HHS Public Access

Author manuscript

J Phys Act Health. Author manuscript; available in PMC 2021 August 26.

Published in final edited form as:

J Phys Act Health. 2019 December 01; 16(12): 1113–1122. doi:10.1123/jpah.2019-0027.

Supports and barriers to home-based physical activity during preoperative treatment of pancreatic cancer: A mixed-methods study

Nathan H. Parker, MPH, PhD,
Department of Behavioral Science, The University of Texas MD Anderson Cancer Center, Unit 1330, CPB3.3278, PO Box 301439, Houston, TX 77230-1439

Rebecca E. Lee, PhD,
College of Nursing and Health Innovation, Center for Health Promotion and Disease Prevention, Arizona State University, Phoenix, AZ

Daniel P. O'Connor, PhD,
Department of Health and Human Performance, University of Houston, Houston, TX

An Ngo-Huang, DO,
Department of Palliative, Rehabilitation and Integrative Medicine, The University of Texas MD Anderson Cancer Center, Houston, TX

Maria QB Petzel, RD, CSO, LD, CNSC,
Department of Surgical Oncology, The University of Texas MD Anderson Cancer Center, Houston, TX

Keri Schadler, PhD,
Department of Pediatrics, The University of Texas MD Anderson Cancer Center, Houston, TX

Xuemei Wang, MS,
Department of Biostatistics, The University of Texas MD Anderson Cancer Center, Houston, TX

Lianchun Xiao, MS,
Department of Biostatistics, The University of Texas MD Anderson Cancer Center, Houston, TX

David Fogelman, MD,
Department of Gastrointestinal Medical Oncology, The University of Texas MD Anderson Cancer Center, Houston, TX

Richard Simpson, PhD,
Department of Nutritional Sciences, Department of Pediatrics, Department of Immunobiology, College of Agriculture and Life Sciences, College of Medicine, The University of Arizona, Tucson, AZ

Jason B Fleming, MD,
Department of Gastrointestinal Oncology, Moffitt Cancer Center, Tampa, FL

Jeffrey E Lee, MD,

(Corresponding author) nhparker@mdanderson.org; phone (713) 745-1769; fax (713) 563-9760.

Department of Surgical Oncology, The University of Texas MD Anderson Cancer Center, Houston, TX

Ching-Wei D. Tzeng, MD,
Department of Surgical Oncology, The University of Texas MD Anderson Cancer Center, Houston, TX

Sunil K. Sahai, MD,
Department of General Internal Medicine, The University of Texas MD Anderson Cancer Center, Houston, TX

Karen Basen-Engquist, PhD, MPH,
Department of Behavioral Science, The University of Texas MD Anderson Cancer Center, Houston, TX

Matthew HG Katz, MD
Department of Surgical Oncology, The University of Texas MD Anderson Cancer Center, Houston, TX

Abstract

Background—Physical activity and exercise appear to benefit patients receiving preoperative treatment for cancer. Supports and barriers must be considered to increase compliance with home-based exercise prescriptions in this setting. Such influences have not been previously examined.

Methods—We used quantitative and qualitative methods to examine potential physical activity influences among patients who were prescribed home-based aerobic and strengthening exercise concurrent with preoperative chemotherapy or chemoradiation for pancreatic cancer. Physical activity was measured using exercise logs and accelerometers. Social support for exercise and perceived neighborhood walkability were measured using validated surveys. Relationships between influences and physical activity were evaluated using linear regression analyses and qualitative interviews.

Results—Fifty patients received treatment for a mean of 16±9 weeks prior to planned surgical resection. Social support from family and friends and neighborhood aesthetics were positively associated with physical activity (p<.05). In interviews, patients confirmed the importance of these influences and cited encouragement from healthcare providers and desire to complete and recover from treatment as additional motivators.

Conclusions—Interpersonal and environmental motivators of exercise and physical activity must be considered in the design of future home-based exercise interventions designed for patients receiving preoperative therapy for cancer.

Keywords

Exercise; accelerometry; qualitative research; resistance training; walkability

Introduction

Complex operations, often following receipt of chemotherapy and/or radiation therapy, are potentially curative for patients with early stage cancer, but patients' physiologic status and anticipated postoperative recovery factor heavily into the decision to operate.[1–3] In pancreatic and other cancers, chemotherapy and/or chemoradiation therapy are increasingly used to treat tumors prior to surgery.[3–6] Exercise may help maintain or even improve the physical fitness of patients with cancer when administered concurrently with these preoperative therapies.,[7] potentially conferring physiologic benefits that improve their ability to recover from surgery. However, cancer is often diagnosed among older adults, who are frequently frail (either at baseline and/or from the disease process), and for whom preoperative therapies may be difficult to tolerate.[1,8–11] Therefore, while exercise has the potential to improve the health of patients treated for cancer, the benefits associated with exercise prescribed in the preoperative setting may be moderated by significant disease- and treatment-related barriers.

Results from our prior study of preoperative exercise in pancreatic cancer patients prompted us to examine these and other factors that may influence physical activity. [12] Participants who were enrolled in a home-based exercise program concurrent with preoperative therapy for pancreatic cancer achieved considerable average weekly aerobic and strengthening exercise volumes (98.6 and 57.4 minutes, respectively), but the degree to which patients exercised was highly variable (standard deviations of 69.8 minutes and 36.0 minutes, respectively).[12] To investigate potential influences that contribute to this variability, we turned to socioecological models of health behavior, which provide a foundation for investigating physical activity influences and inform behavioral interventions, positing that behavioral influences operate at various levels.[13–17] These influences and levels include *interpersonal factors*, including interactions with other individuals, and *environmental factors*, including aspects of natural and built environments.[18] Influences at multiple levels interact to affect behavior, so it is important for interventions to address multiple levels in order to be most effective.[15,16,19]

It is hypothesized that social support and neighborhood resources represent critical interpersonal and environmental influences on cancer patients' physical activity in the context of home-based programming during preoperative treatment.[20,21] Spouses, family members, and friends may influence the degree to which patients exercise by providing social support that is emotional (e.g., encouragement or praise), informational (e.g., improving one's understanding of safe and effective physical activity), or instrumental (e.g., providing transportation or companionship).[22,23] Studies using both surveys and qualitative interviews have established the importance of social support for physical activity among older adults[24,25] and cancer survivors.[26,27] Understanding patients' neighborhood resources may also be critical when prescribing home-based exercise regimens because patients' perceptions of how convenient, safe, and enjoyable it is to exercise in a neighborhood influence their physical activity.[28,29] Furthermore, neighborhood walkability and availability of recreational spaces have been associated with increased physical activity in cancer survivors.[30,31]

