Feasibility and preliminary efficacy of a multimodal exercise, nutrition, and palliative care intervention in advanced lung cancer

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ABSTRACT

Background: Advanced lung cancer patients face significant physical and psychological burden leading to reduced physical function and quality of life. Separately, physical activity, nutrition, and palliative symptom management interventions have been shown to improve functioning in this population, however no study has combined all three in a multimodal intervention.

Therefore, we assessed the feasibility and preliminary efficacy of a multimodal physical activity, nutrition, and palliative symptom management intervention in advanced lung cancer. **Methods:** Participants received an individually tailored 12-week intervention featuring in-person group-based exercise classes, at-home physical activity prescription, behaviour change education, and nutrition and palliative care consultations. Patients reported symptom burden, energy, and fatigue before and after each class. At baseline and post-intervention, symptom burden, quality of life, fatigue, physical activity, dietary intake, and physical function were assessed. Post-intervention interviews examined participant perspectives. **Results:** The multimodal program was feasible, with 44% (10/23) recruitment, 75% (75/100) class attendance, 89% (8/9) nutrition and palliative consult attendance, and 85% (17/20) assessment completion. Of ten participants, 70% (7/10) completed the post-intervention follow-up. Participants perceived the intervention as feasible and valuable. Physical activity, symptom burden, and quality of life were maintained, while tiredness decreased significantly. Exercise classes prompted acute clinically meaningful reductions in fatigue, tiredness, depression, pain, and increases in energy and well-being.

Conclusion: A multimodal physical activity, nutrition, and palliative symptom management intervention is feasible and shows potential benefits on quality of life that warrant further investigation in a larger cohort. **Trial registration:** NCT04575831, Registered 05 October 2020 – Retrospectively registered, <https://clinicaltrials.gov/ct2/show/NCT04575831>.

INTRODUCTION

In 2020, nearly 30,000 Canadians will be diagnosed with lung cancer, making it the most commonly diagnosed cancer in Canada [1]. As a result of improved treatment, including modern targeted therapy and immuno-therapy, lung cancer survival rates are steadily increasing, with roughly one in five patients surviving at least five years [1]. The number living with advanced or incurable disease is also on the rise. Unfortunately, this prolonged survival leaves a growing number of patients with ongoing psychological and physical treatment and disease related burden. Specifically, these patients face increased rates of anxiety and depression, impaired physical health, and increased sedentary behavior; all contributing to reduced quality of life (QOL) [2,3].

Research suggests that physical function and physical independence are central to improving QOL among the growing number of advanced lung cancer (ALC) survivors [4]. Three key interventions have been found to positively impact patient outcomes, including physical activity (PA), nutritional support, and palliative symptom management [5,6,7,11,12]. PA positively impacts physical and mental well-being in advanced cancer, while improved nutritional status is correlated with improved QOL among these patients [7,8]. Palliative medicine can address debilitating symptoms uniquely challenging ALC patients, including pain and shortness of breath [9].

Evidence supports the use of PA, nutrition, and palliative symptom management as separate interventions for enhancing QOL in ALC. However, few studies have examined their potential synergistic effects. A randomized controlled trial (RCT) of an exercise and nutrition intervention for advanced cancer, including non-small cell lung cancer (NSCLC) patients, showed that a bimodal intervention is feasible in this population [10]. Over the 3-month intervention, retention rates were 72% and supervised exercise session attendance was 75% [10]. Intervention effectiveness was mixed however, with improvements in symptom burden and protein intake but no change in physical fitness or overall QOL [10]. Current evidence on the feasibility of combined PA and nutrition interventions in advanced cancer is inconclusive, and no trials to date have integrated palliative symptom management into a multimodal intervention for this population [11].

Therefore, the primary aim of this study was to assess feasibility of a novel 12-week trimodal intervention, including PA, nutrition and palliative symptom management in advanced NSCLC, an underserved advanced cancer population. Feasibility was defined a priori as at least 30% recruitment, 60% attendance, 70% assessment completion, and no adverse events. Secondary aims were to assess intervention impact on patient reported QOL, PA, symptom burden, and physical function. We hypothesized that the PA and Exercise, Nutrition, and Palliative care in ALC, or "ENPAL" intervention would be feasible and would demonstrate preliminary efficacy for enhancing QOL.

METHODS

M.1 Participant Recruitment and Eligibility

All participants were recruited in-person at the lung cancer clinic at the Holy Cross Centre (Calgary, Alberta). Inclusion criteria were: 1) 18+ years old; 2) stage III-IV NSCLC; 3)

Eastern Cooperative Oncology Group (ECOG) performance status 0-2; 4) Edmonton Symptom Assessment System (ESAS) score $\geq 3/10$ on at least one item; 5) hemoglobin $\geq 80\text{g/L}$; 6) life expectancy > 6 months; and 7) cleared for exercise by an oncologist. Exclusion criteria were: 1) active infections; 2) enteral tube feeding or parenteral nutrition; 3) mechanical or functional bowel obstruction; 4) cognitive impairment; and 5) non-English speaking. Eligible participants were briefed by their oncologist before receiving additional study information from the study team upon providing permission. Those who were interested attended the pre-intervention assessment to complete informed consent and required measures..

M.2 Study Design and Intervention

The current mixed-methods study used a prospective design, with participants receiving a multimodal intervention including PA, nutrition, and palliative symptom management. The PA intervention included an individualized plan which incorporated in-person group exercise class as well as a tailored at-home PA prescription. Based on the individual's physical function and prior PA history, the at-home prescription recommended 2-4 days of light to moderate intensity aerobic exercise (i.e. walking), for approximately 10-30 minutes per session, with 1-2 days of resistance exercise using body weight, and an exercise ball or band (provided). The in-person exercise class, led by a clinical exercise physiologist, included individually tailored aerobic, resistance, and flexibility exercises. Resistance exercises targeting major muscle groups were performed for 2-3 sets of 8-10 repetitions. The program was progressed at 4, 6, 8 and 10 weeks (additional resistance/sets/repetitions or progression to a more challenging exercise). A sample of the exercise programs provided to ENPAL participants is available from the authors.

