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THE IMPACT ON RECOVERY CAPITAL FOLLOWING HIGH-
INTENSITY EXERCISE ADJUVANT THERAPY IN OPIOID
ADDICTION TREATMENT

Aaron M. MacDonald

The College of Public Health

University of Kentucky

2022

THE IMPACT ON RECOVERY CAPITAL FOLLOWING HIGH-
INTENSITY EXERCISE ADJUVANT THERAPY IN OPIOID
ADDICTION TREATMENT

ABSTRACT OF CAPSTONE

A Capstone project submitted in partial fulfillment of the
requirements for the degree of Doctor of Public Health in the
College of Public Health
at the University of Kentucky

By:
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ABSTRACT OF CAPSTONE

THE IMPACT ON RECOVERY CAPITAL FOLLOWING HIGH-INTENSITY EXERCISE ADJUVANT THERAPY IN OPIOID ADDICTION TREATMENT

OBJECTIVE: The Counseling Center (TCC), a substance abuse disorder (SUD) recovery facility located in Portsmouth, Ohio, began investigating alternative treatment methods that may improve long-term recovery rates through increased recovery capital (RC). RC takes into account numerous social and physical variables during the recovery phase of SUD and evidence shows a higher RC can lead to better recovery outcomes. TCC partnered with Portsmouth Spartan Kettlebell Club (PSKC), a nearby CrossFit (CF) affiliated gym, and created a partnership that allowed clients at TCC to participate in a guided CF program. The purpose of this study was to examine how this program, which focuses on short, high-intensity workouts affected the recovery capital of those that are enrolled or went through the program versus those clients at TCC who did not participate.

METHODS: Primary data was collected using an electronic survey. Survey was sent to eligible participants, individuals receiving substance use disorder treatment at TCC, to observe statistical frequencies and averages between those who went through the TCC/PSKC program and those that did not.

RESULTS: Participation in the CF program appears to be highest in those with a substantial history of SUD as 92% of those participating in the program have reported at least 1 previous recovery attempt. Those in the program also reported lower levels of anxiety and greater perceived overall health. There also does appear to be a positive correlation between those in the CF program and higher aspects RC, specifically levels of energy needed to complete tasks.

CONCLUSIONS: High-intensity exercise does appear to be associated with greater recovery capital. Further studies are warranted to examine the role of high-

intensity exercise. Specifically, the long-term outcomes of those who go through the program and the impact on the community RC of those in the program.

KEYWORDS: opioid, adjuvant, recovery, substance use disorder, CrossFit, intensity

(Student's Signature) _____

(Date) _____

THE IMPACT ON RECOVERY CAPITAL FOLLOWING HIGH-
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ADDICTION TREATMENT

By
Aaron M. MacDonald
2022

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(Signature of Director of Doctoral Studies)

_____ (Date)

THE IMPACT ON RECOVERY CAPITAL FOLLOWING HIGH-
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ADDICTION TREATMENT

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CHAPTER 1

INTRODUCTION

Introduction

The opioid crisis in the US is entering its 3rd decade and remains an ongoing and significant issue. The Department of Health and Human Services (2019) estimates that in 2019, 10.1 million people aged 12 or older misused opioids in the past year. Of that population, 9.7 million misused prescription pain relievers, and nearly 750,000 used heroin (*Opioid Crisis Statistics _ HHS.Gov.Pdf*, n.d.). While the issue is nationwide, there are pockets of the US that have been especially ravaged by the crisis.

Background

Portsmouth, Ohio, located in Scioto County is a town and region that has been hit especially hard by the initial prescription opioid crisis of the early 2000s, and currently, the non-prescription opioid crisis. Between 2006 and 2012, an estimated 37,686,098 prescription opioid pills moved through Scioto County (*ARCOS: Automation of Reports and Consolidated Orders System*, 2011), earning it the title of “America’s Pill Mill” by various media outlets (Arnade, 2017; Ulloa, 2019).