The purpose of this study was to characterize relationships between socioecological factors and physical activity among patients enrolled in a home-based exercise program concurrent with preoperative treatment for pancreatic cancer. Pancreatic cancer treatment represents an understudied context in exercise oncology research, and there exists significant potential to improve treatment and quality of life outcomes.[32] Given the challenges of age, disease, and treatment, it is particularly important to identify socioecological supports and barriers to improve interventions and to help patients make and maintain healthy lifestyle changes. We used a combination of self-reported, objective, and qualitative methods to investigate these potential relationships. Our research focused on social support from family and friends and perceived neighborhood walkability because they have been shown to be important predictors of physical activity among cancer survivors and older adults.[22,33]

METHODS

Setting and Eligibility Criteria

Patients were recruited for enrollment to a prospective trial of preoperative exercise at The University of Texas MD Anderson Cancer Center, and all study activities were approved by the Institutional Review Board (protocol 2014–0702). Complete inclusion and exclusion criteria have been described previously.[12] In brief, patients who presented with biopsy-proven pancreatic cancer and who were planned to receive at least 6 weeks of preoperative therapy (systemic chemotherapy and/or chemoradiation therapy) prior to anticipated surgery were screened for enrollment. Patients with medical contraindications to unsupervised exercise prescription based on recommendations from referring physicians were excluded. Potentially eligible patients completed the Physical Activity Readiness Questionnaire (PAR-Q)[34] and the Patient-Reported Outcomes Measurement Information System (PROMIS) Physical Function 12a Short Form[35] screener question (“Can you walk 25 feet on a level surface, with or without support?”). Patients taking blood pressure medications or with musculoskeletal concerns received appropriate medical clearance. Patients with musculoskeletal concerns received encouragement for low impact aerobic exercise (i.e., stationary cycling for arthritic knees) and modifications to strengthening exercises (i.e., reduced repetition range of motion for shoulder impairments).

Exercise Prescription

Participants were encouraged to engage in home-based, multimodal exercise from enrollment until final surgical evaluation.[12,32] Exercise prescription was based on recommendations from the American Cancer Society and American College of Sports Medicine but was attenuated to accommodate older age and simultaneous preoperative treatment among patients in the trial.[36–38] The attenuated exercise prescription was selected to provide previously inactive participants with an attainable weekly exercise volume and to encourage progression, and patients were encouraged to exceed this prescription as able. The target exercise period spanned the entirety of preoperative treatment (chemotherapy or chemoradiation) and treatment break between preoperative treatment and final surgical evaluation.

In brief, patients were encouraged to perform preferred moderate-intensity aerobic exercise (e.g., brisk walking, elliptical trainers, stationary bicycles) for ≥20 minutes per day on ≥3 days per week, for a minimum weekly aerobic exercise prescription of 60 minutes. Patients also were encouraged to perform a full-body strengthening exercise routine (lasting approximately 30 minutes) on ≥2 days per week. Instruction and guides covered 19 strengthening exercises, and patients were encouraged to select 8 different exercises (1–2 for abdominal muscles, 3–4 for upper body muscle groups, and 3–4 for lower body muscle groups) and to perform 3 sets of 8–12 repetitions for each exercise to complete a strengthening session. Patients received portable resistance tube sets (Stackable Resistance Band Set, Black Mountain Products) to perform all recommended strengthening exercises. Exercise instruction, focusing on performing aerobic exercise with proper intensity resistance exercises with proper form, occurred in-person at enrollment with an ACSM/ACS certified Cancer Exercise Trainer. Patients received follow-up phone calls once every two weeks to encourage exercise and monitor for exercise-related questions or concerns.

Sociodemographic and Clinical Characteristics

The following sociodemographic and clinical variables were collected from patients' electronic medical records: age at enrollment, sex, location of residence (with distance between home and study location by zip codes calculated using Google Maps®), body mass index (kg/m^2), disease stage at presentation, treatment regimen during the exercise program, exercise program duration, and outcome following preoperative treatment (stable or improved disease and resection or no resection due to disease progression).

Potential Influences on Exercise and Physical Activity

Social support for exercise.—Social support for exercise was measured using the family and friend participation subscales from the Social Support for Exercise Survey (SSES).[39] Social support for exercise was assessed at baseline and at final surgical evaluation (follow up), following exercise program participation. The SSES lists items that family members or friends may do or say to someone who is trying to exercise regularly, from emotional support (eg, "Gave me encouragement to stick to my exercise program") to instrumental support (eg, "Helped plan activities around my exercise"). Patients scored each item for friends and family separately on a scale from 1=none to 5=very often according to how frequently they engaged in the listed behavior in the previous 3 months. Scores for the family participation and friend participation subscales (each with 10 items and score range 10–50) were computed per published protocols, with higher ratings indicating higher social support. Validity and reliability of the SSES have been demonstrated.[39] The SSES was administered at both baseline and follow up in order to account for different levels of social support that family and friends may provide following enrollment in an exercise program concurrent with cancer treatment.

Perceived neighborhood walkability.—Subscales from the Neighborhood Environment Walkability Scan-Abbreviated (NEWS-A)[40,41] were used to examine patients' perceptions of home neighborhood walkability at baseline. These subscales included places for walking and cycling (6 items, each with score range 1–4, eg, "There are sidewalks on

most of the streets in my neighborhood"), aesthetics (4 items, each with score range 1–4, eg, "There are many attractive natural sights in my neighborhood"), traffic hazards (3 items, each with score range 1–4, eg, "There is so much traffic along nearby streets that it makes it difficult or unpleasant to walk in my neighborhood"), and crime (3 items, each with score range 1–4, eg, "There is a high crime rate in my neighborhood"). Per published protocol, each subscale was computed as the mean score of its items, accounting for reverse scoring when appropriate, to produce a subscale score ranging from 1–4. Higher scores in the places for walking and cycling and aesthetics subscales indicate higher walkability, while higher scores in the crime and traffic subscales indicate lower walkability. Validity of the NEWS-A has been demonstrated.[41,42]

Neighborhood socioeconomic status.—Median household incomes of zip codes containing participants' mailing addresses were collected using 2015 5-year estimates from the American Community Survey. Zip code-level estimates were used in place of Census tracts because several patients' mailing addresses in the electronic medical record were post office boxes.[43]

Exercise and Physical Activity Assessment

Exercise assessment.—Patients were instructed to complete an exercise log for each day they were enrolled in the exercise program.[12,32] Weekly totals of aerobic and strengthening exercise minutes were compiled for each 7-day period from the date of enrollment to the date of final surgical evaluation. Weekly averages for aerobic and strengthening minutes were then computed across all weeks of participation. Exercise minutes were assumed to be 0 on days for which participants did not complete logs and for fields in logs that were left blank.