Six educational workshops focused on health behaviour change and maintenance were integrated into exercise classes. Topics included: principles of exercise in cancer, goal-setting, behaviour change and relapse prevention, stress management and sleep, nutrition, and social support and long-term maintenance. The nutrition and palliative care components included open-ended consultations with a cancer centre dietitian and palliative care physician to discuss patient needs. Participants were able to request follow-up as needed. Initial consults were scheduled within 2 weeks of exercise class start, with follow-up appointments arranged at the discretion of the patient and/or provider. Intervention duration was between 12-14 weeks, as participants were afforded additional time to complete up to 12 in-person exercise sessions. The Health Research Ethics Board of Alberta – Cancer Committee approved this study (HREBA.CC-18-0681).

M.2 Assessments

Participants were assessed at pre-intervention and post-intervention (week 12-14). Assessments included questionnaires, physical function testing (symptom limited), and completion of a 24-hour dietary recall. The pre-intervention assessment featured an informed consent discussion and demographic/medical history questionnaires. Optional post-intervention interviews were conducted during the second assessment. Clinical exercise physiologists conducted physical function testing. Semi-structured interviews were conducted by the lead author (ME). Assessment duration ranged between one to two hours. Patient-reported fatigue, energy, and symptom burden was also collected before and after each class.

M.4 Outcomes

M.4.1 Demographics

Demographics/medical history were obtained via baseline questionnaires. This included age, gender, marital status, education level, annual family income, employment status, cancer diagnosis and tumour marker status, current and previous treatment, current side effects, concurrent treatments and medications, past surgeries and musculoskeletal injuries, co-morbidities, and allergies. The medical information was used to inform safe exercise prescription.

M.4.2 Feasibility

Recruitment data (number of eligible patients, reasons for ineligibility, reasons for non-participation when eligible) was collected during weekly recruitment visits. Participant attendance to assessments, weekly exercise classes, and the nutrition and palliative consults was recorded. Adherence to home-based exercise prescriptions and any other PA was monitored via paper-based weekly self-report journals. Exercise class attendance was based on the number of classes attended by all participants divided by the total number of classes offered (the sum of attended and missed classes).

M.4.3 Patient Reported Outcomes (PROs)

Physical Activity

PA was measured using the modified Godin Leisure Time Exercise Questionnaire (GLTEQ), which has been validated for use in adult cancer populations [12]. Participants self-

reported weekly PA frequency and duration across four categories: strenuous, moderate, mild, and resistance exercise. Weekly moderate-strenuous PA (MS PA) and total PA was calculated by multiplying frequency by duration in each category. The leisure score index (LSI) was calculated according to GLTEQ guidelines based on reported mild, moderate, and strenuous PA [12]. LSI is an estimate of weekly metabolic equivalent of task (MET) PA, classified as insufficiently active/sedentary (<14), moderately active (14-23), or active (24+).

Symptom Burden, Fatigue, and Quality of Life – Pre/Post Intervention

QOL was assessed using the validated Functional Assessment of Cancer Therapy – Lung (FACT-L), ESAS, and Functional Assessment of Chronic Illness Therapy – Fatigue (FACIT-F) questionnaires [13,14]. The FACT-L assesses physical (PWB), social/family (SWB), emotional (EWB), and functional (FWB) well-being as well as a lung cancer subscale (LCS). These were combined according to FACT-L scoring guidelines to yield an overall QOL score (FACT-L Total). The ESAS was used to measure symptom burden, and the FACIT-F to measure fatigue as two additional aspects of QOL. FACIT-F scores range from 0-52 and FACT-L total scores range from 0-136, with higher scores indicating better QOL.

Symptom Burden, Fatigue, and Energy – Pre/Post Class

Directly before and after each exercise class, participants reported ESAS symptom burden as well as fatigue and energy on single-item thermometers from 0-10. A single-item fatigue score was used instead of the FACIT-F to reduce participant burden. Acute effects of the class were assessed by comparing pre- and post-class means.

Nutrition

Dietary intake was assessed pre- and post-intervention via the Automated Self-Administered 24-hour (ASA-24) dietary recall tool, completed with the study team for simplicity [15]. Participants were asked to recall all food or drink consumed within the past 24 hours, including dietary supplements, which was then entered into the ASA24 system to yield automatically calculated nutrient intakes. The recall included a question assessing if the daily intake was typical for participants. Nutritional outcomes of interest were macronutrients and total calories per kilogram. Due to the pilot nature of intervention, a single day was collected to assess feasibility of performing the dietary recall.

M.4.4 Physical Function

Physical function tests were conducted by a clinical exercise physiologist, who was not involved with intervention delivery. The same clinical exercise physiologist was responsible for pre- and post-intervention testing. Resting heart rate was measured using a 15-second pulse at the radial artery, multiplied by four to determine beats per minute. Resting blood pressure (mmHg) was measured in duplicate on the left arm using a sphygmomanometer and stethoscope using standardized procedures. Height and weight were collected on a Health Carter balance beam scale and used to calculate body mass index (BMI). While standing, participant waist circumference was measured with an anthropometric tape measure at the top of the iliac crest and hip circumference at the greatest gluteal girth [16]. Upper body strength was assessed using a handgrip dynamometer (Smedley Dynamometer, TTM, Tokyo, Japan), taking the average of two trials according to the Canadian Physical Activity Fitness and Lifestyle Approach (CPFLA) protocol [17]. Lower body strength was assessed using the 30-second sit-to-stand test, recording the number of times that participants could stand from a seated position in 30-seconds [18]. Shoulder range of motion was averaged from duplicate measurements using a goniometer. Trunk and leg flexibility was averaged from duplicate measurements using the sit-and-reach test (Wells-Dillon flexometer) in accordance with the CPAFLA protocol [17]. Single leg balance was measured using a standardized protocol by Fleishman [19]. A six-minute walk test was used to determine aerobic capacity, with walking distance around a 200-meter track recorded to the nearest 0.5 meter [17].

M.4.5 Nutrition and Palliative Consult Report Forms

Information provided during nutrition and palliative consults was recorded using standardized case report forms for each respective component, with specific sections and checkboxes to streamline data summarization. The case report forms covered recommendations provided, issues discussed, and interventions suggested.

M.5 Data Analysis

M.5.1 Quantitative

Descriptive statistics were generated for all variables, with means and standard deviations for continuous variables and raw numbers, as well as percentages for categorical variables. Outcome values were inspected for normality to ensure that appropriate statistical tests were applied. Dependent sample t-tests were used to compare pre and post means for the

intervention and individual exercise classes (to assess acute exercise class effects). P-values are reported for all t-tests, with a cut-off of $p < 0.05$ for statistical significance. Due to the preliminary nature of these analyses and the relatively small number of pre-planned comparisons, no correction for multiple comparisons was performed. All statistical tests were performed using IBM SPSS statistics 26.0 software (IBM).

