

**The PARCS Pilot Study Randomized Controlled Trial:
Feasibility and Acceptability of a Park-Based Exercise Program Led by Peer Specialists for Peers
with Serious Mental Illness**

Catherine L. Davis¹, Heather Bell², Victor Andrews³, Jessica Stewart¹, André de Seixas Soares¹, Jacob Weiser¹, Esmeralda J. Rico Martinez³, Brittany Frazier¹, Joseph P. McEvoy⁴, and Gina M. Besenyi³

¹ Georgia Prevention Institute, Medical College of Georgia, Augusta University, U.S.A.

² Serenity Behavioral Health System, Augusta, Georgia, U.S.A.

³ Department of Kinesiology, Kansas State University, U.S.A.

⁴ Psychiatry and Health Behavior, Medical College of Georgia, Augusta University, U.S.A.

Abstract

Adults with serious mental illness (SMI) die decades early, mostly from heart disease. Few park-based exercise interventions have been tested, none focused on SMI. The study (NCT05293587) tested a 6-week exercise intervention (INT; 45 min park-based exercise led by a certified peer specialist (CPS) 3 days/week) vs. waitlist control (WAIT), as part of an existing peer support program for adults with SMI in Georgia. Eighteen peers (44±15 yrs, 28% female, 72% Black, 17% Hispanic, 33% with diabetes) were randomized (6 INT, 12 WAIT). One CPS was trained to lead exercise sessions, supported by a certified fitness instructor at each session. 10 sessions were conducted in each cohort, up to 2 per week. Transportation was provided as part of peer services. INT peers attended 69±22% of sessions. INT peers attended 100% of sessions when they were present at the peer support program, except for one peer on 2 occasions (improper footwear, medication side effect). Peers were highly satisfied with the park sessions and highly motivated to participate. The CPS who led the sessions expressed satisfaction. While not significant, compared to baseline, INT peers had slightly improved fitness, hemodynamics, and depression symptoms, and social support for exercise at post. The park-based CPS-led exercise program for peers with SMI seems acceptable and relatively feasible. Further work will replicate these pilot findings, assess health outcomes and optimize feasibility and scalability to existing mental health services.

Keywords: Exercise, fitness, park, serious mental illness, cardiovascular risk, feasibility, mental health services, Black/African American

The lives of adults with serious mental illness (SMI, defined as mental, behavioral, or emotional disorders resulting in serious functional impairment, e.g., major depression, bipolar disorder, schizophrenia) are cut short by decades, mostly from heart disease (Chang et al., 2011; Colton & Manderscheid, 2006; National Institute of Mental Health). People with SMI are at higher risk for chronic illnesses including diabetes due to their difficulty functioning in self-care, work and other social roles, with additional cardiometabolic risk due to antipsychotics (Bahorik et al., 2017; Center for Behavioral Health Statistics and Quality, 2015; Druss et al., 2011; De Hert et al., 2012; Donald C Goff et al., 2005; McEvoy et al., 2005). Diabetes is 2-4X more common in people with SMI, more so among minorities and young adults, and this is only partly attributable to antipsychotic medication (Das-Munshi et al., 2017; D. C. Goff et al., 2005; Mangurian et al., 2016; Mangurian et al., 2018). Georgia is 1/3 Black, with a high diabetes burden (12% diagnosed with diabetes) (American Diabetes Association, 2024). Stigma about SMI contributes to health and social disparities (Goldman et al., 2020; Goldman et al., 2018). Physical activity (PA) can reduce cardiometabolic risk in people with SMI (J Firth et al., 2015; Rosenbaum et al., 2015; Vancampfort et al., 2015; Ward et al., 2015). Physical inactivity and prediabetes are more common in people with SMI (Mangurian et al., 2016; Mangurian et al., 2018).

Certified peer specialists (CPSs), trained persons with lived experience in recovery from mental illness and/or addiction working in mental health settings, include PA among their wellness goals (Druss et al., 2018; Druss et al., 2010). Mental health peers (people in recovery from mental illness) in Georgia pioneered this line of work through the grassroots Georgia Mental Health Consumer Network which oversees CPS training with support from the Georgia State Department of Behavioral Health and Developmental Disabilities, winning Medicaid reimbursement for CPS services (Chapman et al., 2015). Peer support programs are now part of reimbursable mental health services in a majority of U.S. states (Kaufman, 2016). Evidence-based exercise interventions for SMI populations incorporate CPSs, group exercise, technology, and behavior change strategies (Druss et al., 2010; Caroline R Richardson et al., 2005; Besenyi et al., 2022). Effective exercise treatment delivery and sustainability remain challenging (Simon Rosenbaum et al., 2014; Wells et al., 2004). Innovative, scalable, evidence-based PA interventions for people with SMI are urgently needed (McNamee et al., 2013).