Physical activity assessment.—Study enrollment occurred during treatment planning appointments (i.e., after cancer diagnosis), and the exercise intervention period spanned from this point until preoperative restaging appointments. The intervention timeframe, therefore, precluded measurement of pre- and post-intervention physical activity. Therefore, we instead aimed to quantify physical activity throughout the intervention. Physical activity was monitored objectively using accelerometers (ActiGraph GT3X+, ActiGraph Corp 2011). Patients received accelerometers and were instructed to wear them over their right hips for 2 consecutive weeks (all waking hours) at approximately the midpoint of each preoperative phase, as previously described.[32] For example, patients who underwent chemotherapy, chemoradiation therapy, and a rest period during study enrollment underwent 3 separate accelerometer monitoring periods. Due to potential for accumulation of side effects (e.g., fatigue) during each treatment phase, the middle two weeks of each phase were targeted for accelerometer wear in order to best approximate average physical activity during that phase. Accelerometers collected data at 60 Hz, and counts were processed in 1-minute epochs. A minimum of 10 hours of wear time on each of at least 7 days were required to include a wear period in analyses. Due to participants' schedules for chemotherapy and/or chemoradiation treatments during targeted accelerometer wear periods, valid days were not required to be consecutive to constitute a valid wear period. Freedson adult (1998) cutpoints were used to provide weekly estimates of light physical activity (LPA) and moderate-to-vigorous physical

activity (MVPA) for each wear period. Weekly accelerometer physical activity in each intensity was averaged across each treatment phase for each patient to provide estimates of LPA and MVPA over the entire course of exercise program participation.

Qualitative Interviews

Potential influences on exercise and physical activity were examined qualitatively through semi-structured interviews with a subsample of patients (n=10). Primary questions and probing questions for qualitative interviews focused on the following constructs: energy and side-effects during preoperative treatment phases and how they affected exercise abilities or motivation; time and logistical issues involving exercise during preoperative treatment; the influence of family, friends, and neighborhood or community resources on physical activity and exercise satisfaction with the exercise program; and suggestions for improvement. The interview guide included 17 open-ended, non-leading questions covering these topics. To minimize study burden on patients during preoperative treatment and postoperative recovery, interviews were conducted 1–2 months following surgery. Interviews lasted approximately 30 minutes and were conducted via telephone, recorded, and transcribed by a research team member who had training and experience in qualitative interviewing. Transcriptions were compared with audio recordings for accuracy.

Analyses

Quantitative analyses.—Descriptive statistics were used to characterize all study variables. Paired t tests were used to compare changes in social support subscale scores from baseline to final surgical evaluation and to compare social support for exercise between family and friends. Linear regression models were used to estimate associations between influence variables (social support at baseline and follow up and neighborhood walkability) and both self-reported exercise and objective physical activity. Separate models were used to estimate the associations between each potential influence and each exercise or physical activity outcome. All linear regression models were adjusted for sex, and models including neighborhood walkability scores as the independent variable were also adjusted for zip code-level median household income to account for the potential confounding effect of neighborhood socioeconomic status on walkability.[44] Inclusion of these covariates was based on evidence of differences or associations detected in bivariate analyses involving sociodemographic characteristics of participants and neighborhoods and influence and outcome variables. Other potential covariates, including age, treatment patterns, and baseline performance status showed no evidence of bivariate correlations with influence or outcome measures (all p>.1). Statistical significance was defined at p<0.05, and all tests were two-tailed. All analyses were performed using SPSS Statistics Version 24 (IBM, 2016).

Qualitative analyses.—Two members of the research staff were trained in qualitative analyses and coded qualitative interviews using NVivo software version 10 (QSR International, 2015) and a constant comparison approach. Principles involving physical activity adoption and maintenance from Social Cognitive[45–47] and ecologic theories[16,19] informed the coding approach. The coders first created a list of *a priori* codes and themes and then coded 5 interviews independently, each adding emergent codes and themes to the list and rearranging *a priori* codes that fit emerging themes. The coders then reviewed

the first 5 interviews together, discussing similarities and discrepancies in coding to reach consensus on the list of codes and themes. This process was repeated for interviews 6–10 and followed by a final meeting between the coders to reach consensus on codes and themes. Finally, one coder reviewed all transcripts a second time to confirm and modify codes and themes that fit, to reject codes and themes that did not fit, and to confirm that no additional themes emerged.

Results

Participant Characteristics

One patient (2%) of the 51 referred by collaborating physicians was deemed ineligible for the study due to losing balance because of dizziness and instead underwent formal physical therapy consultation. Fourteen patients (27%) required clearance from consulting internal medicine physicians due to use of blood pressure medications, 5 patients (10%), required clearance from consulting physical medicine and rehabilitation physicians due to musculoskeletal concerns, and 6 patients (12%) required clearance for both concerns. Table 1 reports clinical and sociodemographic characteristics of the study sample (N=50). Participants had a mean age of 66±8 years, and 24 (48%) of participants were female. Thirty-two (64%) were overweight or obese. Patients' home zip codes were located a mean of 422±409 miles from MD Anderson Cancer Center. Participants underwent preoperative therapy with concurrent exercise prescription for a mean of 16±9 weeks.

Perceived Neighborhood Walkability and Social Support for Exercise

NEWS-A scores were calculated on the basis of data obtained from all 50 participants at baseline, and SSES scores were calculated on the basis of data obtained from 45 participants both upon enrollment and at final surgical evaluation (Table 2). There were no statistically significant differences in social support for exercise from family or friends between baseline and surgical evaluation, but social support from families was significantly higher than social support from friends (p<0.01 at both baseline and surgical evaluation). Cronbach's alphas for the family and friends support subscales (10 items each) were .71 and .66, respectively.