M.5.2 Qualitative

Interpretive description was used, informing analyses of participant perspectives within exercise oncology literature and quantitative results to develop a deeper understanding of study feasibility and impact. Analyses were based on a constructivist philosophy. Interviews were transcribed verbatim by one author (DD) before proof-reading by the lead author (ME). Transcripts were then read by a third author (JD), who developed transcript notes for each interview and performed all coding independently using NVivo 12.0 software (QSR International). Four authors (JD, ME, LCC, NCR) iteratively refined themes based on common concepts, research questions, quantitative data, and theoretical knowledge in exercise oncology. The author who coded data (JD) then selected representative quotes for each theme. Readability was enhanced by removing stutters or repetitive words, replacing long pauses or tangent thoughts by "[...]", and inserting words or replacing names by titles in square brackets.

Results

R.1 Feasibility and Demographics

Over the nine-week recruitment period, 80 lung cancer patients were assessed for eligibility. Of the 31 who were eligible, 23 were approached, and 10 (43.5% of approached) provided informed consent (Figure 1). One participant dropped out before starting the intervention due to lack of interest in group-based classes. As such, only the 9 remaining participants were included when analyzing attendance feasibility. Two participants dropped out during the intervention due to disease progression (1) or hospitalization (1). Seven (70%) completed the post-intervention follow-up.

Figure 1. Modified CONSORT flow diagram for the single-arm ENPAL study. Recruitment began in October 2019 and the post-assessments concluded in March 2020. NSCLC = non-small-cell lung cancer. NMS = neuromusculoskeletal.

The mean age of the 10 ENPAL participants was 64.4 ± 10.3 years. A complete overview of participant demographics, including diagnosis and treatment details, is presented in Table 1.

Table 1. Baseline participant demographics. Income listed in Canadian dollars. Treatment duration is calculated from treatment start date to pre-intervention assessment date. PD-L1: Programmed-death ligand 1. EGFR: Epidermal Growth Factor receptor. ALK: Anaplastic lymphoma kinase.

n=10	Range	Mean (SD)
Age	51-83	64.4 (10.3)

	Category	n	%
Gender	Female	6	60
	Male	4	40
Income (thousands)	<20	1	10
	40-59.9	2	20
	60-79.9	1	10
	>80	5	50
	Not specified	1	10
Education	Some high school	1	10
	Completed high school	1	10
	Some university/college	3	30
	Completed university/college	3	30
	Some graduate school	2	20
Marital Status	Married/common Law	8	80
	Divorced/separated	1	10
	Widowed	1	10
Employment Status	Retired	6	60
	Disability/sick leave	4	40
Tumour Marker	PD-L1 High	6	60
	EGFR activating mutation +	5	50
	ALK translocation +	1	10
Treatment	Tyrosine Kinase Inhibitor	6	60
	Immune Checkpoint Inhibitor	2	20
	Immune Checkpoint Inhibitor + Chemotherapy	1	10
	None	1	10
Treatment Duration	0-3 months	5	50

	3-6 months	2	20
	>6 months	2	20
	N/A	1	10

Assessment completion was 85% (10/10 pre-intervention, 7/10 post-intervention). Four of seven post-intervention assessments were completed remotely due to the COVID-19 university closure, limiting collection to PROs and dietary recall only.

Exercise class attendance was 75% (75/100 possible exercise classes available, Table S1). The most common reasons for missed classes were treatment side effects (7), illness (7), and travel (5). Nutrition and palliative consult attendance was 89% (8/9 attended at least one nutrition and one palliative session). Weekly PA journals were submitted by 78% (7/9) of participants. There were no reported adverse events related to the intervention.

R.3 PROs

R.3.1 Physical Activity

Self-reported PA, presented in Table 2, did not change significantly throughout the intervention. Participant LSI moderate-strenuous (MS) was 5.3 ± 11.9 pre-intervention and 13.6 ± 17.1 post-intervention ($p=0.260$). Aerobic MS PA minutes were 8.0 ± 14.4 pre-intervention and 61.4 ± 88.4 post-intervention ($p=0.112$).

Table 2. Pre- and post-intervention PROs. All outcomes are presented using mean and standard deviation in brackets. LSI = Leisure score index. MS = moderate-strenuous. MMS = mild-moderate-strenuous. $a = p < 0.05$.

n=7	Pre Mean (SD)	Post Mean (SD)	p-value
GLTEQ LSI MS	5.3 (11.9)	13.6 (17.1)	0.260
GLTEQ LSI MMS	13.4 (13.7)	19.6 (17.3)	0.492
Aerobic MS (min/week)	8.0 (14.4)	61.4 (88.4)	0.112
Aerobic MMS (min/week)	68.1 (63.2)	103.6 (103.6)	0.507
Resistance PA	12.9 (23.6)	21.4 (26.9)	0.505

(min/week)			
ESAS Total	20.9 (6.5)	19.6 (20.8)	0.854
ESAS Pain	2.7 (3.1)	1.7 (2.2)	0.086
ESAS Tiredness	4.7 (2.0)	2.9 (2.7)	0.015 ^a
ESAS Drowsiness	1.4 (2.0)	1.0 (1.8)	0.200
ESAS Nausea	0.4 (1.1)	0.3 (0.5)	0.788
ESAS Appetite	0.7 (1.0)	1.7 (3.0)	0.455
ESAS Shortness of Breath	2.1 (1.9)	2.6 (3.3)	0.740
ESAS Depression	3.0 (2.4)	2.1 (3.5)	0.634
ESAS Anxiety	1.4 (1.7)	2.1 (3.6)	0.588
ESAS Overall wellbeing	3.4 (2.1)	2.9 (2.7)	0.654
FACIT-F	33.3 (8.2)	36.6 (15.1)	0.429
FACT-L Total	100.5 (11.5)	103.8 (23.5)	0.736

PA journals (n=49) indicated a mean weekly PA frequency of 7.26 ± 2.20 (sessions), intensity of 3.63 ± 0.99 (RPE 1-10), and total duration of 262 ± 79 minutes (Table S2). Daily life PA (e.g. housework) made up 45.3% of PA recorded, with average weekly frequency of 3.3 ± 1.6 sessions.

