Defying the Odds of Relapse: Social Connection and Exercise Influence on Long-Term Recovery of Substance Use Disorder

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Author Note

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Abstract

Background: Current standard of care practices for substance use disorder is inadequate in reducing relapse, with rates persistently 40-60% within one year of treatment. Unconventional approaches must be explored to reduce the risk of relapse, climbing rate of overdoses, and healthcare expenditures exceeding $740 billion annually. The purpose of this quality improvement project demonstrates how an evidence-based group exercise intervention, used as adjunctive support to standard addiction treatment, can reduce relapse and promote long-term recovery during a global pandemic. ***Methods***: Aims of this project sought to enhance quality of life scores. Participants were recruited upon admission to a residential treatment center. Pre-posttest design utilized the World Health Organization Quality of Life Abbreviated scale to assess program impact on quality of life. Pre-program descriptive questions and a survey assessing prior addiction treatment were collected. Group exercise and wellness education sessions were delivered twice weekly in a live, interactive, virtual format with on-site participants. Upon completion, a post-program survey was utilized to capture the qualitative experiences of participants and impact of project to instill confidence to execute long-term sobriety. ***Results:*** Pre and post scores, as well as domain scores were clinically and statistically significant. Additionally, 80% of participants reported feeling more prepared to achieve long-term sobriety secondary to their participation in this project. ***Discussion and Conclusion:*** Results from this project demonstrate the positive impact that group-based exercise and lifestyle interventions can have on quality of life and long-term recovery. Peer support exercise programs may offer means to enhance addiction treatment and reduce overall healthcare expenditures globally by defying the odds of relapse.

Keywords: substance use disorder, relapse, sobriety, exercise, quality of life

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Substance use disorder (SUD) and addiction is increasing in prevalence. This highly complex disorder does not discriminate, affecting individuals of all demographic backgrounds. For those who attain sobriety, consequences extend beyond the acute treatment period, subsequently requiring lifelong management for recovery. One of the most challenging tribulations during the conversion from addiction to sobriety is relapse. Acquiring social support, feeling connected to peers, and improved physical health may offer protection throughout the difficult transition period after acute treatment towards lifelong sobriety.

Problem Statement

Despite the existence of well-known treatment options for those in recovery, a landmark study reported 40-60% of former substance users relapse within the first year (McLellan et al., 2000). Lack of family and social support, poor participation in self-help programs, and poor adherence to ongoing treatment were found to be strong predictors of relapse (McLellan et al., 2000). Like other diseases such as diabetes and asthma, SUD is recognized as a chronic but manageable disease that requires ongoing follow up and continuous treatment for long term recovery (McLellan et al., 2000). However, unlike diabetes and asthma, former SUD patients often lack continued structure, access to treatment, and social support necessary to be successful after leaving acute rehabilitation facilities. Failure to adequately manage this complex chronic disorder after acute treatment has contributed to poor health and relapse (McLellan et al., 2000; National Institute on Drug Abuse [NIDA], 2018a).

Purpose and Rationale

The burden of health issues associated with SUD are costly to the United States averaging $740 billion annually (NIDA, 2020). The need for continued follow up, social support, and ongoing connection to the SUD community to promote continued adherence to treatment and improved health outcomes cannot be overlooked. This manuscript explores the protective mechanisms of peer support and exercise in recovery, current standard treatments deployed to promote adherence, and examined evidence in support of the design and implementation for a quality improvement project. The purpose of this quality improvement project demonstrates how an evidence-based group exercise intervention, used as adjunctive support to standard addiction treatment, can reduce relapse and promote long-term recovery during a global pandemic. The results suggest that participating in a peer support exercise program while undergoing treatment as usual enhanced patient outcomes and may defy the odds of relapse.

Background and Significance

Neuroplastic changes within the brain assist in understanding why SUD is characterized by compulsive drug seeking despite negative consequences. Substance use stimulates structural and functional changes within the brain, altering the reward circuitry and dopamine system, which are not fully developed until early to mid-twenties. Initiation of substance use typically occurs during the adolescent period, a critical time for brain development (McLellan, 2017; Substance Abuse and Mental Health Services Administration [SAMHSA], 2019b). This disruption leads to impaired cognitive control and compulsive seeking behaviors seen within SUD. The indeterminate extent and reversibility of these neural changes contributes to lifelong risk of relapse which have subsequently been a target for treatment and long-term recovery (Costa et al., 2019; McLellan et al., 2000; McLellan, 2017; NIDA, 2018b; SAMHSA, 2019a).

In the last decade, national and worldwide attention regarding SUD has amplified, with increased access to prescription opiates especially problematic (National Institutes of Health [NIH], 2020). Between 1999 and 2017, drug overdose death rates increased from 16,849 to 70,237 annually (NIDA, 2019a). If SUD continues to be left unmanaged, increased rates of overdose, deaths, health problems, relapse, and costs to the U.S. are expected (McLellan et al., 2000; NIDA, 2018b; NIDA, 2020; NIH, 2020). Drug overdose deaths are especially common amongst former SUD persons who relapse (NIDA, 2018b).

Persons Recovering from SUD

For the purpose of this discussion, the term recovery refers to the abstinence of using substances and return to purposeful life (American Addiction Centers, 2019; NIDA, 2017). For those who attain sobriety from this burdensome disorder, the road to recovery is lifelong. According to SAMHSA (2017), the four main dimensions of recovery are health, home, purpose, and community. Former users are at increased risk of relapse if these dimensions are not met. The changes to the brain associated with SUD discussed previously further places former users at risk, most notably involving inhibited self-control, decision making, and cognition (Costa et al., 2019; NIDA, 2018b).

Acute treatment alone has been shown to be insufficient in supporting long-term recovery. During acute treatment, there is continuous support and structure for clients to focus on sobriety (NIDA, 2018a). When former users transition back to ordinary life without this continuous support, they may begin to skip meetings or doses of medications and lose focus of their sobriety by returning back to previous habits or peer groups. When treatment adherence after acute treatment is poor, relapse occurs (SAMHSA, 2017).

Peer Support

A proposed solution to the lack of continuous care is increasing peer recovery support groups to enable long term recovery and well-being (American Addiction Centers, 2019; Arizona Department of Health Services [ADHS], 2017; NIDA, 2018a; Office of National Drug Control Policy [ONDCP], 2020). This continued support is valuable in preventing relapse by establishing new and healthy connections, encouraging recovery, and restoring cognitive function. In his revolutionary book regarding the war on drugs, Johnathon Hari states "the opposite of addiction is connection" (2015). This statement provides insight into the social isolation former SUD users experience, and the disconnection from those who may not understand SUD. Social isolation has been found to be a strong theme amongst those in recovery (Duffy & Baldwin, 2013). This lack of connection makes the transition from addiction to sobriety difficult, and poor social support may contribute to relapse or stopping treatment. According to SAMHSA, "[t]he process of recovery is supported through relationships and social networks" (2019a). Attending peer support services has the capacity to aid in encouragement, strength, hope to peers, allowing for personal growth, wellness promotion, and long-term recovery (SAMHSA, 2017). Therefore, engaging in peer support groups is critical during the transition from addiction to sobriety to restore one's sense of purpose and community (American Addiction Centers, 2019; ADHS, 2017; ONDCP, 2020; SAMHSA 2017; SAMHSA 2019a).

Exercise

In addition to peer support, exercise aids in re-establishing health, another critical dimension of recovery and relapse prevention (SAMHSA, 2017). Literature supports increased rates of adherence, abstinence, quality of life (QoL), health, well-being, cognitive processes, connection to peers, and decreased rates of withdrawal symptoms, cravings, depression, and

anxiety in former SUD users who exercise (Muller & Clausen, 2015; Nowakowski-Sims & Bullard, 2018; Taylor, 2017, Wang et al., 2014; Weinstock et al., 2017; Zhang & Yuan, 2019). Costa et al. (2019) performed a review of exercise induced neurological changes in former SUD users. It was found that aerobic exercise stimulated neuroplasticity, otherwise known as rewiring of the brain. Improved inhibitory control, decision-making, and impulsivity was observed. These changes associated with exercise may assist in overcoming previous brain disturbances accompanying drug use to reduce relapse. Therefore, combining social support with exercise may help recondition the brain to prevent relapse while promoting connection and improved health outcomes to reduce overall healthcare costs within the U.S.

Current Post Treatment Methods

The majority of post treatment guidelines encourage attending 12-step self-help groups and recovery support groups, which have shown to be effective and conducive to peer support (Duffy & Baldwin, 2013; NIDA, 2017). These are voluntary free meetings that have a variety of meeting times, supporting former users to maintain sobriety. How often and which support group a former SUD user attends is self-guided. It was found that treatment agencies helping to assist clients in setting up aftercare were more likely to attend ongoing treatment (Duffy & Baldwin, 2013). Though evidence suggests the importance of physical health in those suffering from SUD, few treatment programs attempt to incorporate exercise or wellness education. Consequently, patients typically do not meet recommendations of 150-minutes per week of moderate intensity exercise during SUD treatment which contributes to poor health outcomes (Weinstock et al., 2017). The inconsistency of programs to stimulate this health promoting behavior is a disservice to their clients and contributes to poor lifestyle habits post treatment.

Though self-help and recovery support groups are effective, there is not a single therapy or post-treatment method that works for all former SUD users (NIDA, 2019b). Effective treatment must consider the individuals drug abuse, basic needs, and any associated medical, mental health, or legal problems (NIDA, 2018a). Medications may also be required. An individual's treatment plan must also be reassessed and adjusted often to meet changing needs. Ongoing support ensures that changes to a patient's treatment needs are met, improving their chances of successful sobriety.