Following the crackdown on prescription opioid access, non-prescription opioids, almost exclusively in the form of heroin, quickly gained a foothold in southeast Ohio. Beginning in 2007, Scioto County officials reported an almost 100% transition to heroin from those who had been abusing prescription opioids (Krisberg, 2014). Regardless of the form, Scioto County continues to experience some of the highest overdose death rates, not only in Ohio but in the US (Sullivan, 2021). A 2021 report by the Ohio Attorney General's

Office placed Scioto County as Ohio’s leader in opioid overdose deaths, with a rate of 35.22 deaths/100,000 population (Sullivan, 2021), much higher than the US’s overall opioid overdose death rate at 21.6/100000 (CDC, 2022).

The Counseling Center (TCC), located in Portsmouth, Ohio, is one of the largest and oldest treatment facilities in Scioto County. On a given day in 2022, TCC will treat between 500-600 clients across their multiple facilities. TCC expects to treat a total of 2,500 clients this year.



Facing an increasing client population and an increasing rate of relapse in their clients with opioid use disorder (OUD), TCC began looking for treatment methods that would engage clients longer than their course of treatment and establish long-term habits that would engage clients longer than treatment generally would last. TCC decided to begin a partnership with the Portsmouth Spartan Kettlebell Club (PSKC), a nearby CrossFit (CF) affiliated gym.

According to TCC Director, Max Liles, the partnership with PSKC was established based on TCC’s holistic approach to client care and their philosophy of viewing the client as a whole person and not just a person with a single issue. TCC has a history of working with clients to provide free/low-



cost housing, transportation, food services, educational and vocational development, primary health care, and other safety-net services. The addition of supervised gym instruction from certified staff allowed clients to invest in their long-term physical health.

PSKC does not resemble a typical gym. Workouts are done in a group setting and are conducted in a renovated warehouse with little in the way of amenities. Workouts are

written on the board and then introduced to the group by the trainers. Most sessions utilize the gym's pull-up bars, barbells, bumper plates, kettlebells, medicine balls, and various conditioning devices including rowing machines and bike/ski ergometers. Other workouts are done by running outside of the facility. Participants are monitored and encouraged by trainers to push themselves past their perceived comfort zone and challenge themselves mentally and physically. Organizers of the partnership hypothesized that in addition to physical fitness, the TCC participants could thrive in this type of environment and create habits that could assist with long-term recovery. Special classes were designed and took into account the untrained nature of those participating in the program and made special effort to provide a program that slowly increased in intensity and complexity.

CrossFit

CF is an exercise program that was founded in the mid-1990s and has experienced rapid (O'Connor, 2017). As of 2021, CF was a 4 billion dollar company with more than 15,000 CF-affiliated gyms in 120 countries (Bates, 2021). As a training methodology, CF combines multiple training philosophies to create CF programming. In any given workout of the day (WOD) a CF participant, under the guidance of a CF-certified trainer, might partake in elements of gymnastics, strongman training, Olympic lifting, sprints, and calisthenics. Workouts are intended to be done at the highest intensity level possible and as quickly as possible. Most CF workouts, often referred to as the workout of the day (WODs) are scalable to the participant and are designed to be done in 20 minutes or less.

There is a competitive element to most CF gyms. Participants compete against other gymgoers for recognition and many gyms highlight and keep track of workout winners. CF gyms will also track various performance metrics, so participants will monitor workout times and weight lifted and try to better those metrics from workout to workout. There are also a series of competitive CF competitions. Many of these are done locally at the amateur level with CF gyms competing against each other, but CF also has a professional series of competitions, where men and women compete for the CF title of "Fittest on Earth."

The motivational atmosphere of CF gyms is one of the primary reasons for developing the TCC/PSKC partnership. Research into CF has shown that the motivation for engaging in CF is similar to the motivation for participating in competitive sports, which may lead to long-term adherence to CF (Fisher et al., 2017). CF training has also been associated with accepting and overcoming challenges, commitment, connection with the CF community, self-empowerment, and transformation (Simpson et al., 2017).