R.3.2 Symptom Burden, Fatigue, and Quality of Life - Pre/Post Intervention

As shown in Table 2, no statistically significant changes were observed for total symptom burden (ESAS total, $p=0.854$), fatigue (FACIT-F, $p=0.429$), and QOL (FACT-L total, $p=0.736$) across the intervention. Individually, ESAS tiredness decreased significantly from pre to post intervention ($-1.86 \pm 1.46/10$, $p=0.015$).

R.3.3 Symptom Burden, Fatigue, and Energy - Pre/Post Class

As described in the methods, the average pre and post exercise class ESAS symptoms were collected to measure acute changes over the period of an exercise class. Table 3 indicates that exercise classes led to statistically significant acute reductions in ESAS symptom burden ($8.2/100 \pm 8.7$ to $4.7/100 \pm 6.0$, $p<0.001$). ESAS pain, tiredness, drowsiness, shortness of breath, depression, anxiety, and overall well-being all improved acutely after an exercise class ($p<0.05$, Table 3). Fatigue and energy, as measured using single-item thermometers were significantly improved over the duration of one class (Fatigue: $2.4/10 \pm 2.3$ to $1.4/10 \pm 1.4$, $p<0.001$; Energy:

5.7/10 $\pm$ 3.1 to 7.0/10 $\pm$ 2.7, $p < 0.001$).

Table 3. Pre- and post-exercise class PROs. All outcomes are presented using mean and standard deviation in brackets based on 74 exercise classes (one missing form) across nine participants. a = $p < 0.05$.

n=74	Pre Mean (SD)	Post Mean (SD)	p-value
ESAS Total	8.2 (8.7)	4.7 (6.0)	$<0.001^a$
ESAS Pain	1.1 (1.8)	0.6 (1.2)	0.001^a
ESAS Tiredness	2.4 (2.5)	1.6 (2.5)	0.004^a
ESAS Drowsiness	0.7 (1.4)	0.4 (1.0)	0.002^a
ESAS Nausea	0.2 (1.0)	0.1 (0.5)	0.095
ESAS Appetite	0.8 (1.9)	0.7 (1.8)	0.346
ESAS Shortness of Breath	0.8 (1.3)	0.6 (0.8)	0.023^a
ESAS Depression	0.9 (1.7)	0.3 (0.8)	$<0.001^a$
ESAS Anxiety	0.5 (1.3)	0.1 (0.3)	0.002^a
ESAS Overall wellbeing	1.5 (1.9)	1.0 (1.6)	0.009^a
Fatigue	2.4 (2.3)	1.4 (1.4)	$<0.001^a$
Energy	5.7 (3.1)	7.0 (2.7)	$<0.001^a$

R.3.4 Dietary Recall

Mean daily intake was 20.6 $\pm$ 3.4 kcal/kg and 0.79 $\pm$ 0.18 g/kg of protein before starting ENPAL (Table 4). Post-intervention daily intake was 23.9 $\pm$ 7.4 kcal/kg and 1.1 $\pm$ 0.49 g/kg of protein. No statistically significant dietary changes were observed after completion of ENPAL (Table 4). All participants confirmed that the dietary recall represented a typical day for them.

Table 4. Pre- and post- intervention dietary patterns based on ASA24-hour dietary recall. All outcomes are presented using mean and standard deviation in brackets. a = $p < 0.05$.

n=7	Pre Mean (SD)	Post Mean (SD)	p-value
Calories (kcal)	1513 (398)	1755 (655)	0.386
Calories (kcal/kg)	20.6 (3.4)	23.9 (7.4)	0.412

Protein (g)	57.7 (19.1)	79.5 (33.7)	0.167
Protein (g/kg)	0.79 (0.18)	1.1 (0.49)	0.150
Fat (g)	58.7 (22.9)	78.6 (39.1)	0.154
Fat (g/kg)	0.78 (0.25)	1.0 (0.34)	0.182
Carbohydrates (g)	180.5 (55.5)	170.1 (51.2)	0.732
Carbohydrates (g/kg)	2.5 (0.78)	2,4 (1.0)	0.835

R.4 Physical Function

Physical function was assessed for all participants pre-intervention and three participants post-intervention, as shown in Table S3. Due to the COVID-19-related university closure, physical function measures could not be collected for the remaining participants post-intervention. No statistical tests were performed due to limited data.

R.5 Nutrition and Symptom Management Consults

An overview of the information provided during nutrition consults is presented in Table S4. Increases in energy intake (62.5%), protein (100%), and fat (50%) were commonly recommended. Dietitians suggested solutions such as the use of nutrient dense supplements (62.5%) and unflavored protein powder (87.5%). Management of nutrition-related symptoms included diarrhea (37.5%), poor appetite (50%), and dry mouth (37.5%).

Palliative symptom management consults are summarized in Table S5. Pain and dyspnea were discussed in 75% of consults. Discussions around mood, fatigue, goals of care, insomnia, and constipation featured in 62.5% of consults. Two common interventions presented by physicians were analgesics (62.5%) and other medications such as laxatives and bowel medications (37.5%).

R.6 Qualitative Perspectives

Three themes emerged from participant interviews: 1) a multimodal program is feasible, 2) the value of the multimodal program, and 3) how to improve the multimodal program. Additional participant quotes are presented in Table S6.

R.6.1 Theme 1: A Multimodal Program is Feasible

Participants described the completion of pre-/post- class questionnaires and pre-/post- study assessments to be reasonable and helpful, providing a benchmark for physical and psychosocial outcomes during treatment that they could refer to throughout the program.

*That's what got me definitely hooked onto the program, was the assessment. It was very simple to fill out all the questions and I had no problems whatsoever. **P5.***

A satisfaction with the frequency, duration, time, and type of exercise classes and home-based exercise prescriptions in ENPAL was noted. Exercise progression and variation was viewed as acceptable, although one participant would have preferred more variety and a quicker progression.

*The timing is excellent. It's not too long and it's not too short. We all enjoy, and I'm not watching and looking at the clock like oh, I need to go home, no, I'm never do that, I enjoy 100% doing the exercise. **P2.***

*Just too routine, for me. Same thing over and over. **P1.***

The importance of an exercise professional was highlighted for fostering a feasible and successful program, allowing participants to feel safe and supported during exercise and motivated to attend classes.

*They [the instructor] were really marvelous. [...] I think they are a great part of having the successful program like that [...] it's the trainers. The way the kind of aesthetic they invoke on the setting, and also their expertise played an important part. **P8.***

The nutrition and palliative consults were perceived as acceptable. Participants found them helpful to address unique nutritional needs (e.g. increasing protein intake during cancer treatment), while appreciating the expertise of the palliative care physicians. The palliative symptom management consult was less suitable to those with limited pain or side effects.

