An Adaptive Walking Intervention to Manage Chronic Pain in Veterans With Opioid Use Disorder Engaged in Opioid Agonist Treatment

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Research Design and Methods

Overview of Study Design

Study aims will be addressed with a Stage IB pilot randomized controlled trial. Sixty male and female Veterans with OUD and chronic pain will be randomized to either 1) S2C (n=30) or 2) control (n=30). A stratified block randomization will be used to balance the groups for sex and type of OAT treatment (methadone or buprenorphine). All participants will complete EMA surveys and record daily step count for a total of 8 weeks (1-week baseline, 4-week treatment, and 1-week at post treatment, 1 week at 3-month, and 1 week at 6-month follow up). Pain interference (primary outcome) will be assessed 3 times per day using EMA with the following two interference questions modified from the PEG3: “What number best describes how, right now, pain interferes with your enjoyment of life?” and “What number best describes how, right now, pain interferes with your general activity?”. Daily steps will be collected using a study-provided pedometer and recorded by the participant in the end of day EMA survey.

Participants

Veterans that express interest will be assessed for eligibility based on the following criteria:

Inclusion Criteria: (1) Age 18 and older; (2) Meet DSM5 criteria for OUD and receiving stable (i.e., unchanged in 2 weeks) dose of OAT (i.e., buprenorphine or methadone) in VACHS outpatient addiction clinic; (3) Diagnosis of musculoskeletal pain that has persisted for more than 3 months; (4) Report at least moderate pain interference past week (i.e., ≥4/10 on the either of the two pain interference items on the PEG); (5) Self-reported ability to walk 1 block; (6) Access to a mobile phone with active data plan.

Exclusion Criteria: (1) Untreated major psychiatric disorders (e.g., bipolar disorder, psychotic disorder); (2) Current (i.e., past month) active suicidal ideation; (3) Substance use disorder requiring inpatient detoxification; (4) Currently engaged in CBT for chronic pain treatment; (5) Planned surgical intervention for pain.

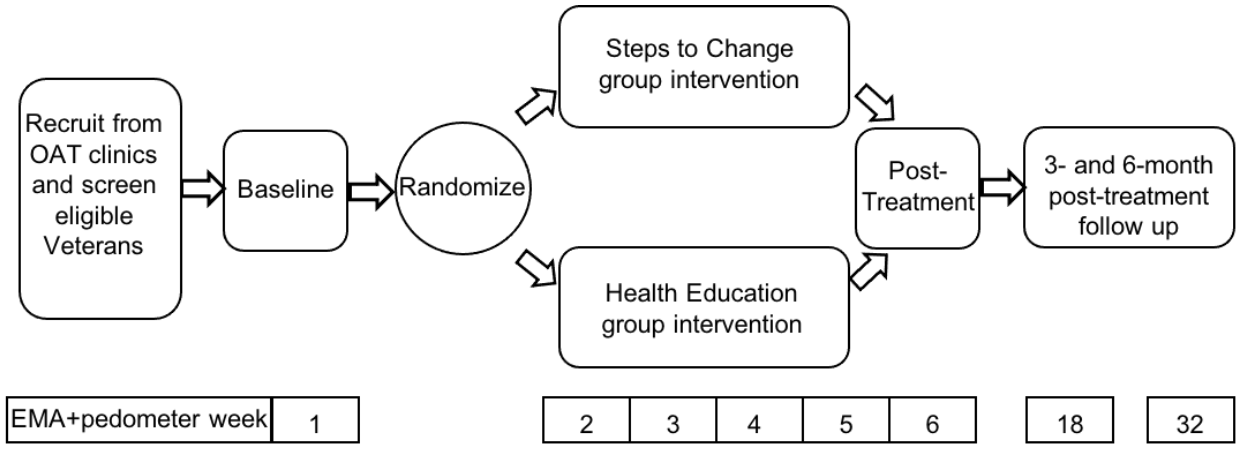
Justification for Study Population: Inclusion criteria were selected to remain as inclusive as possible and accurately reflect Veterans with chronic pain and OUD receiving OAT. Musculoskeletal pain will include back and neck pain, knee pain, joint pain, osteoarthritis, and fibromyalgia. Although it can be argued that fibromyalgia is not necessarily considered musculoskeletal pain, we chose to include it because individuals with fibromyalgia can still benefit from behavioral pain treatment and it is possible that Veterans may have received a fibromyalgia diagnosis due to pain complexity or other individual factors (e.g., female). Recruitment will occur in the VA outpatient addiction clinics because Veterans will be receiving OAT in the clinic and are already connected to substance use treatment at VACHS. We require Veterans to be stable on OAT (i.e.,

