts age and become older adults. Older GI cancer survivors' acceptance of digital health tools should be re-examined periodically.

In sum, the population of older GI cancer survivors has increased over time due to earlier diagnosis and improved treatment [23]. Improved treatments are also extending longevity. Against this backdrop, it is important to find ways to improve the quality of survivorship. Older GI cancer survivors can benefit from increasing PA and limiting SB yet revealed only moderate interest in lifestyle behavior interventions. Efforts are needed to educate older GI cancer survivors about the impact of an active lifestyle on survivorship outcomes. Digital health tools hold promise for increasing access to lifestyle interventions but acceptance of these tools is currently limited among older GI cancer survivors. For now, traditional in-person approaches should continue to be employed and efforts to implement digital interventions should be accompanied by strategies to improve adoption of the digital tool. This challenge seems likely to fade as younger cohorts who have greater experience integrating technology into their lives age into the next generation of older cancer survivors.

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References

1. Sellar CM, Courneya KS (2011) Physical activity and gastrointestinal cancer survivorship. Recent Results Cancer Res 186:237–53. 10.1007/978-3-642-04231-7_10 [PubMed: 21113767]
2. Miller KD, Siegel RL, Lin CC, Mariotto AB, Kramer JL, Rowland JH, et al. (2016) Cancer treatment and survivorship statistics, 2016. CA: A Cancer Journal for Clinicians 66:271–89. https://doi.org/10.3322%2Fcaac.21349 [PubMed: 27253694]
3. SEER Cancer Stat Facts. https://seer.cancer.gov/statfacts/. Accessed 8 Nov 2017
4. Moore SC, Lee I-M, Weiderpass E, Campbell PT, Sampson JN, Kitahara CM, et al. (2016) Association of leisure-time physical activity with risk of 26 types of cancer in 1.44 million adults. JAMA Intern Med 176:816–25. https://doi.org/10.1001%2Fjamainternmed.2016.1548 [PubMed: 27183032]
5. Mishra SI, Scherer RW, Geigle PM, Berlanstein DR, Topaloglu O, Gotay CC, et al. (2012) Exercise interventions on health-related quality of life for cancer survivors. Cochrane Database Syst. Rev 8:CD007566. https://doi.org/10.1002%2F14651858.CD007566.pub2
6. Lynch BM, Leitzmann MF (2017) An evaluation of the evidence relating to physical inactivity, sedentary behavior, and cancer incidence and mortality. Curr Epidemiol Rep 4:221–31. https://doi.org/10.1007%2Fs40471-017-0119-7
7. Buffart LM, Galvão DA, Brug J, Chinapaw MJM, Newton RU (2014) Evidence-based physical activity guidelines for cancer survivors: current guidelines, knowledge gaps and future research directions. Cancer Treatment Reviews 40:327–40. https://doi.org/10.1016%2Fj.ctrv.2013.06.007 [PubMed: 23871124]
8. Kim RB, Phillips A, Herrick K, Helou M, Rafie C, Anscher MS, et al. (2013) Physical activity and sedentary behavior of cancer survivors and non-cancer individuals: results from a national survey. PloS One 8:e57598 https://doi.org/10.1371%2Fjournal.pone.0057598 [PubMed: 23483916]
9. Rock CL, Doyle C, Demark-Wahnefried W, Meyerhardt J, Courneya KS, Schwartz AL, et al. (2012) Nutrition and physical activity guidelines for cancer survivors. CA: A Cancer Journal for Clinicians 62:243–74. https://doi.org/10.3322%2Fcaac.21142 [PubMed: 22539238]