Parks are free, ubiquitous spaces for PA. Parks offer physical, psychological, and social benefits linked with improved health behaviors and outcomes (Bedimo-Rung et al., 2005; Besenyi et al., 2014; Cohen et al., 2013; Maas, van Dillen, et al., 2009). Studies, including ours, have related park access and use to greater PA, mood, and quality of life (QOL), and less obesity, stress, morbidity and mortality (Besenyi et al., 2015; Kaczynski & Henderson, 2007; Kamel et al., 2014; Maas, Verheij, et al., 2009; van den Berg et al., 2010; Villeneuve et al., 2012). Outdoor PA is associated with increased enjoyment, satisfaction, and long-term PA adherence supporting its use

for behavior change, especially among those with SMI (Thompson Coon et al., 2011). Despite park-based PA benefits, few interventions have been tested rigorously. None have focused on SMI populations (Wheeler et al., 2014).

Social cognitive theory (SCT) has been successfully employed in exercise interventions with SMI (K. A. Aschbrenner et al., 2016; C. R. Richardson et al., 2005). Briefly, SCT posits that cognitive outcome expectations of health behavior, such as self-efficacy (e.g., belief that one is capable of changing behavior) and environmental factors, such as social support and modeling influence the behavior (e.g., increasing PA) (Bandura, 1986, 2004). This theory predicts that individuals high in self-efficacy will execute behaviors more readily and with greater perseverance in response to initial failure than individuals with lower self-efficacy, and that social supports that encourage and facilitate the behavior will increase the likelihood of behavior change and maintenance.

Purpose of the Present Study

Our long-term goal is to maximize the reach and clinical impact of evidence-based exercise interventions to reduce cardiometabolic risk among SMI populations through use of existing mental health services and parks. The study aimed to pilot and develop an intervention that could be scaled up in existing programs (Alegria et al., 2011; Kelly A Aschbrenner et al., 2016; Heath et al., 2012). The PARCS Pilot Study tested a 6-week exercise intervention (45 min CPS-led park-based exercise 3 days/week) vs. a waitlist control, as part of current mental health services. Primary aims were feasibility and acceptability, with secondary aims to assess preliminary effects on PA, aerobic fitness, and weight as indices of diabetes risk. Exploratory measures included BMI, mood, and psychological mechanisms of social cognitive theory (self-efficacy, social support) (Bandura, 1986, 2004). Qualitative observations and feedback from mental health professionals were obtained.

Method

Sample

Initial inclusion criteria were that participants were enrolled in the peer support program (PEERS) at a community mental health center (CMHC) and therefore eligible to participate in peer group activities, between 18 and 64 years of age, able to act as their own legal guardian, and obtaining medical clearance by our Safety Officer (JPM) after review of our health assessment, ACSM Risk Stratification screening and a brief physical exam (Whitfield et al., 2017).

Design

The PARCS Pilot Study to Reduce Diabetes Risk in Serious Mental Illness (ClinicalTrials.gov NCT05293587) was the first randomized trial of a park-based exercise intervention as part of current mental health services. Use of a public park exposed participants to this community

resource, to enhance knowledge and self-efficacy for exercise in such a setting, as well as fitting in with the CMHC goal of community outings for peers. This was an NIH-defined stage 1 project focused on the development and refinement of the intervention, pilot and feasibility testing (National Institute on Aging; Onken, 2022). Informed consent was obtained in writing from each peer, and evaluation of consent was conducted by a CMHC staff member to ensure understanding. The study was approved by the CMHC's Rights and Ethics Board, Georgia Department of Behavioral Health and Developmental Disabilities Institutional Review Board (IRB), the Georgia Department of Public Health IRB (190508), and the Augusta University IRB (1434186). After surveys, baseline health assessment and medical clearance (JPM) were obtained, peers were randomized 1:1 into park intervention or waitlist groups using random digits in sealed sequentially numbered envelopes.

Intervention

A 6-week exercise intervention (45 min CPS-led park-based exercise 3 days/week) was planned to include warmup, aerobic (walking), strength training (body weight exercises), and cooldown activities, adapted for each participant's level of ability. Adaptations were made to intervention activities to permit peers with physical limitations to participate fully (e.g., altered stance with one foot forward, seated rather than standing, use of structures to support balance, rest as needed). Research staff supported the CPS in leading the sessions safely. As well, CPSs were offered training at no cost to be certified as Group Fitness Instructors through the American Council on Exercise (ACE, San Diego CA). Transportation to the park was provided by the CMHC using their existing resources.

The PEERS program implemented 2 sessions/week, rather than 3 due to programmatic (other planned activities) and staffing limitations. To protect PEERS program revenue, the transportation to and from the park sessions as well as the intervention had to fit within a clock hour, along with a few minutes for the CPS to prepare. If the peers came back after the top of the hour, they would not be eligible for billing for the next PEERS group session.