unchanged dose for 2 weeks) to ensure that reports of pain interference are due to chronic pain and not pain associated with opioid withdrawal during up-titration of buprenorphine or methadone. Veterans receiving buprenorphine in primary care will be excluded because they may be less likely to endorse criteria for OUD or attend group treatment in outpatient addiction. We currently do not have the capacity to purchase mobile phones with an active data plan for Veterans who do not own such devices. In the recruitment for my VISN 1 CDA, only 1 Veteran out of 43 screened was excluded solely due to no access to a mobile phone. Though we do not anticipate that lack of phone ownership will exclude many Veterans, we will carefully track participant barriers to EMA use (e.g., lack of mobile phone, data plan, difficulty with technology) as one feasibility indicator that will inform a resulting Merit application. One of the goals of the current study is to determine recruitment feasibility in the outpatient OAT clinics; however, in my VISN 1 CDA only 2 out of 43 screened Veterans were excluded due to reporting only mild pain that was not chronic. Exclusion criteria was selected to avoid characteristics that present considerable challenges for engaging a psychosocial intervention, to promote safety, and unintentional interaction with other pain interventions (e.g., other behavioral pain treatment or planned surgery). Veterans with major psychiatric disorders must be compliant with recommended pharmacological interventions and well controlled. In the event of uncertainty about eligibility, Veteran's mental health provider will be consulted to determine if Veteran meets eligibility requirements. Additionally, while diagnosis of substance use disorder (other than OUD) is not exclusionary, Veterans that require inpatient detoxification from substances (e.g., alcohol) will be excluded for safety reasons. Likewise, Veterans with recent suicidal ideation will be excluded. If during screening visit Veteran endorses thoughts of death or self-harm on item 9 of the PHQ-9, consistent with regular clinical care in the outpatient substance use clinic at VACHS, past month suicidal ideation will be screened using the Columbia-Suicide Severity Rating Scale (C-SSRS). Positive screen for past month active suicidal ideation will be indicated by a "yes" response to question 2: "Over the past month, have you had any actual thoughts of killing yourself?". In accordance with established policies of outpatient VHA care, Veteran safety will be evaluated using the full C-SSRS and clinical care will be provided as needed (e.g., warm handoff to Psychiatric Emergency Room, follow-up appointments with primary mental health clinician, discussion of safety plan).

Recruitment

Recruitment will occur in the outpatient OAT clinics at VACHS. Potential Veteran participants will be recruited to the study in several ways, all of which have been approved by the IRB for my VISN 1 CDA pilot study, including: (1) hanging study flyers in outpatient OAT clinics, (2) study staff attending team meetings for OAT and substance use clinicians to provide information about the study and invite Veteran referrals to the

study coordinator; (3) mailing opt-out letters to Veterans engaged in the outpatient OAT clinic inviting them to contact study team if they are interested in participating or if they do not want to be contacted by study staff. Staff will contact patients who did not respond to the letter to describe the study and offer participation up to three times or until they decline or agree to participation. Of note, my primary office is located in the Opiate Treatment Program outpatient clinic at VACHS and I work closely with OAT staff as a psychologist in the Outpatient Addiction Recovery Services clinic and as a researcher for my ongoing VISN 1 CDA. Recruitment strategies will occur in waves to minimize the amount of time between screening visit and group treatment start date. For each recruitment wave, screening visits for multiple Veterans will be scheduled within a 1-2 week period. These recruitment procedures are expected to result in an adequate sample size; however, these procedures will be evaluated in Aim 1.