Sobriety Adherence

As previously discussed, a landmark study found that between 40-60% of former SUD users relapse within the first year (McLellen et al., 2000). Given that it has been 20 years since this was reported and the increase of drug related overdoses and deaths has tripled, the incidence of SUD and relapse may be even higher. Poor long-term follow-up from treatment contributes to former SUD users decreased adherence to treatment plans. Peer recovery support groups improve relationships with treatment providers, treatment retention, satisfaction with treatment, access to social supports, and reduced emergency service utilization, criminal justice involvement, relapse rates, re-hospitalization rates, and substance use (SAMHSA, 2017). The incorporation of a peer recovery exercise program may be a cost-effective strategy deployed within communities and organizations, with a promising likelihood to affect sobriety adherence.

Internal Data

A residential treatment center (RTC) for addiction and dual-diagnosis mental health disorders in Arizona was examined for problems, issues, or gaps. The organization reported high levels of sedentary lifestyles by the residents while undergoing treatment despite having access to a workout facility and equipment on site, which was an area for concern due to the overall

health benefits attributable to exercise as well as value during early stages of recovery. This is consistent with Weinstock et al. (2017) and Cabrera's (2020) findings that a lack of physical activity is common within treatment centers, despite the wide known benefits to recovery and overall health. Additionally, the organization conveyed a lack of appropriate means for continued communication and follow-up with their alumni, which was believed to contribute to relapse. Loss of follow-up is consistent with previous literature uncovered by McLellan et al. (2000). Additionally, hard data for sobriety rates of clients after transitions from treatment centers was determined difficult to track. This organization felt post treatment sobriety rates may be useful to gather since relapse rates less than 40% are remarkable. This data is needed to better understand if their program is meeting or missing what clients need to be successful after treatment and discharge from the residential center. While exploring possibilities to promote continuity of care for long-term recovery as well as methods to enhance social connection for current residents and alumni, exercise and peer support were found to be protective interventions against relapse. This inquiry lead to the development of the PICO question: "In persons recovering from substance use disorder, how does attending a peer recovery exercise program after treatment compared to typical post treatment methods affect sobriety adherence?"

Search Strategy

An extensive literature review was performed including the following databases: Cumulative Index of Nursing and Allied Health Literature (CINAHL), The Cochrane Library, PubMed, PsycINFO, and SPORTDiscus. In particular, CINAHL, PubMed, PsycINFO, and The Cochrane Library databases were selected for their scientific rigor and recognized contributions to medical and nursing evidence-based practice. SPORTDiscus was utilized for its contributions to sports medicine as exercise is the specific intervention investigated. All databases with the

exception of The Cochrane Library yielded significant and applicable results. The Cochrane Library was therefore excluded. The explicit search strategy utilized to obtain studies for this literature review is described below.

Limitations, Inclusion and Exclusion Criteria

While the purpose of this review is to produce general findings regarding the role of exercise in continued recovery for all SUD users or former users throughout post treatment transitions, interventions performed solely in the outpatient setting were difficult to retrieve. Randomized controlled trials (RCT's) and other applicable quantitative studies were found to be lacking, which restricted the quality of evidence reported. Additionally, most research has been conducted within the general adult population as opposed to adolescents or youth despite SUD affecting individuals across the lifespan. Based upon these limitations, inclusion criteria included exercise or QoL-based studies of humans currently in any stage of treatment for any type of SUD, all ages, published between 2015-2020, of peer reviewed academic journals, and English language only. Exclusion criteria included non-academic or non-English language articles, animal studies, book journals, proposed protocols for future studies, systematic reviews or meta-analysis with similar reference lists, articles not addressing exercise or QoL for SUD populations, and articles reporting mixed results with inconclusive findings.

Keyword Selection

Keywords *substance use disorder, substance abuse, addiction, exercise, fitness,* and *physical activity* were initially combined and searched. Through initial findings, the terms recovery and quality of life were found to be concurrent terms, with quality of life emphasizing the social component of SUD. Therefore, keywords were changed and Boolean connectors were

applied to include all combinations of *substance use disorder, drug, dependence, exercise, recovery, quality of life, relapse, craving, abstinence,* and *sobriety*.

Search Yield

An initial yield without inclusion or exclusion criteria of original keywords generated 23,144 results from all databases. Inclusion criteria were applied, generating 2,342 results. Keywords were changed which yielded a final result of 51 in CINAHL, 89 in PubMed, 23 in PsycInfo, and 14 in SPORTDiscus. While reviewing the titles and abstracts for relevance to this PICO, many were found to be duplicates in multiple databases or not applicable to PICO and therefore disregarded. This led to a final yield of 32 appropriate results. Ancestry searching of references lists and grey literature were also explored for applicability; two frequently referenced articles from 2013 and 2014 were extracted from this method for relatedness to PICO. From this process, 18 studies were deemed most applicable to PICO and selected for in-depth review. Rapid critical appraisals were completed before ten final articles were chosen for this literature review. Ten studies were retained for an in-depth review. These studies include five qualitative studies, two randomized controlled trials, one quasi-experimental study, one cohort study, and one meta-analysis.

Evidence Synthesis

Study quality and level of evidence was determined according to applicable rapid critical appraisal (RCA) tools (Melnyk & Fineout-Overholt, 2019). Though qualitative studies are considered lower level evidence compared to quantitative studies, social support and exercise preferences within recovering SUD populations were found to be more deeply understood and represented through qualitative methods. Therefore, the combination of both qualitative (see Appendix A, Table A1) and quantitative studies (see Appendix A, Table A2) were included in

evaluation and synthesis tables (see Appendix A, Table A3) to provide sweeping expertise surrounding the role of exercise, peer support, and barriers in recovery.

The subjects within the studies had a mean age of 34, widely varying demographics, receiving treatment from either an outpatient or residential facility, with approximately 40% conducted within the U.S. The majority involved outpatient programs. All of the studies were of small population sizes lasting 6-12 weeks with the exception of two outliers: one large sample study (Rawson et al., 2015) and one 20-week study (Morton et al., 2016). Nine studies targeted the role of exercise in recovery, with various styles of exercise sessions ranging from 30-60 minutes, 1-7 times per week. Measurement tools were heterogeneous. One study was included for its significant influence and discussion of recovery capital, barriers to attain recovery, and importance of physical health and social support (Duffy & Baldwin, 2013).

Peer Support Exercise Influence on Recovery and Project Development

After careful examination of existing literature, the role of exercise and peer support for long term recovery is clear yet underutilized. Revolutionary mental and physical transformations secondary to exercise aid in fortifying one's journey from addiction to recovery and enhance QoL. Exercise programs provide continued structure and motivation towards maintaining one's health and sobriety in conjunction with highly recognized 12-step recovery models. With the concurrence of mental health disorders and SUD well recognized, the progressive influence of exercise to support SUD subjects with or without co-existing mood disorders in addition to treatment-as-usual is critical. Evidence clearly displayed the feasibility and safety of exercise programs to enhance overall health, QoL, and sustain recovery from SUD. Due to common social isolation and poor relationships found within this population, the value of structured activities designed for those in recovery can increase social interaction, camaraderie, relatability,

and support amongst participants with minimal stigma or judgement. The incorporation of group exercise early on in the recovery process and encouragement of ongoing exercise involvement in post-treatment settings was found to be supportive of sobriety adherence, social connection, and reintegration into communities.

"The Phoenix" is an innovative organization founded in 2006 which offers free exercise programs to those in recovery to help overcome the physical, mental, and spiritual challenges seen in recovery (The Phoenix, n.d.). This program has had dramatic success, transforming the lives of more than 26,000 people in recovery across the United States. Their mission is designed to help those in recovery overcome barriers and stigma, re-establish social connections and health, and live an enthusiastically sober life. The only requirement to be part of this program is 48-hours of sobriety.

Based on inspiration from The Phoenix's success and similar programs, the compelling evidence found, and desire for organizational improvements of patient's overall health and activity levels while undergoing treatment, these findings support the identified needs of the RTC. The introduction of physical exercise and wellness education within their curriculum may offer protective mechanisms against relapse, increase continuity of care, and build recovery capital. Therefore, the scientific underpinnings of these findings influenced a doctoral quality improvement project to be designed in partnership with a RTC to enhance patient health outcomes and defy the odds of relapse (see Appendix B, Figure 3).

Conceptual Framework and Implementation Model

It is well known that intrinsic individual barriers and motivators to achieve and maintain lifestyle choices exist. Many of the barriers and motivators of those suffering from SUD can be explained by a term devised by Duffy & Baldwin as "recovery capital" (2013). Recovery capital

is the constellation of resources those with SUD draw from to initiate and maintain recovery. These resources may stem from social networks, education, employment, financial assets, health, and beliefs. By strengthening recovery capital, the capacity of an individual to attain sobriety improves. This concept aligns with SAMHSA's four dimensions of recovery (health, home, purpose, and community). If recovery capital and four dimensions are met, sobriety adherence is more likely.

A Social Cognitive Model (SCM) was chosen to guide this project's purpose due to its applicability, and visual representation of recovery capital and four dimensions of recovery necessary for sobriety success (see Appendix B, Figure 1). This model is deeply rooted in self-efficacy theory, and portrays the need for balance between environmental, behavioral, and personal factors concerning individual lifestyle choices. Self-efficacy theory guides the personal factors needed to overcome or perform preventative behaviors (Chin et al., 2018). Personal accomplishment and social modeling, vicarious experience, verbal persuasion, and physiological states greatly influence the strength or weakness of one's self-efficacy. This theory has demonstrated exceptional utility in exercise participation, lifestyle choices, and management of chronic conditions (Resnick, 2014). Group interaction and encouragement, social networking, and improved physiological health states secondary to group exercise programs can positively influence personal factors. An individual becoming motivated to achieve similar outcomes or rewards they observe reached by others exemplifies the behavioral factor influence found within this model. Being surrounded by peers who have attained and maintained their sobriety, successfully returned to a purposeful life, and accomplished goals may motivate former users to stay sober. Lastly, environmental factors most significantly linked to social and family relationships may harm or hinder one's ability to engage in healthful behaviors (Chin et al.,

2018). This model offers a clear representation of how a person's environmental, behavioral, and personal factors all reciprocate and influence one another constantly. By effectively synergizing these factors, a person's health and social support can be strengthened through group exercise, outcomes can be better predicted, and relapse may be prevented (Chin et al., 2018).