Self-Reported Exercise and Accelerometer-Measured Physical Activity

Table 2 also reports average weekly aerobic and strengthening minutes and average weekly LPA and MVPA minutes. Mean weekly aerobic exercise minutes (reported in daily exercise logs) exceeded the program recommendation of at least 60 minutes per week, but weekly strengthening minutes did not. Patients performed a mean of 923.8±294.5 minutes of weekly LPA and 158.7±146.7 minutes of weekly MVPA, as measured using accelerometers.

Associations between Influence Variables and Self-Reported Exercise and Accelerometer Physical Activity

Table 3 reports associations between potential influences and weekly exercise and physical activity. After adjusting for sex, there was a significant positive association between social support for exercise from friends and LPA (β=14.27, p=0.04). After adjusting for sex, and zip code-level median household income, there was a significant positive association between home neighborhood aesthetics and MVPA (β=57.92, p<0.05). There were no

statistically significant associations between social support or neighborhood walkability variables and self-reported weekly aerobic or strengthening exercise minutes.

Qualitative Findings

Table 4 reports emergent themes, associated codes, and representative quotes from qualitative interviews. There were 9 discrete themes regarding influences on exercise and physical activity during the exercise program. Themes were organized into 2 general categories: physical activity facilitators (6 themes) and barriers (3 themes). Patients widely described *disease-related motivation*, *past exercise experience*, *encouragement from physicians*, *social support from family and friends*, *neighborhood walkability and physical activity resources*, and *accountability* as themes representing important facilitators. Frequently mentioned themes representing barriers included *treatment*; *weather, logistics, and time*; and *lack of social support.*

Discussion

The purpose of this study was to investigate relationships between socioecological factors and exercise and physical activity for patients enrolled in a home-based exercise program during preoperative treatment for pancreatic cancer. We found quantitative and qualitative evidence that social support and neighborhood characteristics influence physical activity in this setting, and qualitative data uncovered additional influences. Linear regression models revealed a strong association between perceived neighborhood aesthetics and MVPA. In qualitative interviews, patients confirmed that social support and neighborhood walkability and physical activity resources were important influences that helped them be more active (or, in some cases, posed barriers). Qualitative interviews also exposed additional disease- and treatment-related influences—such as preparing for the physical demands of surgical recovery, motivation to survive cancer, encouragement from physicians, and treatment-related barriers—that patients perceived as important. Taken together, the results of this study suggest that physical and social elements of patients' home environments may bolster health-related motivation for exercise and help patients stay physically active during pancreatic cancer treatment. Preoperative pancreatic cancer treatment represents an understudied context in exercise oncology; with the complex confluence of age, treatment, and disease in this population, these findings have potential for generalization.

Chemotherapy and/or radiation therapy are frequently administered to patients with cancer prior to potentially curative surgical resection.[48–51] Exercise during preoperative therapy may help patients maintain or improve physical fitness, leading to improved tolerance of therapy and recovery following surgery.[7] Given financial and logistical constraints associated with access to care at tertiary cancer centers, exercise during preoperative treatment may be most broadly impactful when prescribed as part of home-based programs.[20] But compared with supervised, in-person exercise sessions, home-based exercise programs may have unique socioecological influences to consider. In this study, we showed through quantitative analyses that social support from friends and neighborhood aesthetics were positively associated with objectively-measured physical activity. In the qualitative interviews, participants specifically described the importance of social support

in helping motivate them to exercise. Most patients described social support as a positive influence, with friends or particularly family providing emotional or instrumental support for exercise. Two participants described a lack of social support as a physical activity barrier. Multiple participants also mentioned characteristics of their home neighborhoods—including attractive surroundings, safe streets, and access to gyms and exercise professionals—that helped them to exercise. Exercise prescriptions should therefore include thorough review of each of these factors to expose resources that might be leveraged to enhance compliance. Conversely, absence of such resources should alert the prescriber of the potential need for additional support. Individualized assessment of participants' perceived supports and barriers – both social and physical – may help increase physical activity and exercise.

The themes that emerged from qualitative interviews identified other influences worthy of discussion. Participants frequently described the encouragement they received from physicians and the support and accountability they felt in completing exercise logs that were regularly reviewed by study staff as important drivers of physical activity and exercise. These findings corroborate those from previous studies of interventions aimed to promote habitual exercise, in which self-monitoring and receiving feedback from interventionists have been important techniques to influence behavior.[52] Clinicians in the surgery and medical oncology clinics in which patients were treated served as effective "champions," emphasizing the potential benefits of exercise in improving treatment tolerance and fitness and accelerating postoperative recovery. Perhaps unique to the context of cancer treatment, participants also emphasized that disease-related motivation was an important influence during this exercise program. When participants were enrolled in this exercise program, they were facing several weeks of difficult treatment, but they also seemed to recognize that they had limited timeframes in which to optimize their health to prepare for potentially curative surgery. Cancer care providers, in the context of preoperative treatment for pancreatic cancer and various other cancer contexts, may be able to capitalize on disease-related motivation and successfully encourage patients to complement therapy with exercise.

This is one of few studies examining socioecological influences on physical activity and exercise among patients who are actively undergoing cancer treatment.[53,54] We included self-reported and objective measures of exercise and physical activity, and we measured social support and neighborhood characteristics using a mix of self-report and semi-structured interviews. Further, this was the first known study to examine socioecological influences in the specific context of a preoperative exercise program for patients undergoing simultaneous treatment. Our findings agree with those from previous studies highlighting the importance of socio-ecological influences, including social support and aspects of the built environment, for physical activity among cancer survivors.[27,30,53] Future intervention efforts should incorporate additional program components to capitalize on patients' existing resources for social support or supplement with additional support for patients who may lack support or resources at home. For example, loved ones or caretakers may be incorporated into dyadic exercise program designs or counseled to provide additional support during home-based exercise programming. Healthcare providers and exercise professionals may benefit patients by helping them explore maps of their home neighborhoods to find safe and convenient places to exercise, including parks, trails, and fitness centers.