*To be aware that he's [the Doctor] there, and we had a good chat and that was all, there was nothing directly relevant because I don't have any pain [...] we established that there is such a thing as the pain clinic, that there is real serious expertise involved, that if I get to that situation that I can expect some skill. **P4.***

R.6.2 Theme 2: The Value of a Multimodal Program

Participants noted the physical and psychosocial benefits of the ENPAL program for improving QOL, bringing normalcy back to their lives, increasing energy, decreasing fatigue and anxiety, improving sleep and physical function, and enhancing their outlook on life.

So overall, I'm really happy that I've been a part of it, it's been good for me, it's caused my quality of life to be better [...]. P4.

Well, I think it's definitely the thing that like it helped to get you back to feeling your normal self again. And physical activity. And [...] cancer is, is in many cases, in my case, it's not a treatable thing. So, it's just that, at least for some time, the goal here is to enjoy life as it is, as normal as it as I possibly can. P8.

ENPAL was perceived as beneficial for increasing confidence and motivation for engaging in PA, encouraging behavior change, enabling participants to integrate PA into their cancer journeys and lifestyles. Central to this was the participants' improved self-efficacy for activities of daily living.

I wasn't sure even I can, do the exercises [...]. Especially I just came out of the hospital and you know it was downhill completely. So, the program actually helped me to get back to the normal and realize that I can still, with the medication that I'm taking, get my energy level up and, get my muscles to move again and actually, [...] I think it somehow made me realize that exercise is a better, a good treatment to the side effects that I have from that medication that is primarily the muscle soreness that I have. P8.

The social support from fellow participants and instructors within the group-based exercise classes was widely appreciated, improving willingness to attend and contributing to psychosocial benefits (e.g. mood, QOL).

So, we all know we have the end stage of cancer and like we will think about what happened to my friend, what happened to them why they are not coming. So, I think it's a social life, I got some social life back [...] I just feel it's so important to have a group of people to work together, and we are on the same boat. P2.

R.6.3 Theme 3: How to Improve a Multimodal Program

Participants provided suggestions to improve ENPAL moving forward with additional online resources for exercise and nutrition, one-on-one sessions with other experts (e.g.

psychologist), and ongoing support during and after the program, especially for at-home PA.

*I know there's apps that you can get where they have exercises online, but it would be nice to have the one specific for you online [...] you know, just in case you forget when you go home.***P10.**

I would like to see them introduce and have a [one-on-one] counsellor in there [in ENPAL]. I think talking about the cancer and about their feelings, their emotions. **P5.**

Doing them [the exercises] at home, I wasn't as motivated. As opposed to being at the university, I loved the outing and I loved getting out. That's what I looked forward to. [...] So I found that very difficult doing them at home. **P5.**

Discussion

D.1 Feasibility

Our results indicate that the novel multimodal PA, nutrition, and palliative symptom management intervention was safe, feasible, and well-tolerated. Recruitment (44%), attendance (75%), and assessment completion (85%) rates exceeded the pre-determined feasibility values (30%, 60%, and 70%, respectively). A 44% recruitment rate is comparable to previous exercise interventions in advanced cancer, where the mean rate was 49%, although rates can vary widely [20]. A study in advanced gastrointestinal cancer managed only 15%, while another with direct oncologist referral had a rate of 74% [20, 21]. Given this high recruitment rate from direct oncologist referral, future studies in ALC may benefit from this method of referral versus consent to contact used in this study. Interestingly, the most common reason for ineligibility in this study was non-English speaking (15 patients), emphasizing the need for translation of intervention content to ensure equitable access to supportive care. No adverse events to the intervention were reported and interviews indicated high participant satisfaction.

Intervention (70%) and assessment (85%) completion was comparable to the 76% in past PA interventions for advanced cancer [20]. As with previous interventions, disease progression was the most common reason for attrition in ENPAL (66%, 2/3 of participants who did not complete the intervention). Completion rates of previous bimodal nutrition and PA interventions in advanced cancer ranged from 42-70%, indicating that the addition of a palliative component in the ENPAL program did not affect study completion [11].

D.2 Physical Activity

Due to prevalent dyspnea, pain, fatigue, psychosocial challenges, and demanding treatments, PA adherence can be difficult for individuals living with ALC [2, 3]. Our participants did not report significant changes in PA levels, suggesting that while the ENPAL program may have supported PA maintenance, it was not associated with an increase in PA. In the context of ALC, PA maintenance over three months should not be misinterpreted as a lack of intervention efficacy. On the contrary, it may indicate that this multimodal intervention counteracted the “usual decline” in PA levels previously seen with disease progression in advanced cancer [22, 23]. Exercise interventions in advanced cancer commonly report PA maintenance rather than increases in PA [24, 25]. PA maintenance is important, as increases in physical inactivity, often driven by dyspnea, are prevalent in lung cancer [23]. Participants recorded an average of more than once weekly at-home cardiovascular and resistance exercise, as well as some stretching, as prescribed (Table S2). Despite tailored programs, participants struggled to exercise at home due to lack of motivation and social support (Table S6). Previous qualitative research on exercise in ALC noted similar barriers [26]. Behavior change education in ENPAL was designed to support adoption and adherence to PA despite these barriers, but participants still reported lack of motivation. Additional supportive resources (e.g. health coaching, technology-based support) may be required to overcome persisting barriers. A controlled trial is required to further examine the impact of this multimodal program on PA behavior.

In-person class attendance in previous trials with ALC patients was 44%, in contrast to the 75% in ENPAL [27, 28]. This may be related to class frequency, which was two or three times weekly within previous studies, compared to once weekly in ENPAL, suggesting that the latter may be more suitable for this population [27, 28]. ENPAL classes were offered on two days per week, allowing participants to attend either or both. Participants appreciated this flexibility, which likely contributed to increased attendance rates. As class times were tailored to participants, only 8% (2/25) of missed sessions in the ENPAL program were due to conflicting appointments, compared to 54% in a similar intervention for advanced cancer [29].

No adverse events were noted, suggesting that, in the presence of professional tailoring and monitoring, ALC populations can exercise safely and should not be excluded from general cancer-exercise programs, as long as they are tailored to meet participant needs. In line with prior research, ENPAL participants preferred group-based to at-home exercise due to the enhanced motivation and social support [26].