Baseline Phase

Screening: Veteran eligibility will be confirmed through a brief phone screen or in-person screening interview. If eligible, Veterans will be invited to meet individually with a study staff member in the OAT clinic to hear a complete description of the study and provide informed consent. Veterans will be breathalyzed to ensure they are able to adequately provide consent. After providing informed consent, Veterans will complete baseline assessment measures (approximately 60 to 90 minutes in length) involving both interview and self-report measures. Following the baseline assessment, Veterans will receive training on EMA survey procedures and practice a sample survey with a study staff member. Veterans will also receive a pedometer and instructions on its use, proper placement, and how to enter daily step count in end of day surveys. Once 8 to 10 Veterans have been screened, these Veterans will begin a 7 day baseline EMA run-in period leading up to the start of the treatment week. We anticipate that groups will start

within 3 weeks of screening visit. The feasibility of these procedures will be evaluated in Aim 1.

Baseline EMA: For 7 days prior to the first treatment day, Veterans in both S2C and control will complete EMA surveys using their own mobile device. Similar to procedures from my VISN 1 CDA, use of academic REDCap services will be supported by the VISN 1 MIRECC for the duration of the proposed CDA-2 award. Furthermore, survey procedures have been approved through the VACHS Institutional Review Board and Information System Security Officer. Veterans will be sent text message via REDCap with a link to complete EMA surveys four times per day. Specifically, random surveys will be administered 3 times per day between the hours of 8am and 8pm, constrained to equal blocks of time (i.e., 8am – 12pm, 12:01pm – 4pm, 4:01pm – 8pm). Veterans will have 60 minutes to complete the random survey, with reminders every 15 minutes, otherwise it will be considered a missed survey. All random survey questions will inquire about momentary states (i.e., “right now”) and will be expected to take less than 1 minute to complete. End of day surveys will be administered once per day at 8pm. Veterans will have 4 hours to complete the end of day survey, with automatic reminders every hour or until completed. Veterans will be asked to enter the number of daily steps from study provided pedometer during end of day survey. End of day survey questions will inquire about the past 24 hours and will be expected to take less then 2 minutes to complete. These procedures have been successful in my ongoing VISN 1 CDA project and no Veterans have expressed concerns with using a personal mobile device to answer questions about pain or substance use.

Randomization: Veterans who provide pedometer and EMA survey data on at least 3 days during baseline EMA will be randomized. Veterans will be randomized to either S2C or control in a 1:1 ratio using permuted block randomization stratified by OAT type (1=buprenorphine, 2=methadone) and sex (1=male, 2=female). A variable block size of 2 and 4 will be used to maintain balanced assignment to condition. Dr. Gueorguieva will conduct randomization and allocation will be concealed from study staff.

Treatment Phase

Treatment conditions are described in detail below. Study treatment will last 4 consecutive weeks with a post-treatment visit. Groups will be facilitated by myself and post-doctoral trainees (e.g., MIRECC post-doctoral fellow). This is consistent with a Stage IB design where study interventions are run by research clinicians and not clinic staff.[1] Veterans will attend a weekly treatment group (i.e., S2C or control) and continue to complete EMA surveys and record daily steps using the pedometer during the 4-week treatment phase and for a week after finishing treatment.

Management of Clinical Deterioration: Veterans who show significant deterioration, such as increased substance use (requiring detoxification) or significant suicidal or homicidal ideation (in the context of group treatment) will be regarded as symptomatic failures, withdrawn from the study, and referred for appropriate treatment at a higher level of care (typically inpatient treatment).

Strategies to Minimize Attrition: To minimize Veteran participant dropout, we will use multiple procedures to enhance retention in both conditions. These include rapid assignment to study treatments after screening visit (ideally within 3 weeks from screen) and recruitment in waves, thorough explanation of study treatments and requirements, specified uniform procedures across treatment conditions regarding study staff's handling of Veteran participants who miss or come late to scheduled study visits, ongoing supervision of group facilitators and research assistants, and accessibility to Veteran's therapists for questions and problems. Veterans who miss sessions will be contacted within 24 hours by group facilitator. In the absence of Veteran-provided information, Veterans who miss group treatment will continue to receive EMA surveys to explore potential reasons for the dropout.