Limitation of Delivery

Sessions were sometimes canceled or not held due to the CPS leader's illness (4 times in 2021, 2 in 2022), staff training obligations (2 times in 2021), or other PEERS program needs. For example, the CPS leader needed to stay on campus due to needing to catch up after extended absence (once in 2021), peer crises that required the CPS to stay on-site (once in 2021, 2 times in 2022), and a scheduled ACE Group Fitness Instructor exam for the CPS leader (1 time in 2021). Two other cancellations were due to a holiday when the PEERS program was closed and weather (rain, 1 time). Make-up sessions were held and the intervention period was extended to support intervention dose.

There was 1 full-time and 1 part-time CPS and a vacant supervisor position at the PEERS program during the 2021 intervention. In 2022 a full-time CPS supervisor of the PEERS program (TS) was hired just before the intervention started, which was helpful. The new supervisor facilitated problem-solving to avoid cancellations, for example, altering her schedule to lead the peer group when the part-time CPS was not available so that HB could lead a park session, and providing policy guidance about when it was too cold or hot to exercise outdoors. A mechanical problem with the van beginning at the first 2022 session led to 2 sessions being held on the CMHC campus instead of at the park. This way the exercise was at least out in nature. On another occasion, the CPS did not feel well enough to drive so the session was held at the CMHC campus. A borrowed minivan assigned to another CMHC program provided transportation to the park during the 2022 cohort. Since then, a van has been consistently available.

Measurements

Health assessment

At baseline and posttest, height was measured using a portable stadiometer (Invicta Plastics Limited, Leicester England, IP 0955). Body weight and composition were obtained at baseline and post using a bioimpedance scale (Tanita DC 430U Dual Frequency Total Body Composition Analyzer) or an electronic scale (A&D Precision Scale UC-321, Tokyo, Japan). Resting seated heart rate and blood pressure was measured in duplicate using a Dinamap machine at baseline and post and the lower measure recorded. The 6-minute walk test (6MWT) was conducted using a 100-foot outdoor course in a CMHC parking lot and recorded in feet (Crescent Lufkin FE100N, Apex Tool Group LLC, Apex, NC). Adverse events were recorded and reviewed promptly by Principal Investigator CLD and JPM, the safety officer for the trial.

Participants were given Fitbit Inspire 2 devices that were to be worn every day to monitor daily steps. Fitbit accounts were set up for each participant. We asked peers to always keep their Fitbit on regardless of showering, swimming etc. and to charge them at PEERS rather than at home. Peers were offered choices about color (white, black, pink) for the wristbands, and replacement bands in case of damage. Fitabase (Small Steps Labs LLC, San Diego, CA) was used to access Fitbit data. Steps per day and wear time (percent of time per day the Fitbit heart rate sensor is actively recording data) were downloaded from Fitabase for analysis. To ensure valid data for analysis without excluding too many, the Fitbit steps data were analyzed using 2 different minimum wear time thresholds: 50% and 80% per day. To be as inclusive as possible, the selected minimum qualifying days was determined to be 3.

The Fitbit Inspire2 devices were affordable, durable and reliable, with the longest battery life among available Fitbit devices. One peer's Fitbit survived a run through the clothes washer and dryer. Unobtrusive syncing was feasible from outside the room when peers were in group meetings. Fitbits and gift cards motivated peers to enroll in the study.

However, there were challenges. One peer carried his Fitbit in his pocket instead of wearing it on his wrist, resulting in no valid data according to wear time. Some peers complained that the band was uncomfortable, who simply needed to loosen it one notch. Starting exercise mode on Fitbits was hindered by poor visibility of device screens outdoors. Setting the “Dim Screen” setting to off did not fix this. Syncing challenges often required forgetting devices, turning off Bluetooth and re-pairing Fitbits on staff devices (typically cell phones) because few peers had smartphones. Google acquiring Fitbit in 2021 led to a change in our login and syncing procedures. Several peers lost their Fitbits and/or charging cables. Inconsistent Fitbit wear and charging by peers taught us to encourage and incentivize consistently wearing the Fitbit. We used behavioral contracting and clearer expectations at enrollment to promote wearing the Fitbit, as well as social rewards (praise) and modeling (study staff and CPSs wearing Fitbits) to encourage this. At first, PEERS staff kept Fitbit charging devices in their offices because of theft concerns. We advised them that the study could replace them as needed, and based on their advice, found charging devices that were not as portable as the 11-inch charging cables that come with the devices. PEERS staff decided to expect peers to charge their own Fitbits in the PEERS meeting room to promote independence and reduce dependence on mental health staff. We implemented a labeling system (mouse ear punch used to punch the bands) to identify whose Fitbit is on the charger.

In 2022, after replacing lost Fitbits for a few peers, we had many requests for replacement Fitbits. Loss may be due to cognitive difficulties, housing instability, or lack of security (others in home). One peer’s romantic partner “borrowed” her Fitbit. One peer lost 2 Fitbits, possibly due to theft or sale. One peer requested a replacement when she was wearing her Fitbit. After replacing several peers’ Fitbits, we limited peers to one replacement device before they completed posttest. To avert these requests, we implemented Tile, a mobile app to locate Fitbits when they are lost. (Tile was installed by default on the Fitbit Inspire 2 devices.)