This study has potential limitations. First, the sample included only patients with pancreatic cancer, and generalizability to other clinical settings must be further studied. However, given the challenges that pancreatic cancer diagnosis and treatment pose and the generally older age of patients in this study, these results can help inform exercise research in other contexts in which disease- and treatment-related barriers complicate intervention delivery. Social support and neighborhood physical activity environments may be even stronger influences on physical activity when barriers posed by diagnosis, treatment, and age may be less intense than they are in the context of pancreatic cancer. Another limitation of this study was wide variability in the exact types and durations of preoperative therapies. While these issues reflect the true nature of clinical care for patients with pancreatic cancer, they provide methodological and statistical issues that future studies should strive to control. Completion of daily exercise logs was also inconsistent and variable across patients, and patients may have over-reported time spent exercising at moderate intensity, as is frequently the case with self-reported exercise measures. Interestingly, we did not observe statistically significant associations between social support or perceived neighborhood walkability and self-reported aerobic or strengthening exercise. The absence of such associations may be attributable to reporting errors in daily logs, such as forgetting to complete them on days in which participants performed exercise.

Chemotherapy and chemoradiation treatments complicated accelerometer wear, requiring us to use nonconsecutive valid wear days to estimate weekly physical activity. It was beyond the scope of this study and unfeasible to measure physical activity objectively throughout the intervention. Therefore, we can only hypothesize that accelerometry during the middle two weeks of each treatment phase provided a reasonable measure of physical activity to represent participants' participation throughout the intervention period. Additionally, to the best of our knowledge, the SSES and NEWS-A have not been validated specifically among individuals undergoing treatment for cancer and, as self-reported measures, may have been subject to recall or favorability biases. Although qualitative interviews elicited participants' input and themes emerged regarding exercise motivation, we did not include a measure to study motivation specifically. Our findings suggest that disease- and treatment-related motivation may be particularly important in this context, so future studies should measure exercise motivation specifically and potentially provide variable support based on patients' needs.

In summary, although a significant portion of exercise motivation may stem from patients' goals of completing treatment successfully, social support and neighborhood walkability appear to influence patients' compliance with in home-based exercise prescriptions during preoperative treatment for cancer. Given the hypothesized benefits of exercise in this context, it is important for future interventions to include components to increase and leverage social support and home neighborhood resources.

Acknowledgments

We acknowledge Bryan Tutt of the Department of Scientific Publications at The University of Texas MD Anderson Cancer Center for his contribution to editing this work.

Funding Source/Trial Registration

This study was supported by the Knox Family Foundation; Center for Energy Balance in Cancer Prevention & Survivorship, Duncan Family Institute for Cancer Prevention and Risk Assessment; Texas Chapter of the American College of Sports Medicine; Cancer Prevention & Research Institute of Texas Training Grant/MD Anderson Cancer Prevention Research Training Program (RP170259, Dr. Shine Chang, Principal Investigator); the Bettie Willerson Driver Cancer Research Fund; and the National Institutes of Health/National Cancer Institute (award number P30CA016672; used the Clinical Trials Support Resource and the Biostatistics Resource Group). This study was registered with ClinicalTrials.gov (identifier NCT02295956).

References

1. Cooper AB, Holmes HM, des Bordes JK, et al.Role of neoadjuvant therapy in the multimodality treatment of older patients with pancreatic cancer. J Am Coll Surg. 2014;219(1):111–120. [PubMed: 24856952]
2. Guinan EM, Doyle SL, Bennett AE, et al.Sarcopenia during neoadjuvant therapy for oesophageal cancer: characterising the impact on muscle strength and physical performance. Support Care Cancer. 2018;26(5):1569–1576. [PubMed: 29197960]
3. Prakash LR, Katz MHG. Multimodality management of borderline resectable pancreatic adenocarcinoma. Chin Clin Oncol. 2017;6(3):27. [PubMed: 28705004]
4. Cloyd JM, Chen HC, Wang X, et al.Chemotherapy Versus Chemoradiation as Preoperative Therapy for Resectable Pancreatic Ductal Adenocarcinoma: A Propensity Score Adjusted Analysis. Pancreas. 2019;48(2):216–222. [PubMed: 30629022]
5. Cedermark B, Dahlberg M, Glimelius B, Pahlman L, Rutqvist LE, Wilking N. Improved survival with preoperative radiotherapy in resectable rectal cancer. N Engl J Med. 1997;336(14):980–987. [PubMed: 9091798]
6. Yoshikawa T, Rino Y, Yukawa N, Oshima T, Tsuburaya A, Masuda M. Neoadjuvant chemotherapy for gastric cancer in Japan: a standing position by comparing with adjuvant chemotherapy. Surg Today. 2014;44(1):11–21. [PubMed: 23508452]
7. Loughney L, West MA, Kemp GJ, Grocott MP, Jack S. Exercise intervention in people with cancer undergoing neoadjuvant cancer treatment and surgery: A systematic review. Eur J Surg Oncol. 2016;42(1):28–38. [PubMed: 26506862]
8. Antoun S, Borget I, Lanoy E. Impact of sarcopenia on the prognosis and treatment toxicities in patients diagnosed with cancer. Curr Opin Support Palliat Care. 2013;7(4):383–389. [PubMed: 24189893]
9. Cooper AB, Slack R, Fogelman D, et al.Characterization of Anthropometric Changes that Occur During Neoadjuvant Therapy for Potentially Resectable Pancreatic Cancer. Ann Surg Oncol. 2014;22(7):2416–2423. [PubMed: 25519927]
10. Cooper AB, Tzeng CW, Katz MH. Treatment of borderline resectable pancreatic cancer. Curr Treat Options Oncol. 2013;14(3):293–310. [PubMed: 23793524]
11. Sahai SK, Ismail H. Perioperative Implications of Neoadjuvant Therapies and Optimization Strategies for Cancer Surgery. Current Anesthesiology Reports. 2015;5(3):305–317.
12. Ngo-Huang A, Parker NH, Wang X, et al.Home-based exercise during preoperative therapy for pancreatic cancer. Langenbecks Arch Surg. 2017.
13. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. Health Educ Q. 1988;15(4):351–377. [PubMed: 3068205]
14. Stokols D. Translating social ecological theory into guidelines for community health promotion. Am J Health Promot. 1996;10(4):282–298. [PubMed: 10159709]
15. Sallis JF, Owen N. Ecological models of health behavior. In: Glanz K, Rimer BK, Lewis FM, eds. Health Behavior and Health Education: Theory, Research, and Practice. San Francisco: Jossey-Bass; 2002:462–484.
16. Spence JC, Lee RE. Toward a comprehensive model of physical activity. Psych Sport Exerc. 2003;4(1):7–24.
17. Lee RE, Medina AV, Mama SK, et al.Health is Power: an ecological, theory-based health intervention for women of color. Contemp Clin Trials. 2011;32(6):916–923. [PubMed: 21782975]
18. Glanz K, Mullis RM. Environmental interventions to promote healthy eating: a review of models, programs, and evidence. Health Educ Q. 1988;15(4):395–415. [PubMed: 3068206]