Post-Treatment: One-week post-treatment, Veterans will meet with a research assistant (MIRECC study coordinator) blind to study condition to complete self-report measures (approximately 30-45 minutes). At post treatment visits, Veteran will have the option of keeping the study-provided pedometer to continue progress. Extra pedometers will be available in the event a participant reports a lost or broken pedometer during treatment phase or at follow-up assessments.

Finally, participants will return for 3- and 6-month follow-up visits that include a week of EMA surveys and daily step count using a pedometer (approximately 30 minutes). If participant has lost or broken the study provided pedometer, a replacement will be issued. A research assistant blind to study condition (MIRECC study coordinator) will conduct the follow-up visits. Follow-up EMA surveys will adhere to the same procedures from the baseline and treatment weeks outlined above. We will attempt to follow all participants in our intention to treat sample, regardless of their retention in treatment, using strategies that have been successful in previous studies by my mentors (Drs. Heapy, Allen, and Martino). These include: (a) thorough explanation to participants at the initial consent and screening visit of the importance of follow-ups, (b) requiring that each participant provide at least three verified locators who are likely to have knowledge of their whereabouts throughout follow-up (including contact with OAT or other mental health clinicians), (c) use of multiple sources and locators to track participants, and (d) increasing payment scale for each completed follow-up, with additional monetary incentives for completing EMA surveys during each follow-up week.

Description of Treatment

Participants assigned to S2C and control will be scheduled for 60-minute weekly group sessions held over four consecutive weeks in the outpatient OAT clinic. In S2C*,* topics for group sessions will be based on existing CBT-CP modules. Session 1 will provide pain education including a discussion the biopsychosocial treatment model for chronic pain. Handouts and group discussion will cover the chronic pain cycle and biomedical versus biopsychosocial (e.g., acute and chronic) models of pain. Session 2 and 3 will introduce a progressive walking program with individual goals and weekly step count benchmarks and introduce activity pacing to address pain flare ups caused by cycles of over activity and subsequent sedentary behavior. To decrease potential anxiety about a walking program, the group clinician will discuss the difference between hurt and harm in acute and chronic pain. Group discussion and handouts will emphasize that hurt does not equal harm in chronic pain and the benefits of low impact exercise can increase confidence, improve mobility, and reduce pain. Discussion will explicitly emphasize engaging in moderate levels of consistent activity. Veterans will be expected to increase their average step counts by 10% over their prior week's average starting in Session 2. Session 4 will help develop a treatment plan to continue walking and identify possible barriers to meeting goals.

The control will be matched for treatment exposure and complexity of treatment material. Therapeutic content for the control condition will adopt a person-centered approach wherein the participant is free to discuss any current problems or issues with study clinician. Importantly, providers will not provide guidance, coping skills, or specific goals related to chronic pain. Participants are encouraged to discuss elements of their OAT treatment, challenges with OUD and/or pain, or another topic of their choosing. During both S2C and control groups, participants will be expected to maintain OAT and other clinical appointments as scheduled.

Safety of an adaptive walking treatment in chronic pain patients: Other clinical trials have established walking as a behavioral treatment for chronic pain that is safe and effective. For example, in the Veterans Walk to Beat Back Pain study, Veterans with chronic back pain were randomized to a pedometer-based Internet-mediated intervention (n=111) or usual care (n=118). Number of serious adverse events (e.g., myocardial infarction, inpatient hospitalization) were comparable between the intervention group and usual care (27 versus 26, respectively). Although Veterans in the intervention group reported more musculoskeletal events compared to the usual care (76 versus 36), the number of cardiovascular events was only slightly higher in the intervention group (48 versus 37).[62] Musculoskeletal events were commonly characterized as muscle pulls, soreness, or pain. The most common cardiovascular events were chest pain and shortness of breath. In another 8-week pedometer-assisted walking program for chronic lower back pain, only 5 of 40 participants in the intervention group reported minor adverse events which subsided after a few days.[59] No participant

in either of the above studies dropped out of treatment due to increased musculoskeletal events and both studies concluded that walking interventions for chronic pain are safe and accepted as treatment. We will assess adverse events informally during treatment groups and formally using Veteran identified problems during group sessions and a brief survey at the conclusion of treatment (week 6).[62]