Surveys

At baseline and post-test, surveys were administered by research staff. They were read aloud by the staff member or completed independently by the peers as desired to accommodate possible literacy or handwriting coordination challenges. Surveys included measures of PA (International Physical Activity Questionnaire-Short Form (IPAQ-SF))(Craig et al., 2003), depressed mood (PHQ8) (Kroenke et al., 2009) and the Self-Efficacy for Exercise scale (Bandura, 2006; Resnick & Jenkins, 2000; Wilcox et al., 2005). Higher scores on the PHQ-8 reflect more severe depressive symptoms, and higher scores on the Self-Efficacy for Exercise Scale indicate greater self-efficacy. A modified version of the Social Support for Exercise scale (Sallis et al., 1987) was used to assess social support for

exercise from CPSs and peers, instead of family and friends. We omitted the optional Rewards and Punishments scale, and substituted “today” for “tonight” in the reminders item (Sallis, 1996). A total of 10 items, rated 1-5 (none, rarely, a few times, often, very often) were summed for both CPSs and peer support, with higher scores reflecting more support. The Physical Activity Class Satisfaction Questionnaire (PACSQ) was administered to peers after attending the park intervention, regardless of randomization (Cunningham, 2007). Seventeen items were averaged on a scale of 1-8 where 1 indicates no satisfaction and 8 indicates fully satisfied. Two additional open-ended questions were, “What did you enjoy the most (least) about park activity sessions?”

Qualitative data

Field notes recorded details of each park session, reasons for cancellation, comments made by PEERS staff, and contextual observations. After the intervention was complete, Structured Assessment of Feasibility (SAFE) semi-structured interviews with CMHC staff members were used to assess overall intervention acceptability and feasibility within a mental health services framework (Bird et al., 2014). The SAFE measure includes 16 items in three categories: intervention, resource consequences, and evaluation. The SAFE measure has demonstrated excellent interrater and test-retest reliability (0.84, 95% CI 0.79-0.89; 0.89, 95% CI 0.85-0.93 respectively). SAFE interviews were recorded, transcribed, and coded using Dedoose version 9.0.17 (Los Angeles, CA). Three trained researchers coded each interview. The data were analyzed using a thematic analysis.

Statistical analysis

Descriptive and inferential statistics were computed using SPSS and R after examining distributions and questionable values. Paired *t*-tests or Mann-Whitney U tests compared changes from baseline to posttest between intervention and waitlist control groups. The absolute value of Cohen’s *d* effect size, which shows the magnitude in standard deviation units of difference in changes between groups, was calculated for *t*-tests (Cohen, 1988).

Results

Feasibility

Twenty peers were consented and 18 were randomized (6 to intervention, 12 to waitlist) as shown in the flow diagram, Figure 1. Inclusion criteria were modified to omit an upper age limit due to an otherwise eligible peer who was older than 64 years and fit enough to participate safely. We opted to be inclusive rather than selective in our recruitment consistent with the Recovery Model and the norms of the PEERS program (Peebles et al., 2007; Substance Abuse and Mental Health Services Administration, 2012). There were no differences in baseline characteristics by group (Table 1).