19. Lee RE, Cubbin C. Striding toward social justice: the ecologic milieu of physical activity. Exerc Sport Sci Rev. 2009;37(1):10–17. [PubMed: 19098519]
20. Hardcastle SJ, Cohen PA. Effective physical activity promotion to survivors of cancer is likely to be home based and to require oncologist participation. J Clin Oncol. 2017;35:3635–3637. [PubMed: 28915086]
21. Hardcastle SJ, Maxwell-Smith C, Kamarova S, Lamb S, Millar L, Cohen PA. Factors influencing non-participation in an exercise program and attitudes towards physical activity amongst cancer survivors. Support Care Cancer. 2018;26(4):1289–1295. [PubMed: 29090387]
22. Barber FD. Effects of social support on physical activity, self-efficacy, and quality of life in adult cancer survivors and their caregivers. Oncol Nurs Forum. 2013;40(5):481–489. [PubMed: 23989022]
23. Estabrooks PA, Allen K, Smith E, Krippendorf B, Parks SL. Evaluating physical activity behavior change programs and practices. ACSM's Behavioral Aspects of Physical Activity and Exercise: Lippincott Williams & Wilkins; 2013.
24. Carlson JA, Sallis JF, Conway TL, et al.Interactions between psychosocial and built environment factors in explaining older adults' physical activity. Prev Med. 2012;54(1):68–73. [PubMed: 22027402]
25. Franke T, Tong C, Ashe MC, McKay H, Sims-Gould J. The secrets of highly active older adults. J Aging Stud. 2013;27(4):398–409. [PubMed: 24300060]
26. Pinto BM, Trunzo JJ, Reiss P, Shiu SY. Exercise participation after diagnosis of breast cancer: trends and effects on mood and quality of life. Psychooncology. 2002;11(5):389–400. [PubMed: 12228872]
27. Midtgaard J, Rorth M, Stelter R, Adamsen L. The group matters: an explorative study of group cohesion and quality of life in cancer patients participating in physical exercise intervention during treatment. Euro J Cancer Care (Engl). 2006;15(1):25–33.
28. Arvidsson D, Kawakami N, Ohlsson H, Sundquist K. Physical activity and concordance between objective and perceived walkability. Med Sci Sports Exerc. 2012;44(2):280–287. [PubMed: 21716148]
29. Gebel K, Bauman A, Owen N. Correlates of non-concordance between perceived and objective measures of walkability. Ann Behav Med. 2009;37(2):228–238. [PubMed: 19396503]
30. Keegan TH, Shariff-Marco S, Sangaramoorthy M, et al.Neighborhood influences on recreational physical activity and survival after breast cancer. Cancer Causes Control. 2014;25(10):1295–1308. [PubMed: 25088804]
31. Lynch BM, Owen N, Hawkes AL, Aitken JF. Perceived barriers to physical activity for colorectal cancer survivors. Support Care Cancer. 2010;18(6):729–734. [PubMed: 19636595]
32. Parker NH, Ngo-Huang A, Lee RE, et al.Physical activity and exercise during preoperative pancreatic cancer treatment. Support Care Cancer. 2018.
33. Stathi A, Gilbert H, Fox KR, Coulson J, Davis M, Thompson JL. Determinants of neighborhood activity of adults age 70 and over: a mixed-methods study. J Aging Phys Act. 2012;20(2):148–170. [PubMed: 22472577]
34. British Columbia Ministry of Health. Physical Activity Readiness Questionnaire. British Columbia, Canada1992.
35. Garcia SF, Cella D, Clauser SB, et al.Standardizing patient-reported outcomes assessment in cancer clinical trials: a patient-reported outcomes measurement information system initiative. J Clin Oncol. 2007;25(32):5106–5112. [PubMed: 17991929]
36. Brown JK, Byers T, Doyle C, et al.Nutrition and physical activity during and after cancer treatment: an American Cancer Society guide for informed choices. CA Cancer J Clin. 2003;53(5):268–291. [PubMed: 14570227]
37. McTiernan A.Obesity and cancer: the risks, science, and potential management strategies. Oncology (Williston Park). 2005;19(7):871–881. [PubMed: 16053036]
38. Schmitz KH, Courneya KS, Matthews C, et al.American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. Med Sci Sports Exerc. 2010;42(7):1409–1426. [PubMed: 20559064]

39. Sallis JF, Grossman RM, Pinski RB, Patterson TL, Nader PR. The development of scales to measure social support for diet and exercise behaviors. Prev Med. 1987;16(6):825–836. [PubMed: 3432232]
40. Saelens BE, Sallis JF, Black JB, Chen D. Neighborhood-based differences in physical activity: an environment scale evaluation. Am J Public Health. 2003;93(9):1552–1558. [PubMed: 12948979]
41. Cerin E, Saelens BE, Sallis JF, Frank LD. Neighborhood Environment Walkability Scale: validity and development of a short form. Med Sci Sports Exerc. 2006;38(9):1682–1691. [PubMed: 16960531]
42. Cerin E, Conway TL, Saelens BE, Frank LD, Sallis JF. Cross-validation of the factorial structure of the Neighborhood Environment Walkability Scale (NEWS) and its abbreviated form (NEWS-A). Int J Behav Nutr Phys Act. 2009;6:32. [PubMed: 19508724]
43. Sonderman JS, Mumma MT, Cohen SS, Cope EL, Blot WJ, Signorello LB. A multi-stage approach to maximizing geocoding success in a large population-based cohort study through automated and interactive processes. Geospat Health. 2012;6(2):273–284. [PubMed: 22639129]
44. Sallis JF, Saelens BE, Frank LD, et al.Neighborhood built environment and income: examining multiple health outcomes. Soc Sci Med. 2009;68(7):1285–1293. [PubMed: 19232809]
45. Bandura A. Social cognitive theory. In: Vasta R, ed. Annals of child development. Vol Vol. 6. Greenwich, CT: JAI Press; 1989:1–60.
46. Basen-Engquist K, Carmack CL, Perkins H, et al.Design of the Steps to Health Study of Physical Activity in Survivors of Endometrial Cancer: Testing a Social Cognitive Theory Model. Psychol Sport Exerc. 2011;12(1):27–35. [PubMed: 21218163]
47. Stacey FG, James EL, Chapman K, Courneya KS, Lubans DR. A systematic review and meta-analysis of social cognitive theory-based physical activity and/or nutrition behavior change interventions for cancer survivors. J Cancer Surviv. 2014.
48. Katz MH, Crane CH, Varadhachary G. Management of borderline resectable pancreatic cancer. Semin Radiat Oncol. 2014;24(2):105–112. [PubMed: 24635867]
49. Katz MH, Pisters PW, Evans DB, et al.Borderline resectable pancreatic cancer: the importance of this emerging stage of disease. J Am Coll Surg. 2008;206(5):833–846. [PubMed: 18471707]
50. Badgwell B, Das P, Ajani J. Treatment of localized gastric and gastroesophageal adenocarcinoma: the role of accurate staging and preoperative therapy. J Hematol Oncol. 2017;10(1):149. [PubMed: 28810883]
51. Elliot AH, Martling A, Glimelius B, Nordenvall C, Johansson H, Nilsson PJ. Preoperative treatment selection in rectal cancer: a population-based cohort study. Eur J Surg Oncol. 2014;40(12):1782–1788. [PubMed: 25260598]
52. Samdal GB, Eide GE, Barth T, Williams G, Meland E. Effective behaviour change techniques for physical activity and healthy eating in overweight and obese adults; systematic review and meta-regression analyses. Int J Behav Nutr Phys Act. 2017;14(1):42. [PubMed: 28351367]
53. Trinh L, Larsen K, Faulkner GE, et al.Social-ecological correlates of physical activity in kidney cancer survivors. J Cancer Surviv. 2016;10(1):164–175. [PubMed: 26048546]