Adjuvant therapy

The role of exercise as adjuvant therapy for SUD was first introduced in the late 1970s, however, the concept was lightly researched until the mid-2000s, so the research is limited. In a systematic review, Zhang and Lie (2022) identified 14 individual studies looking at the role of exercise as an adjuvant treatment. The review concluded that exercise can be an effective auxiliary treatment for OUD/SUD, however, no specific data was referenced regarding the relationship between exercise, exercise intensity, or recovery capital.

Purpose

The purpose of this research is to identify descriptive data trends that may indicate if the high-intensity aspect of exercise along with the competitive and motivational factors, can positively impact recovery capital (RC) for the TCC OUD clients who participate in the PSKC program. There are a small number of studies that have examined how CF can aid in recovery from SUD, but the focus of those studies has related to the physiological response and social themes. This study appears to be the first to examine the relationship between RC and exercise, regardless of the type of exercise program or the intensity at which exercise is performed.

The long-term implications for this specific study are to provide a starting point for treatment facilities to examine the role that structured, high-intensity exercise programs may play in the OUD recovery process. Structured, high-intensity exercise classes would offer a relatively easy and inexpensive adjuvant treatment that could provide an avenue to increase RC while at the same time, providing physiological benefits to participants.

Statement of the Problem

The opioid epidemic in the US remains a significant problem. The economic burden of the opioid problem, which includes healthcare costs, lost productivity, addiction treatment, and criminal justice costs, is nearing a hundred billion dollars per year (HEAL, 2021). According to the National Institute on Drug Abuse (2022), the state of the crisis can be summarized as:

- Roughly 21 to 29 percent of clients prescribed opioids for chronic pain misuse them.
- Between 8 and 12 percent of people using an opioid for chronic pain develop an opioid use disorder.
- An estimated 4 to 6 percent who misuse prescription opioids transition to heroin
- About 80 percent of people who use heroin first misused prescription opioids.
- Update: Among 38 states with prescription opioid overdose death data, 17 states saw a decline between 2017 and 2018; none experienced a significant increase.
- The likelihood of developing an opioid use disorder depends on many factors, including the length of time a person is prescribed to take opioids for acute pain, and the length of time that people continue taking opioids (whether as prescribed or misused)

One of the more significant issues that come with opioid use disorder (OUD) is the addictive nature of opioids. Due to the pharmacological effects on the brain, opioids are one of the most addictive substances known to man (Mohammadreza et al., 2021). The initial use of opioids will cause an intense feeling of euphoria and a subsequent feeling of a need to recreate that initial euphoric feeling. The process of withdrawing from opioids, which can include rhinorrhea, piloerection, diarrhea, nausea/vomiting, photophobia, insomnia, hyperactivity, tachypnea, tachycardia, sweating, and hyperthermia are typically severe enough that most people who suffer from OUD continue to use opioids long-term so that they do not suffer symptomatic withdrawal (Huecker and Shah, 2021)

The current opioid crisis in the United States and the addictive nature of opioids have resulted in the rapid expansion of businesses and industries that focus on the treatment of

those with substance use disorder (SUD) specifically related to OUD. Along with Suboxone and methadone clinics, inpatient recovery centers, also known as treatment facilities or addiction rehab facilities, have expanded into areas of the country hardest hit by addiction. The recovery industry is estimated to be worth nearly 10 billion dollars and includes over 14,000 treatment facilities (*Opioid Crisis Statistics _ HHS.Gov.Pdf*, n.d.).

Treatment at these facilities can vary from facility to facility but typically will consist of a multi-step process. Beginning with treatment for withdrawal and eventually moving towards transitional living programs. However, many of these facilities struggle to overcome an exceedingly high relapse rate among their clients after treatment. Relapse rates show that 91% of those who go through a treatment process will experience a relapse episode within 12 months of program completion (Kadam et al., 2017).