The Rosswurm and Larrabee Model adapts to specific needs and problems expressed within organizations, offering concrete steps to efficiently overcome problems, issues, or gaps identified (see Appendix B, Figure 2). The steps within this model align with a doctoral quality improvement project timeline as they parallel specific goals warranted each semester. This model exhibits the ability to progress through each step seamlessly, go back and forth between steps, or even start over. This is comparable to designing an individualized treatment plan for patients with SUD who may relapse or require plan refinement. Therefore, this model guided execution of this project (Rosswurm & Larrabee, 1999).

Methods

During the early stages of development of this project, a partnership was developed with a peer colleague enrolled in the Arizona State University Family Psychiatric Mental Health Nurse Practitioner program to provide mindfulness in addition to physical exercise and wellness sessions for a more robust intervention. Secondary to the partnership, this project became widely known as "The D.R.E.A.M.E.R. Project: Defying Relapse through Exercise And Mindfulness to Extend Recovery". Additionally, in January 2020, the COVID-19 pandemic began. Consequently, Arizona State University Institutional Review Board (IRB) banned all in-person human research.

Ethics

Arizona State University Institutional Review Board (IRB) expedited approval was attained for this project on August 26, 2020. Human subjects were protected from injury throughout the project and all personal identifiers were anonymous to protect confidentiality. Safety measures such as social distancing and disinfection of equipment used during each session due to the COVID-19 pandemic were maintained. Thorough implied consent was reviewed prior to enrollment, medical clearance for physical activity was received prior to participation, and the ability to withdrawal from the project at any time without penalty or change in treatment was made clear. Finally, extensive training and security measures to ensure patient privacy were put in place while using ZOOM Video Communications, Inc. throughout implementation of this project.

Population and Setting

The population of individuals recruited for this project were adults over the age of 18 years old, with a diagnosis of addiction, receiving treatment from an Arizona RTC. The average length of stay was approximately 21 days for each resident. Recruitment was conducted through the use of a flyer and explanation from staff upon admission to the treatment facility. 22 individuals participated in some aspect of the program. Pre-post data was obtained and analyzed for 14 participants who were able to complete the program and questionnaires entirely.

Project Description and Timeline

This project was designed to capitalize upon client's 21-day average length of stay. Therefore, clients within the RTC had the ability to enroll and engage in three sessions weekly for three weeks or more, with ongoing enrollment for 9-weeks. This project incorporated exercise and mindfulness sessions, and general education regarding nutrition, sleep, physical exercise, and mindfulness practice to assist in a holistic treatment of substance use disorder and

enhance sobriety rates. Weekly sessions included: 1 mindfulness, 1 mindfulness/physical exercise, and 1 physical exercise/lifestyle education. These sessions occurred respectfully on "Serenity Saturday", "Sober Sunday", and "Wellness Wednesday" each week. Each session lasted approximately 60 minutes. Due to COVID-19 restrictions, the desire for this project to be implemented in-person shifted to remote implementation. This was executed through a live, virtual, highly interactive platform to on-site participants for every session utilizing ZOOM.

Instrumentation, Data Collection, and Data Analysis Plan

Attendance or participation rates are instrumental to measure to address the stigma against those in recovery being labeled unreliable and unmotivated. Newfound structure and support can encourage enhanced self-efficacy and therefore promote one's propensity for treatment adherence. Attendance and participation were tracked while maintaining anonymity utilizing a unique numeric identifier chosen by the participant to use throughout the project.

A pre-intervention demographic and descriptive questionnaire was administered prior to each participant beginning the program. Upon completion of the program, a satisfaction survey consisting of seven follow up questions was also provided. This assisted project directors and the organization to evaluate demographics, the baseline of each participations previous health level, addiction treatment or relapse rates, post-program satisfaction of participants, program influence on confidence to achieve long-term sobriety, as well as consideration for future modifications.

It has been found that as QoL and recovery capital improves, sustained recovery is more likely (Duffy & Baldwin, 2013). Therefore, QoL was identified as the most valuable measure to examine in relation to sobriety and enhanced patient outcomes for this project. The World Health Organization Quality of Life abbreviated assessment (WHOQOL-BREF) is one of the best-known and widely used instruments developed for QoL comparisons. A minimum score is 26,

and a maximum score is 130. The higher the score, the higher the QoL. In addition to QoL, this 26-item Likert-scale questionnaire also assesses physical health, psychological, social relationships, and environmental domains. The incorporation of these domains makes WHOQOL-BREF unique while directly corresponding with the Social Cognitive Model framework chosen for this project (Chin & Mansori, 2018; Skevington et al., 2004; World Health Organization, 1996). With a consistent reliability of $\alpha = \geq 0.70$ between all domains and all languages, WHOQOL-BREF is a highly reliable and valid tool (Skevington et al., 2004; World Health Organization, 2020). Therefore, pre-posttest design utilized the WHOQOL-BREF to assess program impact on QoL. This questionnaire was supplied to the residential treatment center and completed by clients wishing to enroll in the project using a unique numerical identifier supplied upon admission and again at project conclusion. Data was collected from the project site and used for analysis.

Budget and Funding

The budget for this project was approximately $6,000 to purchase and install necessary exercise equipment needed to facilitate bodyweight workouts, as well as workbook materials and "swag bags" for the estimated 60 participants (see Appendix B, Figure 4). There were no grants or funding opportunities available during the time of this doctorate nursing quality improvement project due to the coronavirus pandemic, therefore philanthropic contributions were solicited. Means to attain and purchase the items required for this project were received through equipment and monetary donations from friends and family, Recovery Through Repetition, FTX Wellness, Temperance Training, Herren Project, RX Smart Gear, Strides in Recovery, FroPro Snack Bars, O2 (Oxygenated Sports Recovery), Street Parking, The Perfect Dose (Kristen Pope), The Barbell Saves, CrossFit Magna, REP Fitness, and Karma Kaps.

Secondary to the funds and donations provided by sponsors, in addition to equipment installation at the RTC, 60 wellness backpacks and workbooks were assembled including: canvas backpack, reusable water bottle, jump rope, yoga mat, hip circle, and workbook. The workbooks include additional mindfulness, exercise, and healthy lifestyle support. Workbooks were issued upon enrollment into the project. Backpacks were distributed to participants upon discharge to all participants who completed at least eight out of nine total sessions during their stay. By providing the equipment items used during exercise sessions and additional workbook resource, individuals were supplied the means to continue incorporating these activities into their daily routine post-discharge with the aim to promote ongoing structure, support, and sobriety.

Results

Launched on September 27, 2020 over the course of nine-weeks, 22 individuals participated in this program, with an average of four residents per session. The number of residents who chose to participate and complete most sessions of the program is consistent with previous studies that were considered in support of this project intervention (see Appendix A, Table A3). Consistent attendance tracked throughout this project demonstrates that those in recovery are not only capable of holding themselves accountable to attend and participate, but also suggests their desire to be an active member of their treatment and gain access to a structured wellness program.

Despite over 22 individuals participating at some level during the project period, complete data sets were only achieved for 14. Attrition reasons are unknown. Of the 14 participants, gender distribution was equally split 50% female/50% male. The mean age of the participants was 33 years old, and 85% were non-Hispanic, with a high school (35.7%) or college (64.3%) education. Nearly all had previously considered their health in good standing

and had experience with physical exercise and/or mindfulness. Most notably, 64% reported multiple treatment attempts, and 78% reported a history of relapse. This is well beyond the 40-60% that McLellan et al. reported in 2000.

Pre- and post-intervention WHOQOL-BREF scores were analyzed using *Intellectus Statistics*™ software. The pre-post total and domain scores from each participant were entered into *Intellectus Statistics*™ and a two-tailed paired samples t-test with on an alpha value set to 0.05 was conducted. Pre-intervention total scores had a mean of 87 and post-intervention total scores had a mean of 105. Results were significant between pre and post scores, ($p < .001$). Additionally, each domain was also clinically and statistically significant (physical health $p<0.001$, psychological $p<0.001$, social relationships $p=0.006$, and environmental $p<=0.016$) using the same analysis measures.

Impact

This intervention had a significantly positive impact on QoL which is a precursor for long-term sobriety. Additional significant positive changes were found within physical health, psychological, social relationships, and environmental domains which are variables that influence recovery capital and prediction of outcome expectations (i.e., relapse) as demonstrated through the social cognitive model (see Appendix B, Figure 1). Most importantly, 80% of participants reported feeling more prepared to achieve long-term sobriety secondary to their participation in The D.R.E.A.M.E.R. Project. Project findings demonstrate the ability for a peer driven exercise, lifestyle, and mindfulness program to enhance patient outcomes through improved QoL, recovery capital, and confidence to achieve long-term sobriety. Ultimately, by arming these individuals with the means to defy the odds of relapse through peer support,

exercise, and mindfulness, an overall reduction in healthcare expenditures globally and fewer overdoses and deaths attributed to SUD can become the expected norm.

Sustainability

Prior to implementation of the project, each exercise and mindfulness session were standardized through prerecorded videography and shared with the partner of this project for continued use if desired after project completion. During the early stages of project design, a five-year partnership was established between ASU Edson College of Nursing and Health Innovation and the identified RTC. This partnership will allow for future ASU students to gain significant learning opportunities in evidence-based care for SUD. Additionally, this project was deemed a "legacy project" by Arizona State University. Meaning, future students will continue enhancing upon the foundation of the project which is referred to as "phase one". Phase two of project has been passed onto a second year Doctor of Nursing Practice Family Nurse Practitioner student, who plans on further exploring the relationship between fellowship, exercise, mindfulness, and lifestyle education on recovery capital and long-term sobriety. This project is sustainable without Doctor of Nursing students if the RTC hires personal trainers, yoga instructors, and spiritual healers with peer recovery group support experience to conduct these sessions at least three times weekly. A logic model for other treatment organizations to implement this project is also provided (see Appendix B, Figure 3).