Table 1.

Characteristics of study sample ($N = 50$)

Characteristic	Value
Mean age at enrollment, years ± SD	66 ± 8
Sex, n (%)	
Female	24 (48)
Male	26 (52)
Mean BMI at baseline, kg/m^2 ± SD	27.6 ± 5.3
Normal weight (18.5 ≤ BMI < 25), n (%)	18 (36)
Overweight (25 ≤ BMI < 30), n (%)	18 (36)
Obese (BMI ≥ 30), n (%)	14 (28)
Mean distance between home zip code and cancer center zip code, miles ± SD	422 ± 409
Mean exercise program duration, weeks ± SD	16 ± 9
During chemotherapy	17 ± 8
During chemoradiation therapy	4 ± 2
During treatment break	6 ± 2

Abbreviations: BMI, body mass index.

Table 2.

Social support for exercise, neighborhood walkability, self-reported exercise, and accelerometer physical activity

Variable		Baseline	During exercise period	Follow-up	*p*
	n	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	
Social support for exercise[a]					
Family participation	45	26.7 ± 12.2	-	27.2 ± 11.1	0.8
Friend participation score	45	17.2 ± 7.5	-	16.3 ± 7.0	0.4
Neighborhood walkability[b]					
Places for walking and cycling[c]	50	2.5 ± .9	-	-	-
Aesthetics[c]	50	3.0 ± .8	-	-	-
Traffic hazards[d]	50	1.6 ± .9	-	-	-
Crime[d]	50	1.4 ±.7	-	-	-
Physical activity and exercise					
Weekly aerobic exercise minutes (daily logs)	42	-	126 ± 83	-	-
Weekly strengthening exercise minutes (daily logs)	42	-	39 ± 33	-	-
Weekly LPA minutes (accelerometer)	44	-	923.8 ± 294.5	-	-
Weekly MVPA minutes (accelerometer)	44	-	158.7 ± 146.7	-	-

[a]Maximum score = 50 for each subscale.

[b]Maximum score = 4 for each subscale.

[c]Higher score denotes higher walkability.

[d]Higher score denotes lower walkability.

Abbreviations: LPA: light physical activity; MPA, moderate physical activity.

Table 3.

Associations between potential influences and weekly exercise and physical activity

Potential Influence	Aerobic Exercise (logs)			Strengthening Exercise (logs)			MVPA (Accelerometers)			LPA (Accelerometers)		
	β	***t***	***p***	***β***	***t***	***p***	***β***	***t***	***p***	***β***	***t***	***p***
Social support *												
Family participation												
Baseline	.41	.41	.69	−32	−82	.42	.44	.26	.80	−10	−03	.98
Follow up	.37	.32	.75	.27	.56	.58	.05	.03	.98	−013	−003	.99
Friend participation												
Baseline	1.19	.75	.46	−19	−31	.76	.45	.17	.87	4.58	.83	.41
Follow up	1.35	.72	.48	.84	1.10	.28	.73	.22	.83	**14.27**	**2.16**	**<0.05**
Neighborhood characteristics **												
Places for walking and cycling	-11.27	−67	.51	-2.9	−42	.68	2.64	.09	.93	-50.23	−.87	.39
Aesthetics	20.52	1.08	.29	−7.10	−.95	.35	**57.92**	**2.02**	**<0.05**	38.30	.64	.53
Traffic hazards	1.15	.08	.94	2.78	.47	.64	14.12	.55	.59	9.11	.18	.86
Crime	11.24	.56	.58	2.84	.36	.72	2.77	.08	.94	1.97	.03	.98

*Linear regression models adjusted for sex.

**Linear regression models adjusted for sex and zip code-level median household income.

Abbreviations: LPA: light physical activity; MPA, moderate physical activity.

Table 4.

Themes, quotes, and codes from qualitative interviews representing influences on physical activity and exercise.