10. Schmitz KH, Courneya KS, Matthews C, Demark-Wahnefried W, Galvão DA, Pinto BM, et al. (2010) American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. Med Sci Sports Exerc 42:1409–26. https://doi.org/10.1249%2FMSS.0b013e3181e0c112 [PubMed: 20559064]
11. Phillips SM, Awick EA, Conroy DE, Pellegrini CA, Mailey EL, McAuley E (2015) Objectively measured physical activity and sedentary behavior and quality of life indicators in survivors of breast cancer. Cancer 121:4044–52. 10.1002/cncr.29620 [PubMed: 26308157]
12. Ganz PA (2014) Institute of Medicine Report on Delivery of High-Quality Cancer Care. Journal of Oncology Practice 10:193–5. https://doi.org/10.1200%2FJOP.2013.001369 [PubMed: 24839280]
13. Roberts AL, Fisher A, Smith L, Heinrich M, Potts HWW (2017) Digital health behaviour change interventions targeting physical activity and diet in cancer survivors: a systematic review and meta-analysis. Journal of Cancer Survivorship: Research and Practice 11:704–19. https://doi.org/10.1007%2Fs11764-017-0632-1 [PubMed: 28779220]
14. Robertson MC, Tsai E, Lyons EJ, Srinivasan S, Swartz MC, Baum ML, et al. (2017) Mobile health physical activity intervention preferences in cancer survivors: A qualitative study. JMIR MHealth UHealth. 10.2196/mhealth.6970
15. Pew Research Center (2017) Tech adoption climbs among older adults. http://assets.pewresearch.org/wp-content/uploads/sites/14/2017/05/16170850/PI_2017.05.17_Older-Americans-Tech_FINAL.pdf. Accessed 8 Nov 2017
16. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG (2009) Research Electronic Data Capture (REDCap) - A metadata-driven methodology and workflow process for providing translational research informatics support. Journal of Biomedical Informatics 42:377–81. 10.1016/j.jbi.2008.08.010 [PubMed: 18929686]
17. Craig CL, Marshall AL, Sjöström M, Bauman AE, Booth ML, Ainsworth BE, et al. (2003) International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc 35:1381–95. https://doi.org/10.1249%2F01.MSS.0000078924.61453.FB [PubMed: 12900694]
18. Dunstan DW, Barr ELM, Healy GN, Salmon J, Shaw JE, Balkau B, et al. (2010) Television viewing time and mortality: the Australian Diabetes, Obesity and Lifestyle Study (AusDiab). Circulation 121:384–91. https://doi.org/10.1161%2FCIRCULATIONAHA.109.894824 [PubMed: 20065160]
19. Katzmarzyk PT, Church TS, Craig CL, Bouchard C (2009) Sitting time and mortality from all causes, cardiovascular disease, and cancer. Med Sci Sports Exerc 41:998–1005. https://doi.org/10.1249%2FMSS.0b013e3181930355 [PubMed: 19346988]
20. Harvey JA, Chastin SFM, Skelton DA (2015) How sedentary are older people? A systematic review of the amount of sedentary behavior. Journal of Aging and Physical Activity 23:471–87. 10.1123/japa.2014-0164 [PubMed: 25387160]
21. Sun F, Norman IJ, While AE (2013) Physical activity in older people: a systematic review. BMC Public Health 13:449 https://doi.org/10.1186%2F1471-2458-13-449 [PubMed: 23648225]
22. Phillips SM, Dodd KW, Steeves J, McClain J, Alfano CM, McAuley E (2015) Physical activity and sedentary behavior in breast cancer survivors: New insight into activity patterns and potential intervention targets. Gynecol Oncol 138:398–404. https://doi.org/10.1016%2Fj.ygyno.2015.05.026 [PubMed: 26026737]
23. Bluethmann SM, Mariotto AB, Rowland JH (2016) Anticipating the “silver tsunami”: Prevalence trajectories and comorbidity burden among older cancer survivors in the United States. Cancer Epidemiology and Prevention Biomarkers 25:1029–36. https://doi.org/10.1158%2F1055-9965.EPI-16-0133
24. Martin EC, Basen-Engquist K, Cox MG, Lyons EJ, Carmack CL, Blalock JA, et al. (2016) Interest in health behavior intervention delivery modalities among cancer survivors: A cross-sectional study. JMIR Cancer 2:e1 https://doi.org/10.2196%2Fcancer.5247 [PubMed: 28410164]
25. Crombie IK, Irvine L, Williams B, McGinnis AR, Slane PW, Alder EM, et al. (2004) Why older people do not participate in leisure time physical activity: a survey of activity levels, beliefs and deterrents. Age Ageing 33:287–92. https://doi.org/10.1093%2Fageing%2Fafh089 [PubMed: 15082435]