Discussion

Despite the overall positive findings associated with this project, there were several limitations and challenges encountered. The COVID-19 pandemic presented unique challenges due to the inability for this project to be implemented in-person. While it is unknown if this had an effect on the satisfaction of program delivery, it greatly impacted data collection and

attendance tracking. Without the ability for project directors to implement in person, data collection and attendance became a responsibility of the staff. Unfortunately, attendance tracking was not reported or collected in a reliable manner. Therefore, this was not accurately represented, and it is suspected that more than 22 individuals participated in some aspect but were unaccounted for. Additionally, data collection was not completed for at least eight participants, which would have strengthened the results of this project. There were several technology related challenges to overcome within the first three weeks of this project's implementation. After further training, these were overcome for the last two-thirds of the project timeline.

The D.R.E.A.M.E.R. Project utilized a novel method during the COVID-19 pandemic to promote social connectedness, QoL, enhanced health outcomes, and enthusiastic sobriety in a highly interactive, HIPAA compliant, group setting promoting readiness for discharge from a residential treatment center for addiction. Results reflected a positive trend toward promoting long-term recovery capital. Substantial evidence demonstrates group-based exercise classes and mindfulness-based interventions are beneficial to recovery (Muller & Clausen, 2015; Nowakowski-Sims & Bullard, 2018; Taylor, 2017, Wang et al., 2014; Weinstock et al., 2017; Zhang &Yuan, 2019). The changes associated with exercise may assist in overcoming previous brain disturbances accompanying drug use to reduce relapse. Research has shown that in former SUD users who exercise, positive outcomes include: increased rates of adherence, abstinence, QoL, and improved health, well-being, cognitive processes, connection to peers along with decreased rates of withdrawal symptoms, cravings, depression, and anxiety. This quality improvement project mirrored these findings by combining social support with exercise and mindfulness as an adjunct to treatment as usual in a residential addiction facility to prevent relapse and extend recovery during a global pandemic.

Further enhancements of this project should be in-person if possible. Additionally, it may be beneficial to consider reduction of exercise intensity levels, as several participants reported the physical exercise portion was “too difficult” during “some” sessions. Furthermore, all attendance and data collection should be completed by project directors in-person if possible, as this was a limitation during phase one. A needs assessment to develop a social platform for participants to remain engaged in healthful behaviors or connect with similar peer driven exercise support groups post-discharge would be useful. Future studies would benefit from utilizing The D.R.E.A.M.E.R. Project methods to conduct a formal research project.

Based on the positive findings associated with this project, it is recommended to promote and develop programs similar to The D.R.E.A.M.E.R. Project within all levels of treatment. Arizona health policy board members should consider reviewing current treatment policies and impose mandates to meet the recommendation of 150 minutes physical activity/week into behavioral health programming (or programs). Additionally, healthcare workers, gym owners, treatment centers, and those in recovery should advocate for these findings by promoting likewise programs to be deployed within communities and treatment organizations due to the positive correlation with community-based exercise sessions on QoL and confidence towards achieving long-term sobriety. Providing this service within communities could be made possible by partnering with fitness facilities with relatively low overhead cost (see Appendix B, Figure 4). Individuals in recovery having access to this resource can reduce the stigma associated with addiction, reduce barriers to access/continue treatment, and ultimately defy the odds of relapse.

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Appendix A

Evaluation and Synthesis Tables

Table A1

Evaluation Table Qualitative Studies

Citation	Theory/ Conceptual Framework	Design/ Method/	Sample/Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Worth of Study to Practice
Duffy et al. (2013). Recovery post treatment: plans, barriers, and motivators **Funding**: Not disclosed **Country**: United Kingdom **Bias**: PTS may have developed strong RC since TX was completed TX, workers played key role in facilitating recruitment for study, unknown	Not stated, inferred to be Social Cognitive Theory	**Design**: Qualitative grounded theory methodology **Purpose:** Identify RC factors that play a role in R post TX	n=45 **Demographics:** 40% RTC, 66% M, 96% white British, MA 39 (s.d. 7.77), 88% poly-substance users, 100% voluntary TX **Site/Setting:** Outpatient; private INT's last 30-90 minutes usually in PTS homes **IC**: Not disclosed **EC**: Not disclosed **Attrition**: Not disclosed	Previous TX backgrounds, AC, SOC support, accommodations, employment and finances, H, smoking, confidence, MO, and barriers to R **Recovery (R)**: voluntary sustained control over SU, H, and WB, and PN in society **Recovery capital:** resources one can draw upon in the initiation and maintenance of R	Authors conducted INT with open-ended Q; INT transcripts; Recordings & field notes analyzed by INT conductors	NVivo 9 software; researched coded data IND and maintained audit trail of procedures interpretations, and coding decisions inductive approach to thematic analysis; IND coded before reaching theme consensus; comparison between until saturation	AC > at RTC versus CTC; SOC ISO among FU; PS from those also in R during R process valuable; sense of belonging and relatability found at 12 step mutual aid groups; + reinforcement of seeing others in R; dissolution of F/RS due to SU; M to reestablish T and RS; lack of F involvement in care; importance of SUP housing; previous loss of work due to SU with desire to return but difficult to find; +H through EX;	**LOE:** VI **Strengths:** Uncovered common problems contributory to RL or continued TX **Weaknesses:** Low LOE, purposive sample, bias risk, predominantly M - findings less generalizable to F; resources, housing, employment, insurance, TX costs are different in UK compared to US **Conclusions**: Insight into RC resources former SUD users turn to maintain R **Feasibility/Applicability to patient population:** While this study is slightly outdated and the generalizability is cautioned only to areas

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Citation	Theory/ Conceptual Framework	Design/ Method/	Sample/Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Worth of Study to Practice
refusal rate for partaking in study may have contributed to clients with less positive outlooks not PN							SU primary cause of MH issues; many smokers; RL risk = high stress, doing too much, SOC interactions or situations, and unoccupied time; finances and criminal record B for R; M for continued R = impact on F and what had been or could be lost if return to SU	with similar resources and geography, the findings of SOC SUP from those in R is crucial and applicable for PICO involving PS and importance of H
More et al. (2018). "It's like a counselling session … but you don't need to say anything:" Exercise program outcomes for youth within a drug and alcohol treatment service	Social Interaction Model	**Design:** Qualitative interpretivist paradigm **Purpose:** Understand H-, R-, and EX-related outcomes associated with structured 1-h 2x/weekly EX in addition to	N=27 **Demographics:** MA 18.2 YO ± 1.5, 66.7% M, 33.3% F, 81.5% C, 14.8% AUS, 3.7% AZN, 88.9% 100% poly-substance users, 50% co-existing MH disorder **Site/setting:** 24-h RTC over 6-	B to EX, EX MO, Feelings of accomplishment, R RS, CR & WD, Routine, AFF & EM, Self-esteem & MH, PL H, sleep	Audio recordings transcribed verbatim listened x 2 for verification, codes, Semi-structured INT guide	NVivo software, critical friends' approach, coding and labeled themes, broad categories x 6 months until saturation	B to EX = PTS PL H, C, injury, lethargy, MH, environmental; MO + w/ EX, + AFF & ATT towards EX, + desire to be active, gave Y something to look forward to, + desire to EX within and outside PGM; + FG of ACC & S, + perception of	**LOE:** VI **Strengths:** at-risk COM sample, provision of long-term EX PGM, youth and staff perspective, insight for SUD TX **Weaknesses:** Concurrent TAU, GP-based discussions not optimal, high rate of dropout from TX, differing data collection methods, RCT of themes needed,

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Citation	Theory/ Conceptual Framework	Design/ Method/	Sample/Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Worth of Study to Practice
Funding: None disclosed **Country:** Australia **Bias:** None recognized		TAU during R	month period, group based or IN INT **IC:** enrolled in EX PGM ≥ 2 weeks, written consent **EC:** WD from SU TX, medical limitations **Attrition:** none				Tx progress, sense of ACH, time well spent, + RS, PS, FSUP, +SOCSUP, +RS & SOC w/ non-users, +T w/ staff; -C & WD; EX provides STR & RNE; +vigor, cathartic role of EX; +acute and long-term self-esteem & MH; -symptoms of MH disorders; +PLH benefits & AP; +sleep quality & duration	restricted insight within PGM **Conclusions**: GP-based structured and PZD EX provision may be important part of successful Y SUD Tx H and R outcomes **Feasibility/Applicability to patient population:** Data consistent with prior research of adults w/ SUD; therefore, may be generalizable to residential SUD population; gives insight into + H and RL outcomes
Morton et al. (2016). Boxing clever: Utilizing education and fitness to build recovery capital in a substance use rehabilitation program **Funding:** None disclosed	Inferred social interaction model or recovery capital model	**Design:** Qualitative, grounded theory **Purpose:** Explore the change processes for PTS engaging in integrated FNS & ED SU	**N**=17 **Demographics:** 57% F, 43% M, MA 37 YO, Primary SU alcohol, 70% AB **Site/setting:** CTC **IC:** None disclosed	IMP of FNS & ED to build PC, SC, RC; role of ED in – SUD & impact on F to aid RC; + re-engagement with COM **Recovery capital**: Resources in which R can be initiated and sustained through	Audio taped and transcribed; Semi-structured Q, alias names	open coding, axial coding	+ H, confidence, AB/C, ED on SU damage to body – desire for use, + MH, + communication, + resilience, + RS with F, desire to contribute and be accepted by COM	**LOE:** VI **Strengths:** Addressed existing gap in literature exploring impact and outcomes of EX and ED as component for rehab PGMs; uncovered range of elements contributory and supportive of RC **Weaknesses:** Small sample size, convenience sample, low LOE