Safeguards against contamination of interventions: Given both S2C and control groups will be administered within the outpatient OAT clinics it is possible that Veterans in different groups may discuss elements of the treatment. In an effort to prevent contamination of treatment blind, we will use general terms when recruiting potential participants and in the informed consent. Study title on informed consent and recruitment materials will be "Enhancing self-management skills for individuals with opioid use disorder." The stated purpose of the study will be intentionally vague and describe an effort to increase Veteran's individual agency over problems in their life that can ultimately improve personal health, enhance quality of life, increase recovery-centered behavior and engagement in treatment. Study measures (both in clinic and EMA) will be described as collecting data on problems that Veterans with OUD commonly report (e.g., negative mood, pain, quality of life, stress, etc.) and may improve with increased engagement in treatment. Veterans will be asked not to discuss the specific elements of group so as not to bias other Veterans who may want to participate. Additionally, at the end of treatment, we will ask Veterans for their feedback on the purpose of the group and whether they thought they were in an active treatment group or a control group. Treatment fidelity will also be assessed in Aim 1 to establish appropriate discrimination between treatment groups.

Assessments

A summary of the timing and purpose of in person assessments are shown in Table 1. We have chosen these assessments to include a broad range of pretreatment subject characteristics and treatment outcome measures. This diversity will enable us to better establish feasibility and acceptability of study procedures and treatment outcomes to inform a larger Stage II efficacy study. Thus, in addition to assessing measures associated with pain interference, we will assess substance use and craving, pain intensity, stress, quality of life, psychological symptoms, and physical functioning. The screening visit should take approximately 30-45 minutes (excluding interview-based measures) to complete in person study measures. Survey items that will be included in EMA surveys are shown in Table 2. Each EMA survey will take no more than 1-2 minutes to complete.

Screening Assessment: A general screening form will provide participant information, including demographic data, substance use history, previous substance use and psychiatric treatment history, medical history, and recent life events. The chronic pain

interview from the CBT for chronic pain manual will be used to collect information on pain history, location, sensations, prior treatments, and interference with activities.[76]

Feasibility: **Aim 1** will determine the feasibility of study procedures including randomization, retention, and proposed study outcomes of S2C and control. Timely randomization after screening visit will increase the probability that Veterans will participate in the baseline week and attend subsequent treatment groups. We will evaluate the proposed "recruitment wave" strategy with a goal of having participants randomized within 3 weeks of completing the screening visit. Optimizing this process will greatly inform the recruitment strategy for future Stage II efficacy trials. We will also examine retention rate in both S2C and control groups. We expect that Veterans randomized to S2C will attend and remain in treatment at rates equal to or superior to control. Fidelity assessment will adhere to methods from the Yale Adherence and Competence System (YCAS), which is a reliable and valid system to assessing fidelity of psychosocial treatments.[77] YACS is a general rating system for evaluating the adherence (how often) and competence (how well) of therapists delivering psychosocial treatments. Items are developed to capture components of a treatment that are unique and essential (e.g., psychoeducation about pain, hurt vs, harm, benefits of walking), essential but not unique (e.g., increasing self-management skills), and antithetical to an approach (e.g., medication interventions). Independent raters (e.g., project manager, MIRECC research assistants) will be trained to rate recorded sessions. YACS also includes therapist checklists completed after each session to indicate intervention elements conducted. Drs. Martino and MacLean will develop the fidelity measure within the first year of funding. Finally, collection of treatment outcomes (i.e., pain interference and daily steps) using EMA is an innovative aspect of this study. To determine feasibility for using EMA for treatment outcomes, we expect that Veterans in each group will complete EMA surveys at comparable rates. Based on prior literature and preliminary studies we estimate that EMA compliance during study participation will be greater than 70%; however, the data pilot will help establish EMA compliance for future studies.