Pharmacological interventions in the form of agonist therapies can be used effectively to prevent or delay early relapse over the course of recovery, but factors that impact long-term recovery (5 or more years) are poorly understood and often vary from individual to individual (Cleveland et al., 2021).

There are indications that multiple variables influence whether someone in recovery from OUD maintains abstinence from drugs or relapses. Relapse rates appear to be highest among those who experience high social levels of poverty, income inequality, unemployment, homelessness, and social isolation (Case and Deaton, 2015). Those who have sustained, long-term success, are reported to be influenced by family structure (Chapman et al., 2021) access to healthcare, and social support/connection (Ashford et al., 2020).

Recovery Capital

The objective measurement of some of the factors that contribute to successful recovery has come to be known as recovery capital (RC). RC is defined as a collection of the people, beliefs, and resources believed to contribute to long-term recovery from addiction (O’Sullivan et al., 2019). Brown (2021) describes RC “as a potential healing capacity across multiple life domains (physical, social, personal, and socioecological) that increases a person's likelihood of recovery when fostered through the proper supportive

social mechanisms.” According to White and Cloud, who are credited with developing the concept in 2008, there are 3 types of RC: personal/physical, family/social, and community.

Personal/physical recovery refers to physical health, sleep hygiene, cessation of drug hunger, housing, finances, access to transport, and physical appearance (Burns and Marks, 2013). Personal/physical can also include the available resources and the skills a person in recovery possesses that will either help or hinder their recovery. These skills and resources can include material resources, education, physical and psychological health, coping and problem-solving skills, a sense of meaning and purpose, and self-efficacy for recovery (Mawson et al., 2015).

Family/Social capital relates to the social structure that surrounds someone who recovering from SUD. Zoorob and Salemi (2016) describe social capital as a protective measure factor that measures the extent and depth of social trust, norms, and networks. There are five main principles of social capital: 1) community and personal networks; 2) civic engagement and participation; 3) local civic identity or a sense of belonging; 4) reciprocity and norms of cooperation, a sense of obligation to help others; 5) trust in the community (De Silva, 2005).

Community capital, sometimes referred to as collective capital, are the resources that the community provides for the person recovering from OUD. These can consist of activities designed for those in recovery, groups, facilities, and non-stigmatizing attitudes within the community (Collinson and Best, 2019). Cultural capital is often used interchangeably with community capital, but cultural capital appears to refer more to the adherence to cultural norms and social conformity (Keane, 2011).

Recovery capital is an important aspect when examining long-term recovery from SUD/OUD. Assessments of recovery capital help to identify gaps in knowledge, beliefs, attitudes, and social support or lack thereof. Assessments can also help to highlight and promote areas within the community that would be considered strengths or weaknesses. There is also evidence for a relationship between those with higher RC and better long-term outcomes in adherence to sobriety and lower rates of relapse (Mawson et al., 2015).

A 2015 study found that high RC in the study population was associated with lower usage rates, stronger identification with non-using groups, and a greater importance of non-using groups in one's social network (Mawson et al., 2015).

To overcome high relapse rates, treatment facilities must engage clients in ways that increase RC. One of these methods may be the institution of exercise programs during inpatient treatment for SUD/OD. The research is limited on exercise programs and their ability to contribute to RC, but preliminary research shows promise, primarily in a program's ability to influence personal and secondarily community capital. Exercise programs contribute to personal RC by increasing confidence, fitness, strength, body image, self-efficacy, and decreasing levels of anxiety and stress (Fitzgerald, n.d.).

Shifting social networks from supportive of substance abuse to networks that are supportive of clean living lifestyles is one of the key drivers of positive outcomes and long-term recovery (Longabaugh et al., 2010). Creating a strong social network is a key aspect of creating positive community capital, and participation in group exercise programs appears to build those relationships among those in SUD treatment (Morton et al., 2016).