D.3 Preliminary Examination of PROs

In ALC patients, QOL can decrease rapidly with disease progression [30]. However, ENPAL participants did not report significant declines in overall wellbeing or QOL across the intervention period (Table 2). Similar to past PA intervention, QOL was maintained, and symptoms burden as well as fatigue did not worsen among participants [24,31]. In fact, clinically significant decreases in tiredness and pain were seen across the intervention (>5%, although only tiredness was statistically significant, $p=0.015$) [32]. Increased PA is associated with decreased fatigue across many cancer populations and may also improve pain management [33, 34]. Furthermore, dietary counseling has been shown to reduce fatigue and pain in other cancer populations, suggesting that a multimodal intervention may play an important role in QOL maintenance [35].

The lack of significant changes in other domains may be due to the limited room for improvement within our sample, which had low symptom burden and high QOL at baseline (Table 2). Additionally, four of seven participants completed post-intervention PROs during the COVID-19 pandemic, which may have led to independent worsening of QOL and fatigue. Additional research is needed to fully understand and maximize QOL benefits of exercise interventions in ALC.

The current study is the first to demonstrate the acute benefits associated with an exercise class for improving symptom management in ALC patients. Statistically significant and clinically meaningful (i.e. > 5%) acute changes in fatigue, energy, tiredness, depression, pain, and wellbeing were observed (Table 3) [32]. Acute effects seen in ENPAL mimic findings from an exercise intervention in head and neck cancer, which also found that exercise classes improved symptoms across the period of an exercise class [36]. Furthermore, in accordance with previous research, these acute improvements are likely to enhance long-term PA adherence in the ENPAL participants, leading to sustained physical and psychosocial benefits for this population [37].

D.4 Palliative Symptom Management

The present work is the first to integrate palliative care consultations, which has demonstrated potential for improving QOL, into a multimodal intervention for ALC [5,6,38]. The palliative care consult was feasible, as evidenced by 89% attendance and positive feedback in interviews (Table S5). Interestingly, participants noted that some topics (e.g., pain) were not relevant to them, yet ESAS pain decreased by more than 5% over the intervention, which was

clinically meaningful (Table 2) [32]. Previous work where patients chose symptom management topics of interest resulted in enhanced QOL, echoing ENPAL participant requests for a more personalized approach [38]. Further research is warranted to evaluate palliative symptom management in multimodal interventions.

D.5 Nutritional Counseling

The feasibility of the nutrition consults in ENPAL was demonstrated by 89% attendance and positive participant perspectives, adding to the evidence for feasibility of nutritional interventions in advanced cancer and lung cancer [10,39-41]. As with the palliative care component of the intervention, the frequency of the dietary counselling sessions was dictated by participants, with all participants attending one session. One participant received a second phone-based follow-up consult. While feasible, the reduced intervention intensity in ENPAL, compared to more frequent consults or specific nutritional prescriptions in previous research, may have limited the impact on nutritional outcomes [10,39-41]. Practical advice to increase protein and overall energy intake was not statistically reflected in the reported post-intervention dietary measures. However, as with PA, maintenance of BMI and nutritional intake is promising, given that weight maintenance is a predictor for improved prognosis in lung cancer and BMI can decrease rapidly in ALC patients [42]. Larger, multi-arm, controlled trials are required to assess the effects of including nutrition consults in a multimodal intervention on QOL and nutritional outcomes.

D.6 Strengths, Limitations, and Future Directions

The in-clinic recruitment process and patient-focused intervention delivery were both key strengths that contributed to the success of the ENPAL program. Involvement of clinical staff in the study design prompted clinician buy-in, while rolling recruitment allowed participants to receive supportive care immediately, which is crucial for advanced cancer populations who cannot afford to wait. Furthermore, social support was facilitated by instructors and the group-based environment, potentially supporting class attendance. Finally, individualization and safety were highlighted using small class sizes and individualized PA programs.

There are several limitations to the current feasibility pilot that must be addressed using a larger controlled trial. Without a control group, we are unable to ascertain intervention effectiveness. Due to the small sample size, the study was underpowered for detecting within-group changes in outcomes, thus results must be cautiously interpreted as exploratory.

Furthermore, statistically significant changes, indicating potential benefits of ENPAL, may represent false positives due to lack of correction for multiple comparisons. Due to voluntary recruitment, highly motivated patients were more likely to participate in ENPAL, therefore limiting the generalizability of the results. Additionally, without objective PA monitoring, PA outcomes remain prone to self-report biases. As participants reported relatively low symptom burden, high QOL, and moderate PA at baseline, the recruitment process requires further optimization to ensure that supportive care targets at-risk subgroups. Finally, although a variety of lung cancer subtypes and treatment regimens were represented among ENPAL participants, additional research is needed to understand differences in capacity for and response to multimodal interventions depending on these characteristics, which need to be consistently reported.

Conclusion

In conclusion, the present study indicates that a multimodal exercise, nutrition, and palliative symptom management intervention is safe and feasible in patients with advanced NSCLC. Furthermore, the positive acute effects of the exercise class on symptom burden were demonstrated. One participant concluded, “it somehow made me realize that exercise is a better, is a good treatment to the side effects that I have from that medication.” Current findings warrant further research on multimodal interventions to improve QOL in ALC.

Contributions

Contributed to conception and design: ME, SNC-R, AA-R, GF, GB, JB, AA, CG, LG, LCC

Contributed to acquisition of data: ME, SNC-R, AA-R, JTD, DD, GB, JB, AA, LCC

Contributed to analysis and interpretation of data: ME, SNC-R, JTD, DD, GB, CG, LCC

Drafted and/or revised the article: ME, SNC-R, AA-R, JTD, DD, GF, GB, JB, AA, CG, LG, LCC

Approved the submitted version for publication: ME, SNC-R, AA-R, JTD, DD, GF, GB, JB, AA, CG, LG, LCC

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Data and Supplementary Material Accessibility

Supplementary Material can be found following the references below.

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Supplementary Material: Feasibility and preliminary efficacy of a multimodal exercise, nutrition, and palliative care intervention in advanced lung cancer

Table S1. ENPAL exercise class attendance breakdown.