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Citation	Theory/ Conceptual Framework	Design/ Method/	Sample/Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Worth of Study to Practice
Country: Ireland **Bias:** None recognized		rehabilitation PGM investigating elements of RC that might SUP sustained R from SU; 7 hours/week 20-week FNS & ED	**EC:** None disclosed **Attrition:** 41%	PL, human, SOC, and cultural CAP				**Conclusions**: Beyond personal CAP developed through ED & EX, the building of COM CAAP, including + COM engagement and SOC integration, is pivotal for people seeking to address SUD in their lives **Feasibility/Applicability to patient population:** **"**Not possible to extrapolate findings or other populations or PGM's". However, this study reveals that EX PGM allowed IN to re-integrate and reconnect to COM's and F which cannot be overlooked as potential protection from R
Nowakowski-Sims et al. (2018). Relearning to live life without substances: A grounded theory of the impact of	Inferred convoy model of social relations	**Design:** Qualitative grounded theory **Purpose:** Explore the role of GP EX on helping	N=16 **Demographics:** 81% M, 19% F, MA 31.8 $\pm$ 8.23, LOT SBR *M* 45.19 $\pm$ 24.43 months, 66% previous TX, majority	Failing to succeed; participating in PGM; belonging to COM **Phase I**: Achieving SBR **Phase II**: Maintaining SBR	Immediate transcribed tape recordings memos, IN INT, open-ended Q, pseudonyms, member checking, peer review, two R	Charmaz's grounded theory strategies, line-by-line open coding, independent then group agreeance coding, axial	GP EX PGM mirrors 12-step PGM and is conducive to feelings of belonging, COM, accountability which assist in MN of SBR	**LOE:** VI **Strengths:** Saturation achieved, visual model for representation of themes & phases; meets all PICO **Weaknesses:** convenience & snowball sampling, underrepresentation of

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group physical exercise on sobriety **Funding:** Barry University Faculty Research **Country:** USA **Bias:** None recognized		those in R maintain SBR	CrossFit GR EX PGM **Site/setting:** Outpatient R GP, gym in SE US; INT conducted at neutral public location **IC:** 18+ YO, in R & PN GP EX program ≥ 3 months **EC:** not disclosed **Attrition:** Not disclosed		IN's in another GR EX PGM asked to review analysis & establish confirmability	coding, selective coding, visual model		minorities, cost of EX PGMs may be B **Conclusions**: Supports the use of PL GP EX as adjunct TX for SUD; PL GP EX critical to MN SBR secondary to first seeking SBR through 12-step model; GP EX + PL & EM H **Feasibility/Applicability to patient population:** Feasible for SUD populations in which resources for TV are not abundant or with COM focus; Generalizable to those in early R from SUD. All aspects relevant to PICO and has reasonable timeframe for project. Having a combination of 12-step PGM & EX PGM would be useful as this study identifies that they mirror one another
Stevens et al. (2020). Tools you'll have for the rest of your	Symbolic Interactionism	**Design:** Qualitative, grounded theory	N=26 **Demographics:** Not stated	Aide for R, PL benefits of PN, "being part of the	GP INT, semi-structured INT guide, transcribed	Atlas.ti software, transcript analysis,	PGM was critical aide in the R progress, eased transitions back	**LOE:** VI **Strengths:** Theoretical saturation achieved; fills

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Citation	Theory/ Conceptual Framework	Design/ Method/	Sample/Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Worth of Study to Practice
life: A qualitative evaluation of a fitness and vocational training program for substance use recovery **Funding:** Fitness SF **Country:** USA **Bias:** Author is employee of Fitness SF		**Purpose:** Gather feedback about the FNS vocational PGM, how the PGM affected R, and how it impacted their lives; 5x/wk 60 min x 12 wks	**Site/setting:** Residential; Large FNS facility and SUD RTC; walkable from TV center to FNS facility **IC:** PTS of Live Fitness PGM, 90-day SBR **EC:** None disclosed **Attrition:** 15%	COM, easing back into life"	verbatim double checked with audio file, theoretical saturation achieved	word-by-word and segment-by-segment coding, axial and selective coding, memos	into COM, provided platform for future success	gap in research; unanimous agreement F PGM served as aid for R; visibility of peer success **Weaknesses:** GP INT's, 90-day SBR IC, bias **Conclusions**: TX centers should invest attention and resources into guided FNS PGM; F PGM may provide basis to build RC **Feasibility/Applicability to patient population:** Generalizable to SUD population. Feasibility of such PGM may be difficult due to FNS facility agreement/need for employees. Effective and innovative way to encourage SBR and ease transition back into COM. Could certainly include H ED pieces. Applicable to PICO

Key: **-** Reducing/Decrease/Negative **+** Increase/Improve/Positive **AB** Abstinent **AC** Aftercare **ACC** Accomplishment **ACH** Achievement **AFF** Affect **AP** Appearance **ATT** Attitude **AUS** Australian **AZN** Asian **B** Barriers **C** Caucasian **CAP** Capital **COM** Community **CR** Cravings **CTC** Community Treatment Center **EC** Exclusion Criteria **ED** Education **EM** Emotion **EX** Exercise **F** Family **FG** Feeling **FNS** Fitness **FU** Former Users **GP** Group **H** Health **IC** Inclusion Criteria **IMP** Importance **IN** Individual **IND** Independently **INT** Interview **ISO** Isolation **H** Health **LOE** Level of Evidence **LOT** Length of Time **M** Male **MA** Mean Age **MGMT** Management MO Motivated **MH** Mental Health **MN** Maintain/Maintenance **OTC** Outpatient Treatment Center **PC** Personal Capital **PGM** Program **PL** Physical **PN** Participation **PS** Peer Support **PTS** Participants **PZD** Personalized **Q** Questions **QoL** Quality of Life **R** Recovery **RC** Recovery Capital **RL** Relapse **RNE** Routine **RS** Relationship **RTC** Residential Treatment Center **S** Satisfaction **SBR** Sober/Sobriety **SC** Social Capital **SOC** Social **STR** Structure **SU/D** Substance Use/Disorder **SUP** Support **T** Trust **TX** Treatment **WB** Wellbeing **WD** Withdrawal **Y** Youth **YO** Years Old

Table A2
Evaluation Table Quantitative Studies

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/Results	Worth of Study to Practice
Brellenthin et al. (2019). Psychological and endocannabinoid responses to aerobic exercise in substance use disorder patients **Funding:** NIH **Country:** USA **Bias**: none recognized	Not stated, inferred CBM	**Design:** RCT **Purpose:** Determine the effects of acute (single) and chronic (6-weeks) aerobic EX as an adjunctive to IOP TAU on various psychological symptoms and eCB's; three 40-min EX sessions/week on treadmill, 18 total	N=21 patients n=11 (EG) n=10 (CG) **Demographics:** 57% M, 43% F; IOP only; MA 35 YO; 76% C; 71% college-ED; SUD similar; 52% on antidepressants, 29% on anxiolytics, 33% on no Rx at BL **Setting**: Limited information; IOP; laboratory monitored by research assistants; Quiet sessions took place within sound-dampened chamber without electronic or mobile devices; EG on treadmill **IC**: ability to read and write in English to	**IV1:** EX **DV1:** continuous abstinence rates **DV2:** depression **DV3:** anxiety **DV4-:** self-efficacy **DV5:** perceived stress **DV6:** mood states **DV7**: cravings **DV8:** circulating eCB's **EX**- anaerobic exercise	TLFB (α=0.70-0.94), SDS ($\alpha \geq 0.73$), PHQ-9, GAD-7, SCQ, PSS (α=0.85), Craving questionnaires (α=0.61-0.90), POMS (α=0.84-0.95), & blood sample eCB quantifications	Mann-Whitney *U* and ANOVA	**DV1** (p=0.27), clinically significant reduction in frequency to BL use by 50% for both groups **DV2** (p=0.56), **DV3** (p=0.81), **DV4** (p=0.35), **DV5** (p=0.001 and p=0.002), **DV6** (p=0.01 all), **DV7** (p=0.04/0.06), **DV8** (p=0.002; $\eta^{2=}$0.38, p=0.02)	**LOE**: II **Strengths:** Appropriate statistical analysis; use of consort diagram, tables, and bar graphs for reporting data is useful; highly reliable instruments used; measurable fitness levels; comparison group; higher than typical retention rate **Weaknesses** Short length of study (6 weeks), small sample, many limitations **Conclusions:** Supportive that patients currently enrolled in IOP were able to adhere to PGM. Supportive that EX did not negatively

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			provide consent and complete study questionnaires; diagnosis of any SUD meeting IOP LOC; currently PL inactive, not participating in any formal/structured EX PGM **EC**: severe depression, psychotic, or bipolar disorders; cardiac disease or other MED condition making EX unsafe; cancer, autoimmune, or other chronic conditions; pregnancy or plans for pregnancy; concurrent methadone TX **Attrition:** 23% lost to different phases					impact effects of IOP. EX may not promote full AB but can assist in reduction of drug use and cravings, and improve stress, mood, vigor, and AEA. **Feasibility/Applicability to patient population:** Generalizable to SUD outpatient population; Relevant to PICO; length of time achievable
Gür et al. (2017). The effect of the cognitive-behavioral model-based	CBM	**Design:** Quasi-experimental pretest posttest control group	n=37 EG: 18 CG: 19	**IV:** EX + PED **DV1:** PF **DV2:** RP **DV3:** BP **DV4:** GH	SF-36 (α=0.76-0.81)	SPSS, post hoc power analysis, Mann	**DV1:** BG (p=0.011), EG (p=0.003), CG (p=0.327)	**LOE:** III **Strengths:** Appropriate statistical analysis with explicit discussion, ease