There is a growing body of work that supports CF as a way to initiate new social networks. This appears to be the first research that seeks to indicate if there is data to support further examination into how exercise intensity can affect RC, but there have been previous studies that have examined how CF can aid in SUD recovery. There is little data currently to support the CF methodology itself as a tool, however, one of the recurring themes in this research is the effective social aspect of CF. The research suggests that the community and social components of CF are a key mechanism of the recovery process (Lautner et al., 2020). This social component can be traced to the support, culture, camaraderie, relationships, and competition that CF offers. This research certainly supports CF as an avenue to increasing community capital.

Purpose of the study

The goal of this research is to identify if self-reported RC is higher among individuals participating in the CF program compared to those not participating. Based on the current

evidence on exercise and SUD/OD, implementing a high-intensity exercise program may provide a two-fold benefit of increasing RC and having a positive effect on the overall health of those who participate in such a program. CrossFit's supportive and motivational environment may also show promise for building RC. The outcomes of this research can also assist treatment facilities in establishing policies on non-pharmaceutical adjuvant therapies and how to allocate resources to support this type of program. This study will be the first SUD/OD RC study that attempts to establish a relationship between exercise and RC and will ideally contribute to the overall concept of RC in SUD/OD treatment.

This project represents one of the first examinations of the relationship between exercise and RC. RC appears to be well-defined in the literature, but it is unclear how much control treatment facilities have in increasing RC with traditional inpatient non-pharmaceutical methods. Many of the variables that show evidence for increased RC are cultural and systematic and while treatment facilities may be able to address those variables in the short-term, establishing long-term RC is vital to decreasing relapse rates for those with OD. Establishing the relationship between exercise and RC would provide treatment facilities with data to support establishing exercise programs that would increase RC and also aid clients, who typically show poor health markers when first entering into treatment.

The following chapter of this capstone represents a summary of the current literature and key concepts pertaining to the role exercise may play in recovery capital. This review collects research from the fields of public health, addiction medicine, exercise science, and psychology. The information contained in this chapter has been collected from journals, books, and book chapters. The databases used to identify scholarly literature in these areas have been collected using Google Scholar, Medline, and PubMed. The keywords used in this research included: opioid, substance use disorder, opioid use disorder, withdrawal, addiction, recovery capital, exercise, adjuvant therapy, and exercise intensity.

CHAPTER 2

LITERATURE REVIEW

Exercise and SUD/OD

The idea of non-pharmaceutical adjuvant therapies for addiction was first described in the literature in the late 1970s and early 1980s. These first studies often focused exclusively on alcohol or nicotine dependence. One of the earliest studies found in the literature concluded that clients going through an alcohol abuse program who exercised, were more likely to maintain abstinence from alcohol than those in their cohort who did not exercise (Sinyor et al., 1982). The researchers were hesitant to directly correlate exercise with abstinence as they were unable to determine whether it was the increased physical fitness that played a role in the maintenance of abstinence or if it was the participation in the program itself, regardless of what the program was based on, that helped to reorganize social patterns. Although the initial research showed promise, the concept of exercise as an adjuvant therapy failed to gain traction in the literature. The next study to examine how exercise might impact substance use disorder was not published until 1988. Palmer, Vacc and Epstein (1988) examined clients in an inpatient alcohol treatment program. They were able to conclude that those who participated in a mild exercise program were better able to cope with post-discharge life stressors. This determination was based on the mild exercise program participants' scores on a self-assessment depression scale and a state-trait anxiety test as compared with those who did not participate in the exercise program.

A comprehensive health promotion program was instituted at a correctional facility in 1993. As part of this program, female inmates with a history of drug abuse were enrolled in an exercise program. The outcome of this program found that the inmates who participated reported significant enhancements in psychological well-being, self-esteem, health awareness and concerns, healthy lifestyle adoptions, and relapse prevention skills (Peterson & Johnstone, 1995).