Figure 1. CONSORT flow diagram of study sample

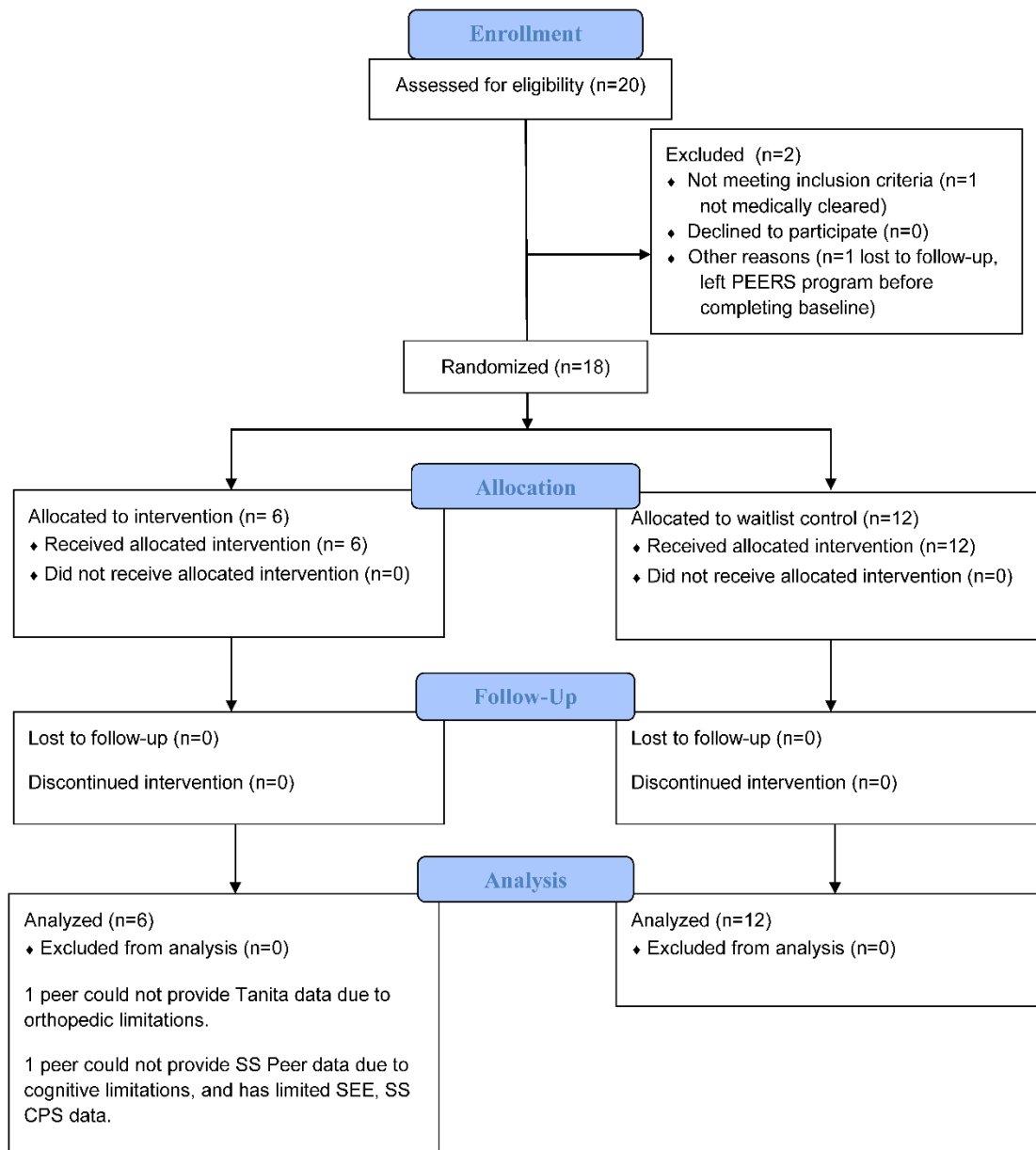


Table 1. Baseline characteristics of the participants (n (%) or M (SD))

	Intervention	Waitlist
Number of peers	6	12
Age (years)	48 (12)	42 (16)
Female	1 (17%)	4 (33%)
Black	4 (66%)	9 (75%)
Hispanic	1 (17%)	2 (17%)

Smoking	0 (0%)	5 (42%)
Diabetes	4 (66%)	2 (17%)
Hypertension	3 (50%)	5 (42%)
Antipsychotic medication	5 (83%)	6 (50%)
Antidepressant medication	5 (83%)	6 (50%)

During the COVID-19 pandemic when in-person PEERS group services were paused from 2020 to April 2021, a mental health staff member (HB, an experienced CPS with the PEERS program) was trained (ACE Group Fitness Instructor course and study protocol) to lead park exercise sessions. The ACE course material was mostly familiar due to the CPS training on working with peer groups; the exercise specific material (anatomy, physiology, designing and leading group exercise) was more challenging. This CPS has not yet earned ACE certification due to a combination of test anxiety and severe technical difficulties during her first virtual test. On a second test, in person, she scored 1 point below passing. She plans to retake the test. Nonetheless this pioneer CPS has competently led park-based exercise sessions since then.

Park sessions were held in a nearby (1.3 miles, 2 stoplights away) city park with bathrooms, a pavilion, benches, shade trees, and a walking trail. (Another park that was even closer was not selected because CMHC personnel advised that it was not safe due to crime and drugs, even in the mornings.) City parks and recreation officials were contacted to facilitate the progress of the study.

Park exercise sessions were led by HB, supported by a certified fitness instructor at each session. While 18 sessions (6 weeks, 3X/week) were planned, 10 sessions (7 weeks, up to 2X/week) were conducted in each cohort.

Session length averaged 38 (SD = 5.5) min. Notably, PEERS revenue was higher for sessions held in the park than the same time at the CMHC campus, consistent with the recovery model goal of community involvement.

Attendance

In total, 2 to 5 peers participated in each park session, not including the CPS leader. In 2022, those randomized to intervention and those previously assigned to the waitlist were invited, as well as those previously included in park outings if there was room in the van. No peers were refused park outings due to limited transportation capacity. Peers assigned to the intervention (n = 6) attended from 4-10 sessions (mean ± SD = 6.8 ± 2.3 sessions, 69 ± 22%). Assigned peers that were present at the PEERS program attended 100% of those sessions, except for one peer on 2 occasions (wearing flip-flops instead of proper footwear, sleepy after getting medication).