	Week													
ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	1	3	3	1	1	1	1	1	1	1	1		
2	1	1	1	1	1	2	2	2	3	3	1			
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	1	1	1	1	1	1	1	1	1	1	1	1		
5	1	1	1	1	1	3	3	3	3	3	3	3	Z	Z
6	1	1	1	1	3	3	3	1	1	3	3	3	3	3
7	1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
8	1	1	1	1	1	3	1	1	1	3	3	3	Z	Z
9	1	2	1	1	2	2	2	1						
10	1	1	1	1	1	3	3	1	1	1	1	Z	Z	Z

1: attended. 2: attended 2 sessions. 3: did not attend. X: Did not start intervention. Y: Drop out due to disease progression. Z: Class not offered due to COVID-related university closure. Blanks indicate that the program was completed (for participants who attended 12 sessions in under 14 weeks). A total of 100 classes were offered.

Table S2. Self-reported PA from weekly activity journals.

n=7	Mean (SD)	
Frequency (weekly)	7.26 (2.20)	
Intensity (RPE 1-10)	3.63 (0.99)	
Time (minutes)	261.68 (79.23)	
Type (weekly)	Mean (SD)	%
Cardiovascular	1.18 (1.50)	16.21
Resistance	1.34 (1.52)	18.45
Stretching	0.51 (1.25)	7.05
ENPAL Class	0.94 (0.31)	13.00
Daily life PA	3.29 (1.62)	45.29

RPE = rating of perceived exertion. Daily life PA is any PA done in as part of daily life tasks (e.g. housework). Percentages represent recorded frequencies for each activity divided by the total number of all activities.

Table S3. Pre- and post-intervention physical function measures.

		Pre (n=10)	Pre (n=3)	Post (n=3)
BMI (kg/m²)		28.5 (5.5)	26.8 (1.1)	27.2 (2.1)
Grip Strength (kg)	Right	32.9 (10.2)	35.3 (13.0)	36.8 (12.5)
	Left	31.9 (12.1)	34.2 (18.8)	34.7 (16.0)
30s Sit to Stand (repetitions)		12 (6.0)	15.3 (3.5)	17.3 (1.5)
Shoulder ROM (degrees)	Right	152 (14.2)	151 (5.5)	152 (1.3)
	Left	151 (16.3)	156 (5.8)	150 (8.7)
Sit and Reach (cm)		18.6 (10.8) ^a	15.7 (12.6)	18.1 (9.6)
1-Leg Balance (seconds)	Right	20.5 (19.5)	27.9 (22.1)	35.2 (17.0)
	Left	22.4 (16.3)	33.2 (20.5)	33.6 (19.8)
6MWT Distance (m)		505 (84.0)	593 (71.2)	618 (50.0) ^b

All outcomes are presented using mean and standard deviation in brackets. ROM = range of motion. 6MWT = 6-minute walk test. *a*: *n*=9. *b*: *n*=2.

Table S4. Frequency of information provided to participants during ENPAL nutritional consults.

n=8	Category	RD suggestion	n	%
Recommendations	Food Choices	Balanced meals	4	50
		Eating every 2-3 hours	1	12.5
	Energy Intake	Increase	5	62.5
		Maintain	2	25
	Protein	Increase	8	100
	Fat	Increase	4	50
		Maintain	1	12.5
		Healthy fats	1	12.5
	Carbohydrates	Increase	1	12.5
		Maintain	3	37.5
Issues Discussed	Supplements	Nutrient dense nutritional supplement as tolerated	5	62.5
		Unflavored protein powder	7	87.5
	Diarrhea		3	37.5
	Poor appetite		4	50
	Dry mouth		3	37.5
	Constipation		1	12.5
	Mouth sores		1	12.5
Interventions	Dry lips		1	12.5
	Diarrhea	Imodium	3	37.5

	Poor appetite	Eat small amounts frequently	5	62.5
		High calorie/protein diet as tolerated	4	50
		Nutrient dense nutritional supplement as tolerated	4	50
		Unflavored protein powder	5	62.5
	Dry mouth	Frequent use of water	3	37.5
	Mouth sores	Frequent use of water	1	12.5

RD = registered dietitian. Numbers in the rightmost column represent the percentage of consults where specific information was provided according to the nutrition case report forms.

Table S5. Frequency of information provided to participants during ENPAL palliative symptom management consults.

n=8	Category	Details (if applicable)	n	%
Issues Discussed	Pain		6	75
	Nausea/emesis		2	25
	Cough		3	37.5
	Mood (depression, anxiety, wellbeing, other)		5	62.5
	Fatigue		5	62.5
	Delirium		1	12.5
	Goals of care		5	62.5
	Dyspnea		6	75
	Insomnia		5	62.5
	Appetite		3	37.5
	Constipation		5	62.5
	Other	Quit smoking (1), diarrhea/rash (1)	2	25
Interventions	Opioids		1	12.5
	Adjuvant Analgesics		5	62.5
	Anti-emetics and Neuroleptics		0	0
	Laxatives and Bowel Medications		3	37.5
	Goals of Care/Goals of Care Designation	Introduced concept	3	37.5
		Reviewed previous decisions/discussions	4	50
	Mood-related	Referred to psychosocial oncology	2	25
	Other	Reviewed medications/other health	3	37.5

Numbers in the rightmost column represent the percentage of consults where specific information was provided according to the nutrition case report forms.

Table S6. Participant quotes from semi-structured interviews.

Theme 1: A Multimodal Program is Feasible
Key Quotes
<i>[The assessments] went really, really well. I, that's what got me definitely hooked onto the program, was the assessment. Um, it was very simple to fill out all the questions and I had no problems whatsoever. I loved the tour, I liked um, being able to walk around the Oval and see where I would be and, I was just in my glory. I was so, so happy. Yeah. Yeah. I was very, very comfortable. Yeah. [...] and the questions, the questions were very simple. Very, very simple. P5.</i>
<i>The ENPAL program was just absolutely amazing. As soon as I walked in the door, I felt extremely welcome, very relaxed, very comfortable [...] I've never experienced anything like that before, so, it was a really good support system for me at that time. Especially just getting out of the hospital. P5.</i>
<i>Um, the program I think is really, really good because it's okay to our, really, what I can do it, so, mm, the timing is excellent. It's not too long and it's not too short. We all enjoy, and I'm not watching and looking at the clock like oh, I need to go home, no, no, I'm never do that, I enjoy 100% doing the exercise. P2.</i>
<i>Oh, they [the instructors] were marvelous. They were really marvelous. And uh, I think their energy and uh, with the way they conducted themselves [...] it really became a nice labour to the setting itself, so [...] I think they are a great part of having the successful program like that [...] it's the trainers. The way the kind of aesthetic they invoke on the setting and uh, also their expertise, understanding, uh, that definitely, uh, played an important part. P8.</i>
<i>To be aware that he's [the Doctor] there, and we had a good chat and there was all, there was nothing directly relevant because I don't have any pain [...] we established that there is such a thing as the pain clinic, that there is real serious expertise involved, uh that if I get to that situation that I can expect some skill. P4.</i>
Additional Quotes
<i>Exercise Progression: The exercises that I did to start with were right perfect and the exercises that um, [our instructor] copied to me in the email are more challenging and it will take a while to get back into those ones. So, you don't feel like you're stagnant, you're just doing the same thing over and over and over again, you're working towards something. So, I think that's really good that they're doing that, and giving you an incentive to continue at home and improve. P10.</i>
<i>Class Frequency: To me, the weekly, coming here once a week was absolutely fine for me. Um, like especially nowadays with me having so many other appointments. And plus I've always done my own routine at home, so I just threw in some of your routine stuff as well at home, so. Yeah. But, once a week was great, for me. P1.</i>