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psychoeducation and exercise intervention on quality of life in alcohol use disorder **Funding:** No financial support for this research, authorship, and/or publication **Country:** Turkey **Bias:** None recognized		**Purpose:** Assess the effect of CBM-based PED and EX IN on QoL in persons w/ AUD; EX 45-60 min 3x/wk, PED 50-60 min 1x/wk x 6 weeks	**Demographics:** 19% F, 81% M; 18.9% < HS ED, 45.9 % HS ED, 35.1% university ED; 65% UNE, 35% EMP; 48.6 % married, 35.1% single, 16.2% divorced; 86.5 live with parents, 13.5% live alone; MA 45.13 $\pm$ 10.74; avg years AUD 22.51 $\pm$ 9.4 **Site/setting:** Outpatient/AA; Seminar hall and gym **IC:** 18-65 YO, AUD Dx, continuing regularly $\geq$ 3 days with AA, early in R (AB 1 month), sedentary **EC:** PL, MED, or Rx problems that would interfere with EX, pregnant or plan to become pregnant, current psychotic symptoms, current suicidality, individuals	**DV5:** VI **DV6:** SF **DV7:** RE **DV8:** MH **PF:** physical functioning **RP**: role limitations attributable to physical problems **BP**: bodily pain **GH**: perception of general health **VI**: vitality **SF**: social functioning **RE**: role limitations attributable to emotional problems **MH**: mental health **DIF:** 8 question form		Whitney *U,* chi-square, Wilcoxon Signed Rank Test	**DV2:** BG (p=0.055), EG (p=0.055), CG (p=0.339) **DV3:** BG (p=0.098), EG (p=0.207), CG (p=0.342) **DV4:** BG (p=0.033), EG (p=0.006), CG (p=0.98) **DV5:** BG (p=0.177), EG (p=0.000), CG (p=0.046) **DV6:** BG (p=0.245), EG (p=0.016) CG (p=0.118) **DV7:** BG (p=0.407), EG (p=0.006), CG (p=0.234) **DV8:** BG (p=0.018), EG (p=0.059), CG (p=0.037)	of tables for reporting, strong findings, sample early in R, adequate sample size, description of EX and PED, incentive materials/resources needed for INT considered, American College of Sports Medicine guidelines for EX INT **Weaknesses:** Non-RCT, small sample size, many lost to attrition, AUD only, unknown long-term consequences of study **Conclusions**: CBM based PED & EX increased domains of QoL of individuals with AUD which may allow individuals to take precautions to recovery from AUD, increase EX adherence, cope with

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			with AUD with co-morbid diseases **Attrition:** EG 24%, CG 19%	developed by researcher to collect sociodemographic information **SF-36:** tool to measure individuals perceived health status/QoL profile				negative emotions, and provide lifestyle changes **Feasibility/Applicability to patient population:** Generalizable to AUD, variables considered applicable to PICO; strong evidence/efficacy of group EX + PED INT to improve QoL and social interaction in those with AUD - may promote sustained R & strengthen social networks; length of study feasible for DNP project
Muller et al. (2015). Group exercise to improve quality of life among substance use disorder patients	Not stated	**Design:** Non-random cohort study **Purpose:** Explore the feasibility and QoL effects of	N=35 Completers: 24 Non-completers: 11 **Demographics:** 26% F, 74% male; MA 41 YO; 94% Norwegian descent; 62% never married; 83%	**IV:** EX **DV1:** Physical Health **DV2**: Psychological Health **DV3**: Social Relationships	WHOQOL-BREF (α = 0.70-0.77, CFI = 0.89) HSCL-25 (α = 0.93) Attendance data	Mann-Whitney *U,* ANOVA, Greenhouse-Geisser F-tests,	**DV1**: p=0.005 **DV2**: p=0.023 & $p < 0.0005$ **DV3**: p=0.919, non-completer clinical significance	**LOE:** IV **Strengths:** Clinical and statistical significance found; QoL profile plots provide visual for clinical significance; PGM received positively

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Funding: No grants received from funding agencies in public, commercial, or not-for-profit sectors. The Norwegian Centre for Addiction Research compensated one coach (salary). Non-financial incentives donated by local sports and fitness organizations **Country:** Norway **Bias:** None recognized		group EX among residential SUD patients through implementation of 10-week, low intensity group EX PGM that was voluntary and led by motivating coaches outside of TX system**;** three 30-minute sessions/wk	neither in labor market or studying; <12% EMP; 80% secondary ED training or less; ~92% had previous inpatient or outpatient; 69% single substance, 50% poly-substance – 41% benzodiazepine, 38% alcohol, 28% cannabis, 25% opiates, 25% amphetamines; 77% tobacco smokers; 55% clinical distress & depression, 48% anxiety **Site/setting:** Residential SUD TX PGMs; On premise or within 1 km of premise **IC:** 18-65 YO, enrolled in long-term residential SUD TX, and sedentary **EC:** Pregnancy or intended pregnancy	**DV4**: Environmental Domain **DV5**: Anxiety **DV6:** Depression **DV7**: Program feasibility **DV8**: AB **WHOQOL-BREF**: World Health Organization Quality of Life Brief **Hopkins Symptoms Checklist**: HSCL-25		SPSS, MCID	**DV4**: p=9.348, completer clinical significance **DV5**: p=0.103; 28% reduction completers; 5% increase non-completers **DV6**: p=0.072; 42% reduction completers; 15% increase non-completers **DV7**: 44% attendance adherence **DV8:** 74% for completers compared to 37% non-completers	by participants; best practice recommendations; benefits and advantages identified by participants; participants were not excluded for health issues; motivation techniques **Weaknesses:** small sample size, lack of CG, group differences at baseline and not truly comparable statistically, control of confounding variables lost; specific activity and prescribed intensity, conservative effect estimates/flaw in inclusion for analysis **Conclusions**: QoL improved among completers in EX group; Low doses of group EX can yield appreciable QoL benefit;

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			Attrition: Not described, states 69% completion					socialization was obvious **Feasibility/Applicability to patient population:** PGM is feasible for SUD patients within TX setting; methods and considerations for EX barriers are useful when planning project
Rawson et al. (2015). Impact of an exercise intervention on methamphetamine use outcomes post-residential treatment care **Funding:** National Institute on Drug Abuse (NIDA) **Country:** USA **Bias:** None recognized	Not stated	**Design:** RCT **Purpose:** Characterize the effects of 8-week EX Int on MET use outcomes at 1-, 3-, & 6-months post-discharge from residential TX compared to a health education CG	N=135 EG: 69 CG: 66 **Demographics:** 80% male; MA 31.7 $\pm$ 6.9 YO; H 48.1%, C 41.5%, AF 4.4%, AZN 3.7%, Other 2.2%; 16.3% EMP; 64.7% HS ED; MET use ~16.3 days/month **Site/setting:** Residential TX center & outpatient; Treadmill and weight room	**IV:** EX **DV1**: MET use outcomes by study condition **DV2**: MET use severity subgroups **DV3**: Study Int participation and MET use **DV4**: Effect of post-discharge EX **DV5**: Lower MET-use severity versus	UDS & SUI (α=0.65, 85% agreement)	Intent-to-treat model, mixed-effects	**DV1**: UDS OR 1.51, p=0.013, clinically significant decrease (8%); SUI β=0.23, p-0.75, clinically significant decrease (1.4 days) **DV2:** UDS (OR=0.17, p=0.03), SUI (β=0.46, p-0.02,) **DV3**: UDS (OR=3.29, p<0.05),	**LOE:** II **Strengths:** Diagram and tables provided for clarification, carry over effect demonstrated by reductions in MET use at 1-, 3-, 6-month follow-up, mixed-model appropriate for statistical evaluation, low attrition **Weaknesses:** Data is difficult to follow, male dominant, MA only; self-report measurements

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			IC: 18-45 YO M, 18-55 F, vital sign stability, ability to comply with study procedures **EC:** opiate dependence, significant cardiac or pulmonary disease, musculoskeletal disease that would prevent participation, psychiatric impairment warranting hospitalization or primary TX, other MED conditions, ECG findings, or laboratory results that would compromise safety **Attrition:** 2.2%	higher MET-use severity **Lower severity use**: using MET 18 or fewer days/previous month **Higher severity use**: using MET 19 or more days previous/month			SUI (β=-.304, p=0.05), more sessions attended = less MET use **DV4**: UDS (p=0.03), SUI (p-0.01) **DV5**: p<0.05	**Conclusions**: Results support the value of EX as post-TX component for individuals using MET 18 or fewer days/month; ameliorating relapse sustained after EX INT; higher AB rates among those who attended 16 or more EX sessions; EX decreases MET use among lower severity MET users with carryover benefits over time even after EX discontinued **Feasibility/Applicability to patient population:** Findings may not be generalizable to EX INT beginning in outpatient setting, less frequent or less intense EX PGM, specific aerobic or resistance training INT, or other than MET users. Positive findings of R

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/Results	Worth of Study to Practice
								reduction post EX INT cannot be overlooked.
Wang et al. (2014). Impact of physical exercise on substance use disorders: A Meta-analysis **Funding:** ISP grant from Scientific and Technological Commission of Shanghai, National Foundation of China and the Project of Scientific and Technological Innovation grant from Shanghai University of Sport	Not stated; Inferred Trans-theoretical Model and/or Social Cognitive Model	**Design**: Quantitative meta-analysis following PRISMA guidelines **Purpose**: Verify the TX effects of chronic PL EX on various SUD by analyzing current RCT studies and provide details of potential optimal PL EX therapies for specific drug addictions	N=22 articles **DS:** PubMed, Web of Science, Elsevier, China National Knowledge Infrastructure, and China Info **IC**: articles studying PL EX intervention's effect on drug abuse, RCT's, objects of study were adults over age 18 years old assessed as alcohol, nicotine, and illicit drug abusers through DSM-III(R)/IV, results from chronic PL EX experimental studies, primary outcome measures in the study included rate of AB from drug addiction, withdrawal symptoms,	**IV**: EX **DV1**: Abstinence rates **DV2**: withdrawal symptoms **DV3**: anxiety levels **DV4**: depression levels	Confidence interval set at 95%, p value < 0.05, funnel plot visual, Egger's test, and false safe number, Abstinent rate, BDI, STAI(state), Withdrawal symptoms, SAS, SDS, HAS, MPSS, BDI, POMS, HRSD, STAIT, CESD, SAIS	PRISMA, Q test, I^2 test, fixed-effects model	**DV1:** OR=1.69 (95% CI: 1.44, 1.99), z=6.33, p<0.001 **DV2:** SMD = -1.24 (95% CI: -2.46, -0.22), z= -2.00, p<0.05; **DV3**: SMD= -0.31 (95% CI: -0.45, -0.16), z=4.11, p<0.001 **DV4**: SMD =-0.47 (95% CI: -0.80, -0.14) z=-2.76, p<0.01. PL EX leaves a long-lasting TX effect on SUD likely due to	**LOE**: I **Strengths:** Frequently cited in other literature found which affirms that this is a very strong study that other researchers have looked to for application. RCT's for this population are lacking which this analysis helped uncover and summarize; flow charts, tables, and forest plot deployed for readers **Weaknesses**: Limitations of overall literature regarding topic for meta-analysis **Conclusion:** This article supports the feasibility and efficacy of a PL EX