Most peers do not attend the PEERS program every day. According to PEERS staff, a standing order for Medicaid

transportation requires 3 days/week at the PEERS program. Without the standing order, peers are unlikely to be able to attend consistently on assigned days due to having to arrange transportation every day, and transportation is not very reliable. Some peers experienced crises or had appointments that kept them from attending the PEERS program when the park sessions were held.

Adverse events

There were no adverse events. One peer was hospitalized intermittently for mental health, but this was not a change from baseline.

Acceptability

Ten peers completed the PACSQ after participating in park sessions (6 intervention, 4 waitlist). PACSQ mean 7.4 +/- 1.1 out of 8 showed high satisfaction with the park sessions. About what they enjoyed most about the park sessions, peers said “I enjoyed the exercises and my quietness at the park”, “when we walked”, “getting out going to the park, exercises and socializing with my fellow peers”, “happy play run”, “being able to motivate each other to do there (sic) best and to work out more”, “It don’t matter. I liked a lot about it, don’t know how to say”, “exercising more, anxiety depression and your heart, listening to the coach teach me how to exercise the right way, to take 2 (inhaler) puffs before exercise and take my time, not rushing”, “being in the park in the wide open spaces and unstiffening my muscles—helping my muscles to relax, the forest and the brook”, “going to the park and exercising, talking to you (CLD) and the other lady (JS)”, “the exercising because it helped me lose weight”, “the exercise and the company, everybody was friendly”.

Responses to the question, what did they enjoy least about the park sessions included: “I didn’t like the second walk around the field because I was tired”, “knees”, “nothing”, “I liked it all”, “everything is OK”, “cold”, “I didn’t not like it”, and “Sometimes the cooldown came too soon”.

Peers were highly motivated to participate. The peers who knew they were included in park outings lined up waiting for the CPS leader to be ready to go. Others who were waitlisted or not enrolled in the study asked when they would be allowed to go.

Mental health staff interviews

Qualitative results of 4 semi-structured SAFE interviews with CMHC staff in Fall 2022 showed strong support for a park-based CPS-led exercise program like PARCS as an acceptable, feasible, and possibly sustainable health promotion intervention for mental health peers (Rico Martinez et al., 2024). The lead CPS (HB) enjoyed it, as demonstrated with this quote: “I honestly love it. I enjoy it. It’s fun. Oh, the peers they seem to be, and they love it. They’re excited. I’ve seen some of the peers, they have done a lot of improvements. They’re able to walk further or keep up with us more...I’ve always liked being active and it’s just fun to be [in the park]. This morning we weren’t able to go because it was all rainy and nasty but we’re going to do try to do 3 days next week.” Benefits of park sessions to peers’ mood and motivation, weight loss, getting them more physically active, reducing social isolation, and peers’ enjoyment of the Fitbit devices and pride in their daily steps was noted. Privacy with regard to tracking Fitbit location to find lost devices was a concern. Challenges included cold weather for outdoor activities, and identifying mental health staff that are interested in training to lead park sessions. Video format for training CPSs was suggested. Reimbursement for services provided in a park session was not a concern.

Feasibility of research tasks

Most feasibility challenges (e.g., staffing) would not affect implementation of the park intervention in practice, outside of a randomized controlled trial. Because splitting a peer group between locations requires at least 2 staff members to oversee them, taking the whole peer group to a park for exercise would be feasible with fewer CPS staff given adequate transportation, or could be implemented on the CMHC campus which affords an outdoor walking path

with trees and wildlife, albeit not as appealing or well-equipped with benches and level walking paths as the nearby park.

Fitbit data

After applying minimum wear time (50 or 80%) and valid days (3) to the Fitbit data, we had either 6 or 7 peers (2 intervention, 4-5 waitlist) with analyzable data.

Preliminary health and psychosocial outcomes

There were no significant changes by group on physical or mental health measures (Tables 2 and 3). However, there were some hints of improvement from baseline to post that favored the INT group. INT peers walked further on the 6-minute walk test (80 ± 136 ft, $d = 0.39$) and improved pulse (-5 ± 19 bpm, $d = 0.30$) and SBP (-17 ± 19 mmHg, $d = 0.52$). INT peers had a greater improvement at post than the control group in PHQ8 scores (-5.8 ± 5.8 , $d = 0.43$) and social support from CPSs (8.2 ± 10 , $d = 0.26$). The reduction in SBP was a medium effect size (half of a standard deviation), the increase in the walk test and reduced depressive symptoms were small to medium effects, and the reduced pulse and increase in social support from CPSs were small effects (Cohen, 1988). PA (steps/day) also showed a slight advantage in the intervention group, albeit not statistically significant (Figure 2). Unfortunately, there was a larger increase in body fat in the intervention group, but this analysis was limited to those who provided Tanita measurements at baseline and posttest (83% of participants). The small changes in weight and BMI in the complete sample ($N=18$) did not show a substantial difference between groups.