Acceptability: **Aim 2** evaluates acceptability of S2C and control by assessing intervention credibility and satisfaction as a treatment to compliment OAT. Judgments of treatment credibility will be assessed at post-treatment using an adapted version of the Credibility/Expectancy Questionnaire,[78] with an internal consistency of .85 and test-retest reliability of .83. Treatment satisfaction will be assessed using the Client Satisfaction Questionnaire,[79] with an internal consistency of .93 and test-retest of .92.

Table 1. In Person Assessment Measures		
Interview-Based	**Variable Measured**	**Timepoints**

Substance Use Calendar (SUC; similar to Timeline Followback; Sobell & Sobell, 1992)	Substance Use	B, Post, F/u
Chronic Pain Interview (Murphy et al., 2014)	Pain History and Treatment	B
Self-Report Measures	**Variable Measured**	**Timepoints**
Brief Pain Inventory-Short Form (16 items; Tan et al., 2004)	Pain Intensity and Interference	B, Post, F/u
Rolland Morris Disability Questionnaire (24 items; Rolland and Fairbank, 2000)	Physical Disability	B, Post, F/u
Perceived Stress Scale (PSS; 10 items; Cohen et al., 1983)	Perceived Stress	B, Post, F/u
Veterans SF-12 (12 items; Kazis, 1999)	Quality of Life	B, Post, F/u
Patient Health Questionnaire-9 (PHQ-9; 9 items; Kroenke et al., 2001)	Depression symptoms	B, Post, F/u
Treatment Credibility (7 items; Borkovec & Nau, 1972)	Treatment Credibility	Post
Client Satisfaction Questionnaire (8 items; Larsen et al., 1979)	Treatment Satisfaction	Post
Biological	**Variable Measured**	**Timepoints**
Urine Drug Screen	Substance Use	B, Post, F/u

Note: B=Baseline, Post=Post-treatment, F/u= 3 and 6-month follow-up

Treatment outcomes: The primary pain treatment outcome (**Aim 3**) will be the average of the two pain interference questions from the PEG3[2] included in all study visits. In the original validation of the PEG3, the reliability was good (0.73-0.89) and construct validity was good for pain-specific measures (r=0.60-0.95). Primary outcome timepoints will be pain interference from start of treatment to post-treatment (i.e., week 5). Durability of the primary outcome will be assessed using pain interference items collected during 3- and 6-month visits.

Other pain measures were selected based in the Initiative on Methods and Pain Assessment in Clinical Trials (IMMPACT) recomendations,[80] which promote assessment of pain experience across multiple domains. These measures were also selected based on psychometric properties and respondent burden. Similar measures have successfully been used in my VISN 1 CDA and Dr. Heapy's (co-primary mentor) COPES

trials. Pain intensity and interference will be assessed using the Brief Pain Inventory – Short Form (BPI-SF).[3] The BPI-SF results in two factors representing pain intensity and pain interference. Both factors have acceptable internal consistency (0.85-0.88) and correlate with measures of disability (r = 0.57-0.40). The Roland and Morris Disability Questionnaire (RMDQ) assesses physical functioning in multiple behaviors and has demonstrated good internal consistency (0.84-.093) and test-retest reliability (0.83).[81] The Veterans Short Form 12 (SF-12)[82] is a 12 item measure to evaluate quality of life and functioning in physical and mental health domains. Internal consistently within domains is good to excellent (0.85-0.94). Depression will be evaluated using the 9-item Patient Health Questionnaire (PHQ-9).[83] The PHQ-9 demonstrated excellent internal consistency (0.89) and test-retest reliability (0.84).