Facilitators of physical activity and exercise		
Category/Theme	**Representative quotes**	**Associated codes**
Disease-related motivation	"I believed in exercise, and I knew I was being attacked, and it seems like exercise was a reasonable way that I could try to make myself stronger." *–Female, 63 years old* "My mindset was, 'I had a month to prepare my body for surgery,' and I wanted to get as strong as I possibly could." *–Female, 63 years old* "You hit me at a time when all my synapses were firing like crazy. When the hospital offered me an exercise program and I had just got the death certificate that the doctors had diagnosed me with, I got quite motivated." *–Male, 71 years old* "I was pretty well out of shape and was getting weaker and had lost some weight. And I needed to do it to strengthen myself. To go through the chemotherapy and the radiation and eventually the surgery." *–Male, 68 years old* "I wanted to make sure I was in no worse shape when I got my surgery, or as good of shape as I could possibly be in for my recovery." *–Female, 65 years old* "I wanted rid of this disease, so that was my motivation. To get well." *–Female, 74 years old* "The sense of urgency and how critical it was, that helped me. The better shape I could be in coming into surgery, the quicker I was going to heal up and get over all of this." *–Male, 64 years old*	Facilitator* Preparation for surgery* Improve recovery* Improve fitness* Treatment tolerance* Will to live Hope Commitment Desire to improve
Past exercise experience	"I've always been fairly active. So, the transition wasn't hard." *–Male, 71 years old* "I think it certainly helped me, having been used to exercising." *–Male, 77 years old* "I always knew the importance of exercising, so that made it easier." *-Male, 80 years old*	Facilitator* Routine Regular exercise Exercise history* Personal values*
Encouragement from physicians	"I really did hear the docs saying, 'The better shape you're in, the easier it's going to be for you to recover.' It motivated me." *–Male, 71 years old* "I think each one of the doctors stressed how important it was to stay exercising." *–Male, 77 years old* "I needed the support of [my surgeon] saying, 'This is pretty critical. The stronger you are going into surgery, the stronger you are when you're going to recover.'" *–Male, 77 years old*	Facilitator* Accountability* Timing Preparation for surgery* Improve recovery* Treatment tolerance*
Social support from family and friends	"My husband was like my whip. He reminded me every day that maybe I could do X, or maybe I could do Y." *–Female, 63 years old* "I'm a very fortunate person. My wife has always been exercising. The community I live in and play golf with and know, they'd kick my butt if I didn't. That encouragement really helped, because I didn't want to have to tell them why I didn't make it." *–Male, 71 years old* "My niece and my husband were after me all the time. Telling me that I had to exercise, that I had to move. That helped, because they were there for me." *–Female, 74 years old* "I've had tons of support. My family, they were the ones who hauled the exercise bike down here for me." *–Female, 74 years old* "My wife has had three mini strokes, and every single day, she gets on the treadmill, or she does Pilates, and she does her yoga, without exception. For me, that was something to look up to." *–Male, 59 years old* "It would come on the edge of nagging, but you know, [my wife] was right. I begrudgingly did it, but I did do it. She is a valuable asset when it comes to getting something done." *-Male, 80 years old*	Facilitator* Spouse* Family* Companionship Accountability* Pushing me Encouragement* Motivation*
Neighborhood walkability and physical activity resources	"I like walking, and that made the walking part desirable. I live in a place that's pretty, and the walks were a nice, pleasant distraction." *–Female, 63 years old* "I remember filling out a form that asked, 'In your community, is it safe to walk in your streets?' Well, in my community, I walk right down the center line in the evenings." *–Male, 71 years old* "I'm fortunate, because I've got a gym in my neighborhood. If I had only the resistance tubes to work with, I don't know if I could have	Facilitator* Enjoyment* Neighborhood walkability* Resources

Facilitators of physical activity and exercise		
Category/Theme	**Representative quotes**	**Associated codes**
	stayed with a strengthening program." *–Male, 71 years old* "I joined a gym and got a trainer, and he helped me with the exercise program. To encourage me to get it done and to give me some more accountability." *–Male, 68 years old*	Gyms or exercise facilities Location Home environment *
Accountability	"Having to keep a log, be accountable, that was motivational." *–Female, 63 years old* "It was tremendous. The diary, the accountability, to track that stuff—it gave me some more motivation to get it done." *–Male, 68 years old* "Those relentless reports—you know, every day—you'd always have something to do. It was always on your mind, so it's not something that you can ignore. And so they helped motivate, too." *-Male, 80 years old* "It was something that had to be done. It was a job. It was a commitment. I didn't feel right unless my exercise was done." *-Male, 80 years old* "The phone calls I received following my progress and seeing how I was, that was motivational." *–Female, 63 years old*	Facilitator * Accountability * Self-monitoring Motivation * Commitment Follow-up Program staff Coaching Social support *
Barriers to physical activity and exercise		
Category/theme	**Representative quotes**	**Associated codes**
Treatment	"I had a little trouble after the 10 days of chemo and radiation combination. I didn't have the motivation or the level that I was able to do a lot." *–Male, 77 years old* "On the bad days, there was no exercise. You know, 4 or 5 hours of infusions takes a lot out of you mentally, too. So I wasn't in the mood for exercising." *–Female, 65 years old* "Part of my chemo was the fact that I wore a pump for 3 days. I was really inactive because everything I did pulled on the catheter. The pump wasn't too heavy, but it wasn't convenient." *–Female, 65 years old* "After chemo and radiation, I didn't have quite as much energy, and it took a few weeks to kind of get my strength back up." *–Male, 64 years old*	Barrier * Variance by treatment phase Fatigue * Chemotherapy * Radiation therapy * Physical or functional limitations * Energy Time * Motivation * Treatment cycles
Weather, logistics, and time	"It was hard to do it here in the extreme heat of summer." *–Female, 63 years old* "If it weren't cold out, I probably would have been a lot more involved than I was." *–Female, 65 years old* "What got in the way were fatigue and other tasks, other items I had to take care of during the day. Doctors' appointments, consults, and other activities." *–Male, 68 years old* "There were obstacles. One was travel. If you stop at a motel, you can go into that gym, if they have one, but it's limited. If you're traveling as far as I'm traveling, you'll be tired when you get there, from just sitting there, riding. *–Male, 80 years old*	Barrier * Weather Climate Time * Fatigue Schedule Obstacles * Barriers * Travel Accommodations Appointments

Facilitators of physical activity and exercise		
Category/Theme	**Representative quotes**	**Associated codes**
Lack of social support	"I'm a social person who enjoys exercise accompanied by other people versus alone. Having my husband walk with me was good, but doing the bands alone, I just wasn't as motivated. It was harder." *–Female, 63 years old* "Occasionally someone encouraged me, but otherwise it was, 'Well, if you don't do it, you don't do it.' I'm not sure there was a lot of encouragement. It was probably that they thought I should be sufficiently motivated on my own." *–Female, 65 years old* "Friends were staying away, because they didn't want to expose me to their colds or germs or anything like that. But I'm much more motivated if I'm in a crowd." *–Female, 65 years old*	Barrier * Motivation * Social support * Encouragement * Lack of support Spouse * Family *

* Denotes a priori codes