Table 2. Health assessment measures (M (SD))

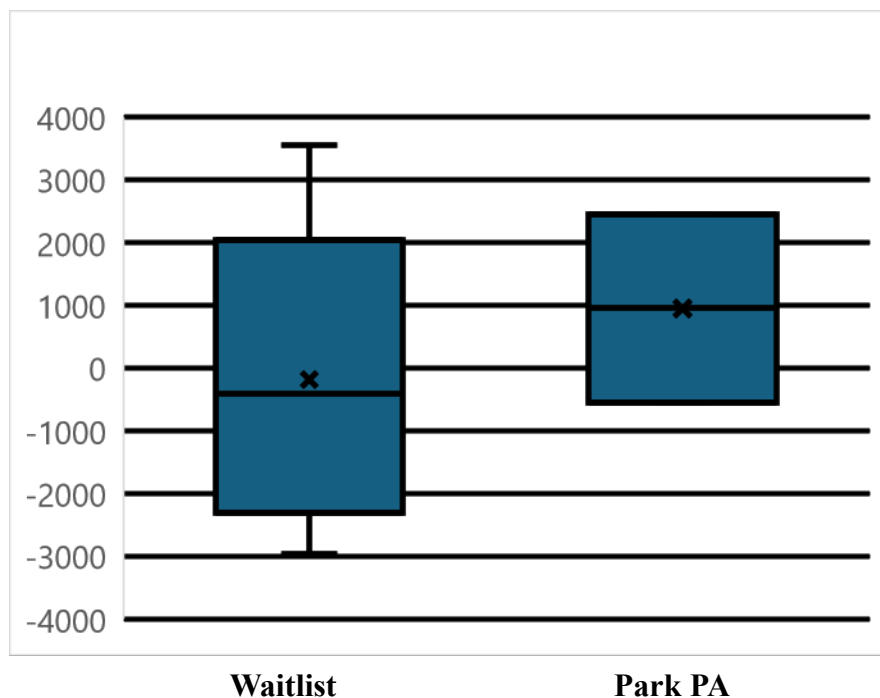
	Baseline		Change		Cohen’s d
	Intervention	Waitlist	Intervention	Waitlist	
6-minute walk test (ft)	1365 (401)	1549 (167)	80 (136)	26 (139)	0.39
BMI (kg/m ²)	35.5 (6.4)	31.7 (6.2)	0.1 (1.5)	0.2 (0.7)	0.14
Weight (lb)	227 (31)	201 (39)	1.5 (15)	-0.8 (6.2)	0.24
Body fat (%)	30 (4.1)	32 (12)	1.1 (1.3)	-0.9 (4.0)	0.58
Heart rate (bpm)	76 (6.6)	83 (13)	-4.8 (19)	-1.3 (7.0)	0.30
Systolic blood pressure (mmHg)	120 (14)	126 (19)	-17 (19)	-0.6 (34)	0.52
Diastolic blood pressure (mmHg)	73 (9.3)	75 (9.9)	-3.0 (7.1)	-3.1 (5.4)	0.02

Table 3. Self-report measures (M (SD))

	Baseline		Change		Cohen’s d
	Intervention	Waitlist	Intervention	Waitlist	

Patient Health Questionnaire-8	9.7 (8.1)	9.5 (6.3)	-5.8 (5.8)	-2.3 (9.2)	0.43
Self-Efficacy for Exercise	6.5 (1.9)	6.3 (3.7)	-1.0 (3.6)	-0.3 (3.5)	0.20
Social Support for Exercise (CPS)	32 (10)	30 (13)	8.2 (10)	5.5 (9.5)	0.26
Social Support for Exercise (Peers)	28 (15)	28 (16)	6.4 (14)	7.4 (16)	0.17

Figure 2. Change in steps per day by group from baseline to posttest.



Discussion

An inclusive, inexpensive approach to a park-based exercise program within current mental health services is safe, acceptable, feasible with adaptations to local conditions, and potentially widely scalable to existing peer support programs. A training module could be developed to efficiently teach CPSs exercise-specific skills that would complement the peer group leadership skills they already have, and may enable them to earn certification through ACE or other organizations as Group Fitness Instructors which could further their career goals.

As expected, no significant improvements in physical or psychological health or mechanisms (self-efficacy, social support) were observed in this pilot study, but small improvements in fitness, physical activity, mood, and social support from CPSs were seen in the intervention group. Increased fitness (walk test) and physical activity (Fitbit step count) may be attributable only to the intervention, or to the possible increase in daily PA outside the intervention among those so randomized. Improved mood is a well-established benefit of physical activity (Piercy et al., 2018). The literature about exercise intervention in people with SMI is limited. However, the landmark systematic review

and meta-analysis of exercise interventions in people with non-affective psychotic disorders by Firth et al. suggests that these results fit with other studies, mostly in small samples, showing that exercise interventions with at least 90 min/week moderate to vigorous exercise improved physical fitness and psychiatric symptoms in these patients (J. Firth et al., 2015). Similarly, a broader systematic review and meta-analysis of PA interventions in people with mental illness found a large effect of exercise improving mood, and moderate effects on fitness and QOL (S. Rosenbaum et al., 2014).