Key: **2-AG** 2-arachidonoylglycerol **AA** Alcoholics Anonymous **AB** Abstinent **AF** African American **AEA** N-arachidonoylethanolamide **AUD** Alcohol Use Disorder **AVOVA** Analysis of Variance **AZN** Asian **BDI** Beck Depression Inventory **BG** Between Groups **BL** Baseline **C** Caucasian CESD Center for Epidemiological Studies Depression Scale **CBM** Cognitive Behavioral Model **CG** Control Group **DIF** Descriptive Information Form DS Databases Searched **Dx** Diagnosis **eCB** endocannabinoid **EC** Exclusion Criteria **ED** Education **EG** Experimental Group **EMP** Employed **EX** Exercise **F** Female **GAD-7** Generalized Anxiety Disorder-7 item **HAS** Hamilton Anxiety Score **HRSD** Hamilton Rating Scale for Depression **H** Hispanic **HS** High School **IC** Inclusion Criteria **INT** Intervention **IOP** Intensive Outpatient Program **LOC** Level of Care **LOE** Level of Evidence **M** Male **MPSS** Mood and Physical Symptoms Scale-anxiety **MA** Mean Age **MCID** Minimally Clinically Important Differences **MED** Medical **MET** Methamphetamine **PED** Psychoeducation **PF** Physical Functioning **PGM** Program **PHQ-9** Patient Health Questionnaire **PL** Physical **PSS** Perceived Stress Scale **PRISMA** Preferred Reporting Items for Systematic Reviews and Meta-Analyses **POMS** Profile of Mood States **QoL** Quality of Life **R** Recovery **RCT** Randomized Controlled Trial **Rx** Medications/Prescriptions **SAIS** State-Trait Anxiety Inventory Scale **SAS** Self-Rating Anxiety Scale **SCQ** Situational Confidence Questionnaire **SDS** Severity of Dependence Scale **SF-36** Short Form Health Survey **SPSS** Statistical Package for Social Sciences **SRDS** Self-Rating Depression Scale **SUI** Substance Use Inventory **SUD** Substance Use Disorder **TLFB** Timeline Follow Back **TAIS** Trait Anxiety Inventory State **TAU** Treatment as Usual **TX** Treatment **UDS** Urine Drug Screen **UNE** Unemployed **YO** Years Old

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/Results	Worth of Study to Practice
Country: Not listed **Bias:** Limitations in literature collection; included studies have risk of bias, lacking assessor blinding and allocation concealment most frequent shortcoming of studies			level of depression, and anxiety, BL of primary outcome measures and descriptive statistical data must be obtainable **EC**: reviews, animal studies, no PL EX, no addictions, preventative studies, inquiring studies, cross over trials, cohort studies, acute EX studies, not the main outcome, no original data **Attrition**: n/a				changes in brain structure function	INT for both current and former SUD users to promote AB rates, which addresses PICO, as well as reduction of withdrawal symptoms, anxiety, and depression levels which may perpetuate continued adherence to TX **Feasibility/Applicability to patient population:** Generalizable and practical adjunctive TX option for entire SUD population

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Table A3

Synthesis Table

Study (Author, year)	Brellenthin, 2019	Duffy, 2013	Gür, 2017	More, 2018	Morton, 2016	Muller, 2015	Nowakowski-Sims, 2018	Rawson, 2015	Stevens, 2020	Wang, 2014
Design/ LOE	RCT/ II	Qual/VI	QE/ III	Qual/VI	Qual/VI	NR CS, IV	Qual/VI	RCT/II	Qual/VI	MA/I
Sample										
n subjects	21	45	37	27	17	35	16	135	26	22
Mean Age	35	39	45	18	37	41	31.8	31.7	Not stated	n/a
Country	USA	UK	Turkey	AUS	Ireland	Norway	USA	USA	USA	n/a
Setting										
Residential				X		X		X	X	
Outpatient	X	X	X		X		X	X		
Intervention										
Exercise	X		X	X	X	X	X	X	X	X
Education			X		X				X	
Group			X	X	X	X	X		X	
Individual	X	X					X	X		
Length per Session	40m	n/a	50m	60m	60m	30m	n/a	60m	60m	n/a
Sessions Per Week	3x/wk	n/a	1x/wk	2x/wk	7x/wk	3x/wk	n/a	3x/wk	5x/wk	n/a
Length of Intervention	6wk	n/a	6wk	12wk	20wk	10wk	12wk	8wk	12wk	n/a

Key: **CBM** Cognitive Behavioral Model **ED** Education **EX** Exercise **INT** Interviews **ISO** Isolation **PGM** Program **PS** Peer Support **R** Recovery **SCT** Social Cognitive Theory **SF-36** Short Form Health Survey **SDS** Severity of Dependence Scale **SOC** Social **SUI** Substance Use Inventory **TLFB** Timeline Follow Back **UDS** Urine Drug Screen **WHOQOL-BREF** World Health Organization Quality of Life Brief

Applicable Measurement Tools	TLFB, SDS	INT	SF-36	INT	INT	WHOQOL-BREF	INT	UDS, SUI	INT	SDS
Framework	CBM	SCT	CBM	SOC Interaction	SOC interaction or R capital model	n/a	Convoy model social relations	n/a	Symbolic interactionism	n/a
Outcomes Identified										
Cravings or Withdrawal	-			-	-				-	-
Drug Usage	-				-	-		-		-
Social Support/Health			+	+	+	+			+	
Physical Health	+		+	+		+	+		+	
Mental Health	+		+	+	+	+	+		+	+
QoL	+		+	+	+	+			+	
Themes Identified										
PS valuable to R		X		X	X		X		X	
Sense of Belonging/Understanding		X		X	X		X		X	
+Health through EX		X		X	X		X		X	
Importance +R Capital		X		X	X		X		X	
EX provides Structure				X	X		X		X	
+Knowledge lifestyle choices					X				X	

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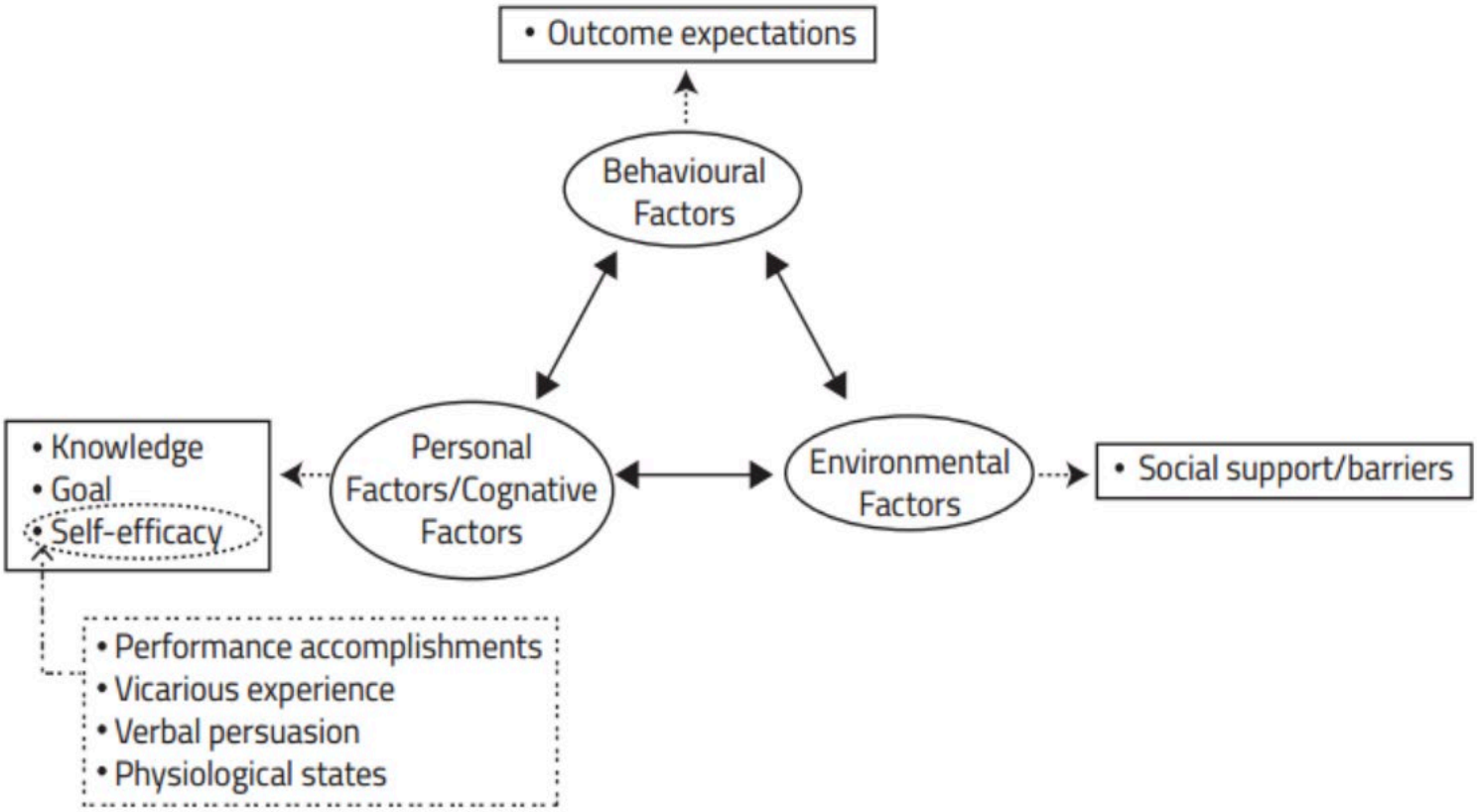
Appendix B