<p><i>Class Variety: Getting back to the more variety, uh and different routine, but uh the exercises that you provided were good, like like you know, were very helpful. Just too routine, for me. Same thing over and over. P1.</i></p>
<p><i>Individualization: So, that's uh, and that's good that the person, the trainer understands the different kinds of exercises and the different alternatives to exercises. So, if you cannot do this exercise then the other alternative, it's so and so. So, that's that's a helpful thing. P8.</i></p>
<p><i>Nutrition: Yeah, and I think it because uh, there's a lot of uh, um, regarding uh, nutrition when it comes to cancer patients, so I think it's an important part, an addition to the program to have that part, as part of the program. P8.</i></p>
<p>Theme 2: The Value of a Multimodal Program</p>
<p>Key Quotes</p>
<p><i>So overall, I'm really happy that I've been a part of it, it's been good for me, it's caused my quality of life to be better [...]. P4.</i></p>
<p><i>Well, I think it's uh, definitely the thing that like it helped to get you back to feeling your normal self again. And physical activity. And that's ultimately um, cancer is, is in many cases, in my case, it's not a treatable thing. So, it's just that, at least for, um, some time, uh, so, the goal here is to enjoy life as it is, as normal as it as possibly can. P8.</i></p>
<p><i>At the time when I started, I wasn't sure even I can um, do the exercises, or jump on a treadmill, or go back again and do some weightlifting or the different exercises. Especially I just came out of the hospital and you know it was downhill completely. So, the program actually helped me to get back to the normal and realize that I can still, with the medication that I'm taking, get my energy level up and um, uh, get my muscles to move again and actually, I have I think it somehow made me realize that exercise is a better is a good treatment to the side effects that I have from that medication that is primarily the muscle soreness that I have. P8.</i></p>
<p><i>So, we all know we have the end stage of cancer and and like we will think about what happened to to to my friend, what happened to them why they are not coming. So, I think it's a social life, I got some social life back [...] I just feel it's so important to have a group of peoples to work together, and we are on the same, we are on the same boat. P2.</i></p>
<p>Additional Quotes</p>
<p><i>Assessment: Probably the most important one was actually the original assessment. Um, I had been largely avoiding doing things cause I would immediately run out of breath. [...] The assessment showed me that uh you can run out of breath and keep on going. Okay, and doing things, um, so that was probably the most important thing looking back, was getting started on doing things. P4.</i></p>
<p><i>Education: Well, it was actually a good, uh, a good part in addition to the actual discussion of the mechanism of the exercise, why we're doing the exercise. Uh, so, um, some part of the education that we had it regarding ah, it was also regarding a bit of uh, uh, I think motivation</i></p>

<p>as well [...] Uh, like it was, it adds up to the whole picture, they were really, really very helpful. P8.</p>
<p>Fatigue/Energy: I found after the exercise, it's funny, after the exercise at the [Thrive], I felt more energetic than I did when I came in. P10.</p>
<p>Positive Outlook: Um, I was thinking because you know, I have this situation you know, I have this uh, I have the cancer and all that, you know. And maybe I cannot do it, right? So, yeah, it's improved me a lot. And even the way I think, it's helped it's given me focus to be more positive, you know, you can do it, it will, you know, it will come to pass [laughing]. P9.</p>
<p>Functional ability in daily life: But, um, as I was starting treatment, we have a walk-out basement. I would not go downstairs more than once a day, max. I think of nothing of running up and down the stairs now. P4.</p>
<p>Nutrition: I don't eat much. And she let me know to um, what I should use, yeah, I I actually, during that time I lose weight when I do exercise and I have, I followed her instructions, I took some Ensure, if I couldn't eat I take 1 bottle of Ensure a day and it helped me. P2.</p>
<p>Theme 3: How to Improve a Multimodal Program</p>
<p>Key Quotes</p>
<p>[...] The exercises, it would be nice if you could see them online, um, I know there's apps that you can get where they have exercises online, but it would be nice to have the one specific for you online [...] you know, just in case you forget when you go home and you haven't done them, you know, you've only done them once, then it'd be nice to watch somebody do them. P10.</p>
<p>I think what would be missing, um, would be, which is surprising, is having a one-on-one either counsellor or psychiatrist dealing with the issue itself. Um, I never had anybody um, talk about the cancer, basically [...] I would like to see them introduce and have a counsellor in there [in ENPAL]. I think talking about the cancer and about their feelings, their emotions. P5.</p>
<p>[...] Doing them at home, I wasn't as motivated. Um, as opposed to being um, at the university, um, I loved the outing and I loved getting out. That's what I looked forward to. And at home, I'm going oh, I'm staying at home, I'm in the basement, oh, I'm not getting out, I'm not talking to anybody. So, I found that very difficult doing them at home. Cause I love the interaction of getting up, getting dressed, and it gets you motivated, it gets you up and going. P5.</p>
<p>Additional Quotes</p>
<p>Barrier (Appointments): Uh other appointments, like especially like for this week, like, too many appointments. Like I just get appointment out [...] And so, your exercise class would be the last on my list right now to attend, so. I got cataract surgery coming up, I got dental surgery coming up, and- And my cancer therapies so. P1.</p>

Additional class times: Um, it would be nice, like I know you offer it twice a week, I know people sometimes have certain days they can go and can't go. P10.

Quotes are arranged according to themes in presented in results. Quotes within results are classified as key quotes, while additional quotes follow to provide further depth.