26. Sander AP, Wilson J, Izzo N, Mountford SA, Hayes KW (2012) Factors that affect decisions about physical activity and exercise in survivors of breast cancer: A qualitative study. Physical Therapy 92:525–36. https://doi.org/10.2522%2Fptj.20110115 [PubMed: 22156026]

27. Humpel N, Magee C, Jones SC (2007) The impact of a cancer diagnosis on the health behaviors of cancer survivors and their family and friends. Support Care Cancer 15:621–30. https://doi.org/10.1007%2Fs00520-006-0207-6 [PubMed: 17205274]

28. Blanchard CM, Denniston MM, Baker F, Ainsworth SR, Courneya KS, Hann DM, et al. (2003) Do adults change their lifestyle behaviors after a cancer diagnosis? American Journal of Health Behavior 27:246–56. [PubMed: 12751621]

29. Prince SA, Adamo KB, Hamel ME, Hardt J, Gorber SC, Tremblay M (2008) A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review. International Journal of Behavioral Nutrition and Physical Activity 5:56 10.1186/1479-5868-5-56 [PubMed: 18990237]

30. Healy GN, Clark BK, Winkler EAH, Gardiner PA, Brown WJ, Matthews CE (2011) Measurement of adults' sedentary time in population-based studies. American Journal of Preventative Medicine 41:216–27. 10.1016/j.amepre.2011.05.005

Table 1.

Participant demographic characteristics and medical histories

		N	%
Marital Status			
	Married or domestic partner	94	62.7
	Divorced	24	16
	Widowed	23	15.3
	Never married, single	6	4
	Separated	3	2
Employment Status			
	Retired	73	48.7
	Full-time	34	22.7
	Part-time	11	7.3
	Unemployed	32	21.3
Household Income			
	<$50K	43	28.6
	$50K-$150K	49	32.7
	>$150K	5	3.3
	Prefer not to answer	53	35.3
Education			
	High school education or less	99	65.9
	Some college or Associate's degree	27	18
	Completed ≥4 year college degree	24	16

Table 2.

Descriptive statistics on weekly physical activity and sedentary behavior

	M	*SD*	Median	Mode	Range
Vigorous-intensity PA					
Frequency (day/week)	0.33	1.22	0.00	0	0–7
Duration (min/day)	5.24	21.36	0.00	0.00	0–180
Moderate-intensity PA					
Frequency (day/week)	2.03	2.25	2.00	0	0–7
Duration (min/day)	28.79	44.95	15.00	0.00	0–240
Light-intensity PA (walking)					
Frequency (day/week)	4.45	2.32	5.00	7	0–7
Duration (min/day)	30.19	30.86	20.00	30.00	0–180
Total volume of PA (MET·min)	1110.35	1575.97	560.50	0.00	0–9,492
Sedentary behavior					
Weekday duration (min/day)	438.93	148.16	420.00	360.00	60–780
Weekend duration (min/day)	442.14	150.94	420.00	360.00	120–780
Average weighted duration (min/day)	441.22	147.42	428.57	360	102.86–780

[a]Data were excluded from participants who reported >16 hrs/day of total physical activity or sedentary behavior. Outlying data points (+3 SD) were also excluded from analysis (n = 47).

Table 3.

Physical activity and sedentary behavior profiles among clinic patients (based on subset of data within 3 SD of mean; n = 103).

	Meeting PA Guidelines	Not Meeting PA Guidelines	Marginal Totals
Limited Sedentary Time	n = 18 (17%)	n = 42 (41%)	n = 60 (58%)
Excessive Sedentary Time	n = 4 (4%)	n = 39 (38%)	n = 43 (42%)
Marginal Totals	n = 22 (21%)	n = 81 (79%)	