Table 2. EMA surveys

Item	**Variable Measured**
PEG3 (3 items; Krebs et al., 2009)	Pain Intensity and Interference
Substance use items (3 items)	Substance Use
Opioid Craving Scale (3 items; McHugh et al., 2014)	Opioid Craving
Perceived Stress Scale (PSS; 5 items; adapted for momentary evaluation; Preston et al., 2018)	Perceived Stress
Environmental context/cue-related items (e.g., around others using drugs) (3 items)	External substance cues
Daily step count from pedometer (1 item; End of day survey only)	Physical Activity

Compensation

Veterans will be compensated for all components of the study, to encourage attendance with scheduled study visits and completion of EMA surveys. Of note, Veterans will not be compensated for attending treatment sessions. However, compensation for completing EMA surveys while engaged in treatment will likely encourage engagement in the treatment sessions. Veterans will be compensated $25 for the screening visit, $35 for the post-treatment visit, and $45 for 3-month follow-up and $60 for 6-month follow-up. Veterans will also be compensated $1.00 for each completed random survey (3 per day for a total of 8 weeks). To encourage Veterans to enter daily step count, they will be compensated $1.50 for each end of day survey (1 per day for a total of 8 weeks). In total, Veterans can earn $165 for all in-person visits

and up to $252 for completion of EMA surveys (final payment up to $417). If a Veteran withdraws or drops out of the study, payments will be prorated for completed portions of the study.

Data Analysis

To assess feasibility (**Aim 1**), we will use CONSORT reporting standards to diagram the number of Veterans screened, found eligible and ineligible (with reasons), consented, session attendance, and completed S2C and control sessions. Our target for treatment attendance is ≥70% of those randomized and, for those that attend treatment, we will target session attendance ≥65%. The retention and attendance thresholds are consistent with a recently published meta-analysis on retention for psychosocial interventions in substance use disorder treatment[84] and prior attendance in chronic pain studies in individuals with substance use disorders[54, 85], respectively. We will also collect data on the number of Veterans retained at each follow-up. Group facilitator checklists will be reviewed after each recruitment wave and trained raters will review recorded sessions. We will compare EMA survey completion rates between S2C and control. Survey completion will be calculated by the number of completed surveys divided by the number of surveys sent by the REDCap program. For acceptability (**Aim 2**), we will examine means, standard deviations, and median scores calculated for intervention credibility and satisfaction measures. We will also evaluate fidelity of intervention delivery and expect a 3 or higher average score on competence for each characteristic of treatment. **Aim 3** will examine preliminary efficacy for S2C in reducing pain interference (primary). Outcome analyses will be intent-to-treat and will include all randomized participants with at least one data point. All hypotheses will use a significance level of 0.05. We will calculate the 95% CI to estimate the mean changes from baseline in each group, and mean differences between groups at each timepoint from baseline to each follow-up time point (post-treatment, 3-month, and 6-month). If the 95% CI does not include 0, we can assume that there may be a significant effect on pain interference by group.

Data Management Plan and Power Analysis

The research assistant funded under the current project will be responsible for recruitment and screening as well as maintaining the REDCap database and monitoring survey responses and treatment attendance. Dr. MacLean and post-doctoral trainees (e.g., MIRECC post-doctoral fellow) will be responsible for facilitating S2C and control groups. Trainees will be directly supervised by Dr. MacLean. A MIRECC research assistant that is not involved in screening or facilitating groups or REDCap surveys will conduct post-treatment and follow-up sessions. REDCap provide secure automated export procedures for data to be downloaded to Excel and common statistical packages (e.g., SAS) for data analysis. REDCap catches unclear characters, out-of-range variable and logical inconsistencies. Only the MIRECC research assistant will have access to

post-treatment or follow-up in person assessments. Data analysis will be conducted after study completion by Dr. MacLean and Dr. Gueorguieva. There will be no interim data analysis.

To our knowledge, no study to date has evaluated walking as a treatment to reduce pain interference (primary outcome) in individuals with chronic pain and OUD receiving OAT. We recognize that the intra-group correlation will likely require a larger sample. We assume the variance inflation factor will be approximately 0.1; however, results of this trial will inform intra-group correlation for a Stage II power analysis. Power analysis was computed using G*Power software with mean difference between two groups (n = 26/group) with an alpha of .05 and a power of 0.80. Under these assumptions, we would be able to detect a large effect (d=0.79). Although this effect is large, results from preliminary efficacy analysis will provide training opportunities using clinical trial data and serve as preliminary data in funding applications for a future Stage II efficacy trial.