Models and Frameworks

Figure 1

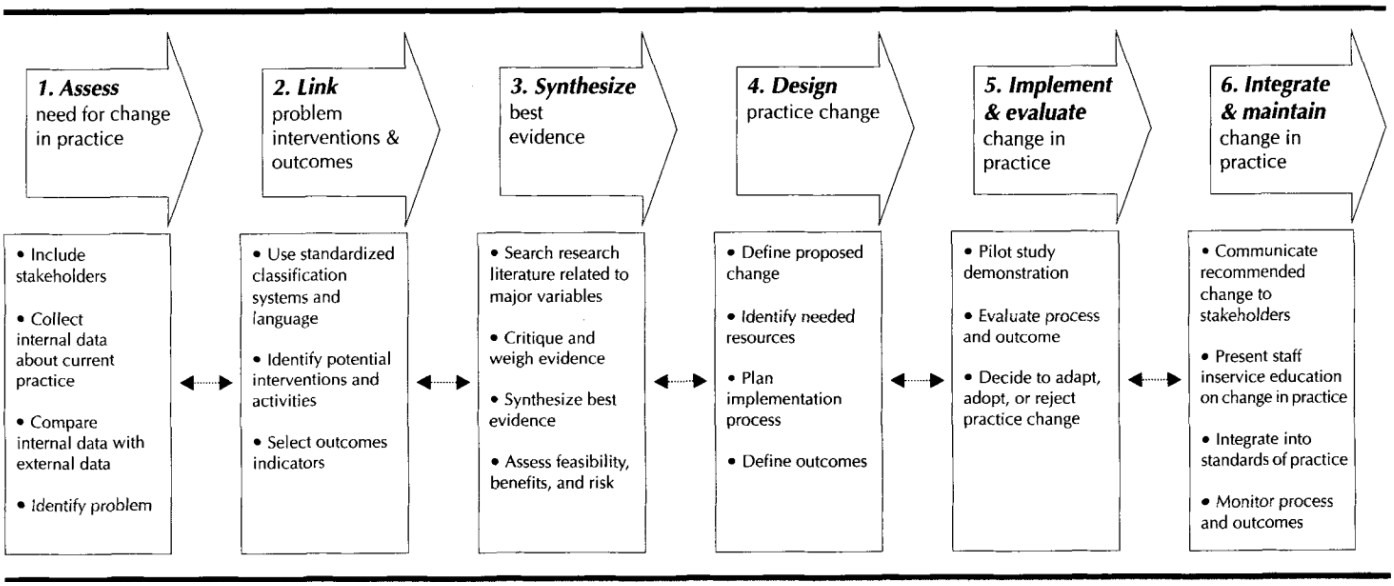
A Social Cognitive Model



Chin & Mansori (2018)

Figure 2

Rosswurm and Larrabee's Model for evidence-based practice



Rosswurm & Larrabee (1999)

Figure 3

Logic Model

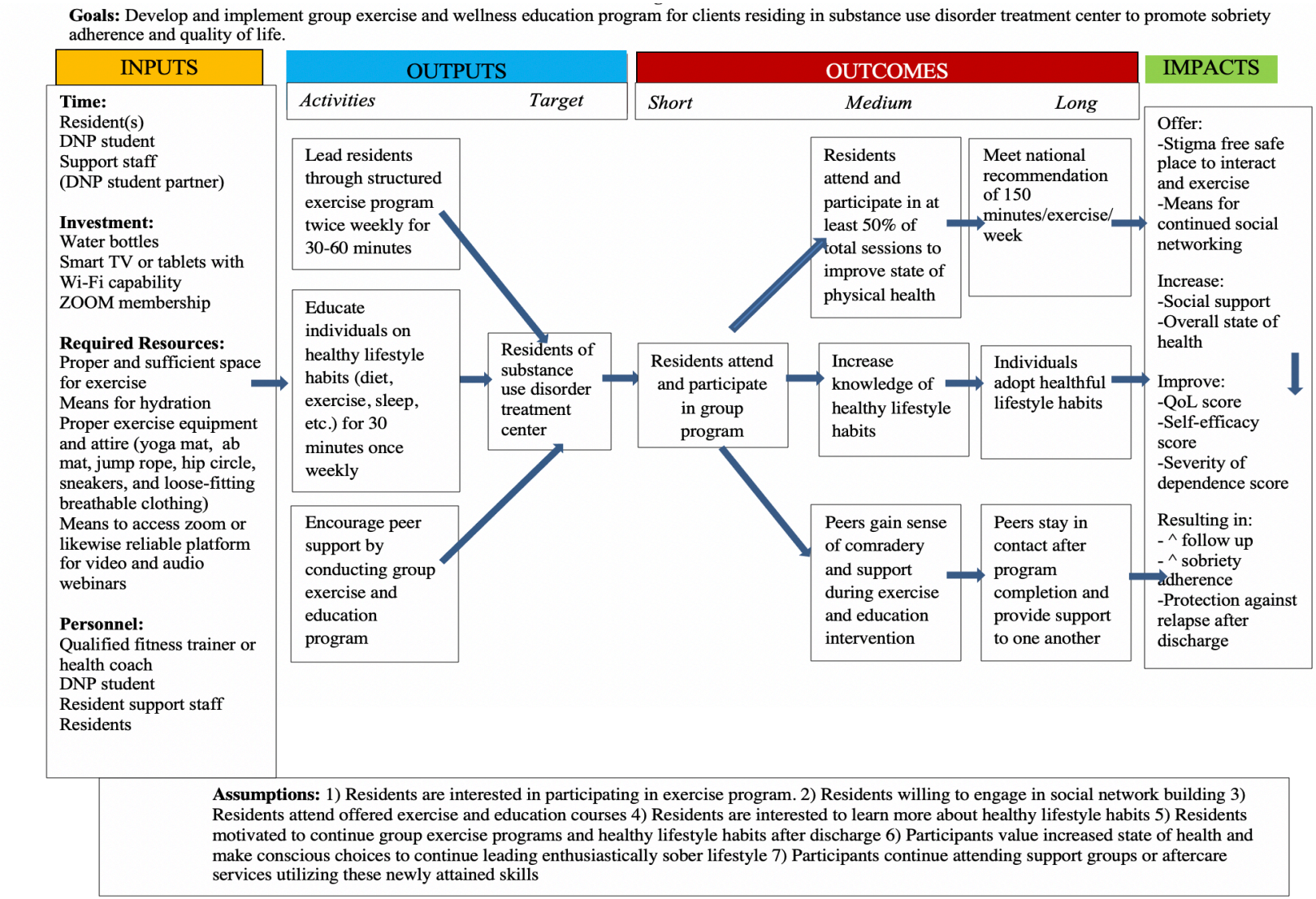


Figure 4

Budget Model

Projected Costs for Exercise and Wellness Education Intervention: Residential Treatment Center (RTC)		
	Expenses	**In-Kind Support**
Personnel (Direct Cost)		
Project director $40/hr x 3hr/wk x 15wks		$1800.00 (volunteered time)
Qualified fitness trainer $40/hr x 3hr/wk x 12wks		$1440.00 (volunteered time)
RTC Director of Operations $50/hr x 1hr/wk x15wks		$750.00 (volunteered time)
RTC Operations Manager $40/hr x 1 hr/wk x 15wks		$600.00 (volunteered time)
RTC Clinical Director $30/hr x 1 hr/wk x 15wks		$450.00 (volunteered time)
Support staff for medical needs of participants as needed $20/hr x 3hr/wk x 12wk		$720.00 (organization providing)
Equipment/Materials (Direct Cost)	**Expenses**	**In-Kind Support**
Yoga mat/workout mat $15 x 60	$900.00	
Ab-mat $25 x 60	$1500.00	
Hip-circle $25 x 60	$1500.00	
Jump rope $25 x 60	$1500.00	
Reusable water bottle $5 x 60	$300.00	
Disinfectant materials	$100.00	
1-inch binders $2 x 60	$120.00	
Filler paper $2.50/125 pack x 8	$20.00	
Page protectors $0.10/page x 1000	$100.00	
Color printing services $0.30/page x 1000	$300.00	
Writing utensil (erasable pen) $5/12-pack x 5	$25.00	

75-inch or larger smart TV $1750 x 2		$3500.00 (organization providing or purchasing)
Webcam w/ microphone $100 x 2		$200.00 (organization purchasing)
Security camera $150 x 2		$300.00 (organization purchasing)
Operations (Indirect Costs)	**Expenses**	**In-Kind Support**
Gym space utilization (on-site) $20/hr x 3hr/wk x 12wks		$720.00 (organization providing)
Air conditioning/electricity of gym space $150/month x 2.25 months		$450.00 (organization providing)
WiFi capability to stream virtual wellness interactive webinar $100/month x 2.25 months		$225.00 (organization providing)
ZOOM or likewise webinar membership $15/month x 2.25 months		$35.00 (provided by project director, cost savings)
Total cost of project	**Expenses of project**	**In-Kind donations**
$17,555	($6,365.00)	($11,190.00)
Cost breakdown of SUD within US and cost to organization		
Total health expenditure cost of SUD in U.S.	$740 billion/annually	
Cost per person in the U.S. for SUD $370.00 x 60	($22,200.00)	
Typical cost/person/day at RTC $1000/day x 21d x 60	($1,260,000.00)	
Typical cost of group fitness classes $35.00/class/person x 60 x 6	($12,600.00)	