In 1995, the first research was published that looked primarily at the type of exercise that was being used as adjuvant therapy among individuals recovering from SUD (Palmer et al., 1995). This was also the first research to look at the therapeutic benefits of weight training. The authors found that participants that showed increases in strength reported significantly fewer depressive symptoms. Interestingly, the authors stated that those who made gains in strength showed a mastery of the selected exercises and this mastery effect may be the mechanism related to the decrease in depressive symptoms.

Outside of these initial studies, the early published research is sparse. A Google Scholar search set with a custom time range of 1982 – 1999 and using the terms “exercise” “adjuvant therapy” and “substance use disorder” produced no useable research related to exercise and SUD. The topics that do appear related to exercise and substance abuse focus on psychoactive drug abuse and other behaviors unrelated to substance abuse. The topic does not appear again in the literature until 2001.

Read and colleagues (2001) examined the attitudes and behaviors related to exercise among a sample of individuals who were being treated for alcohol use disorder. Of all the benefits the program provided, stress and tension relief were the most highly valued benefits of the program. This was also the first study to identify barriers to adjuvant exercise therapy. The reported barriers included costs associated with exercise, lack of motivation, and lack of time (Read et al., 2001).

Beginning in the mid-2000s, in conjunction with the peak of the prescription opioid crisis and the beginning of the mass transition to non-prescription opioids, articles related to adjuvant opioid abuse therapies started to become more readily available. A Google Scholar search with the keywords "substance use disorders" "exercise" and "therapy" with a custom date range of 2009 – 2022 returned multiple pages of results.

One of the initial studies in this wave of research was a Dutch study that examined if adjuvant exercise programs 1) alter the behavior of drug abusers in both the short and long-term and 2) Does a positive body image create self-confidence (Roessler, 2010)? They were able to determine that body image had a positive effect but they also found that adherence to exercise programs was also positively affected by peer group influence.

This was the first study to discuss how peer influence concerning an exercise program relates to long-term abstinence.

A 2011 Norwegian study provided one of the first long-term studies examining the role of exercise and SUD. This study was unique for two main reasons. First, they followed participants for 11.5 months, which was the longest term study to date. Secondly, the exercise was tailored to the individual in the program. The participants were allowed and encouraged to participate in exercises that they found enjoyable. Previous studies placed participants into a standard program, regardless of enjoyment. The outcome, similar to Palmer et al. (1995), listed mastery as one of the primary motivators in the participants who reported positive outcomes. This was also one of the first studies to find that while there were positive effects reported during the program, the effects diminished to baseline following the completion of the program (Mamen et al., 2011).

In 2013, researchers conducted an 8-week endurance and resistance training program with individuals undergoing inpatient treatment for methamphetamine addiction (MA). Based on the reduction in body fat and increase in strength of the participants, the researchers were able to demonstrate the feasibility and efficacy of an exercise program based in an inpatient treatment facility. One point the researchers emphasized was that the activity level and intensity of those in the program were not sufficient to elicit more significant changes and that the addition of qualified trainers and a more structured program would improve outcomes (Dolezal et al., 2013).

Previous studies to date had looked at the overall health benefits of exercise but did not focused specifically on cardiovascular health. The first study to look at the role drug abuse plays on cardiovascular health determined that illicit drug users have a 15-20 year decreased life expectancy due to the prevalence of cardiovascular disease (CVD) directly attributable to SUD (Stenbacka et al., 2009). Building on this study, Flemmen, Urnhjem, and Wang (2014) examined the role exercise intensity plays in the cardiovascular health of clients with SUD. The researchers were able to make three key findings. 1) baseline aerobic power at baseline is lower in this population than in the average population 2) The SUD clients improved aerobic power and work performance and as a result,

decreased their risk factors for lifestyle diseases, and 3) the training intervention can be integrated into clinical treatment.

Strength training as a primary form of adjuvant therapy had been proposed by Palmer et al. (1995), however, there was no objective measure of relative strength gains and how strength training may relate to long-term recovery prospects. In 2016, researchers examined the role that maximal strength training may play in SUD clients. The pursuit of strength, according to the researchers, has numerous long-term benefits, including stability, balance, fall prevention as well as an association between low muscular strength and an elevated suicide rate (Ortega et al., 2012). The researchers concluded based on their results that maximal strength training was a feasible form of adjuvant treatment and improved bone health and decreased chances of lifestyle disease (Unhjem et al., 2016).