Like the innovative peer-support based work of Aschbrenner et al. (2016), we implemented this exercise intervention in the context of mental health peer support services. In contrast with that work, rather than have an outside fitness trainer lead the exercise sessions, we coached a CPS to do this with the peers in the peer support program she led. This approach may reduce the cost of a potentially effective exercise intervention while enabling CPSs to take a more “active” role in improving the health of their peers. We used a more inclusive approach to permit anyone who was enrolled in the adult PEERS program (provided they had medical clearance) to participate regardless of age, obesity status, substance abuse disorder,

psychiatric diagnosis, medications, or transportation resources. We did not have any access to the peers' health records other than that they were included in the PEERS program. This is a health promotion approach that could be implemented for nearly all mental health peers in such peer support programs.

Another contrast to the Aschbrenner et al. (2016) study was that this was done in the Southeast with predominantly people of color (72% Black, 17% Hispanic). These communities are disproportionately burdened by diabetes and cardiovascular disease risk, which is compounded by being afflicted with SMI and side effects of necessary treatment (Das-Munshi et al., 2017; D. C. Goff et al., 2005; Mangurian et al., 2016; Mangurian et al., 2018).

Lessons Learned

Challenges in this population include literacy and cognitive limitations. Questionnaires were mostly administered verbally, as an interview, to avoid the peer needing to say they had trouble reading, and to ensure understanding of the questions. Some questions had to be rephrased to clarify, and some were not understood (e.g., on the PACSQ, "My improvement in class performance" and "The instructor's ability to effectively communicate"). Peers who were inclined to write their own responses did so with support from study staff as needed. The IPAQ-SF was not understood by several participants and their responses were inconsistent, so those data were not analyzed (Lee et al., 2011).

Limitations and Future Directions

This single-site pilot study extended the resources of existing mental health services toward whole health for people with SMI. It was a small study, limited in scope and needs replication in other sites with more participants. No statistically significant benefits to mental or physical health were observed, though small improvements were noted. The accessibility, regulatory and financial aspects of mental health services vary state by state in the United States, so adaptations may be necessary to implement this approach. The long-term goal is to develop a sustainable CPS-led park-based exercise intervention that could be scaled up inexpensively in existing PEERS programs for peers with SMI. Adherence to consistently wearing a Fitbit device to monitor PA was challenging in this population, and changes in available technology (i.e., Google acquiring Fitbit in 2021) complicated data collection. In future work, PA monitoring devices may be incorporated as intervention components, rather than just as an outcome assessment method. Nutrition education could be a helpful complement to an outdoor exercise program in peer support programs.

Implications for practice & policy

This park-based exercise intervention led by CPSs was safe, feasible and acceptable within existing mental health services serving mostly minority adults with SMI in Georgia. This park-based exercise intervention might benefit mental health mechanisms (mood, social support) to promote health behavior and improve health outcomes in

this vulnerable, underserved population. Adding a park-based exercise element to peer support programs might enhance the physical and mental health benefits of peer support programs (Firth et al., 2015).

The long-term goal is to develop a sustainable CPS-led park-based exercise intervention that could be scaled up in existing PEERS programs for peers with SMI. As we develop the training, we will work with the Georgia Mental Health Consumer Network and Georgia Department of Behavioral Health and Developmental Disabilities, and related programs in other states, to propose a park-based exercise training module that can be offered for CPSs to further develop their professional skills and incorporate park-based exercise into peer support programs. Towards this end, we are pursuing further RCT testing of our approach in Kansas and Georgia with support from the National Institute of Mental Health (R34 MH126043).

Correspondence should be addressed to

Catherine L. Davis

Georgia Prevention Institute, HS-1755

Augusta University

1120 15th St.

Augusta, GA 30912

Email: katiedavisphd@gmail.com

- Catherine L. Davis: [0000-0002-2942-8233](tel:0000-0002-2942-8233)
- Gina Besenyi: [0000-0002-4538-9510](tel:0000-0002-4538-9510)

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Author Contributions

Conceptualization, C.L.D. and G.M.B.; Methodology, C.L.D., V.A., and G.M.B.; Community partner

interventionist, H.B.; Technical assistance, B.F., A.S. and J.S.; Quantitative analysis, C.L.D. and J.W.; Qualitative analysis, E.R.; Medical oversight, J.P.M.; Scientific direction, C.L.D., Writing, C.L.D., Review & Editing, C.L.D., A.S., and G.M.B.; Funding acquisition, C.L.D.

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