One of the first systematic reviews of anaerobic exercise and SUD was published in 2014. This study determined that the evidence for anaerobic exercise as adjuvant therapy was strongest for nicotine addiction, mixed for alcohol, and weak for illicit drugs (Colledge et al., 2018). This weak association, according to Colledge et al. (2018), was based more on study logistics – small sample sizes and irregular participation, but the results still trend toward positive. The conclusion of this review doubted the ability of previous studies on the anaerobic effects to accurately measure the intensity which participants were reaching and the researchers go so far as stating that, to their knowledge, there have not been any substantive determinations regarding exercise intensity and SUDs.

Recovery capital

The introduction of the concept of RC, and much of the early research into RC was the result of the work of Granfield and Cloud. The initial definition of RC was published after researchers began examining how those with SUD became abstinent from drugs or alcohol without the benefit of being enrolled in any type of addiction treatment program. Granfield and Cloud (1999) were able to establish a relationship between recovery and a complex set of social conditions and forces that surround an addicted individual. One of the key points that the authors establish is that for addiction services to be successful

long-term, they must factor in the personal and social complexities that any individual in treatment will face once the services are concluded.

Cloud and Granfield expanded on the concept of RC in 2004 by combining it with the idea of a life span trajectory. Life span trajectory is a term that is used in addiction theory to describe the dynamics and transitions that will lead to addiction and/or recovery from SUD. Laub and Sampson (1993) describe a life span trajectory as a dynamic process whereby the interlocking nature of trajectories and transitions generate turning points in the life course. Cloud and Granfield took this definition and applied it to RC, specifically how social capital influences life force trajectory.

Granfield and Cloud published their article “Conceptualizing Recovery Capital: Expansion of a Theoretical Construct” in 2008. This paper aimed to tie the concept of RC together. This paper also introduced the concept of negative recovery capital. According to the research tool Semantic Scholar, this paper is one of the more influential papers and most cited papers on RC.

More recent research on RC has focused on the use of data collection tools for the statistical analysis of RC. Recent publications have concluded that efforts to quantify RC have largely been ignored and domains have been used inconsistently within the literature (Hennessy, 2017). Other issues with RC include the lack of research into community-level factors as well as a lack of research into specific populations and cultures (Hennessy, 2017). The current recommendations for RC research include making RC more empirically driven and culturally appropriate (Best and Hennessy, 2022).

CrossFit

The research on the effectiveness of CF as a modality is limited. The current majority of published CF research deals with the physiologic response to high-intensity exercise or specific metrics related to performance. There are, however, some studies that look at motivation, overall effectiveness, and risk vs benefits.

A 2018 meta-analysis analyzed and summarized the current research into the CF methodology (Claudino et al., 2018). The result of the analysis showed that research into

CF had, to this point, focused on body composition, injury risk, health aspects, physiology, and psycho-social behavior. However, the meta-analysis found that of the thirty-one studies related to CF, only two showed a high level of evidence. The analysis concluded that there was a lack of quality, unbiased research into CF, but that preliminary data suggested that CF could be associated with a sense of community, satisfaction, and high levels of motivation (Claudino et al., 2018).

One of the largest criticisms CF has faced has been the perception of increased rates of musculoskeletal injuries as compared to other training methodologies. Research on injuries varies, but previous studies have indicated that the rate may fall somewhere between a low of 0.27 musculoskeletal injuries per 1,000 hours of CF participation to a high of 18.9 (Gardiner et al., 2020; Szeles et al., 2020). Those who do suffer from injuries related to CF have been found to have similar characteristics. Injury rates appear to be higher in those in their first year of CF training and those that engage in CF training fewer than 3 days per week (Feito et al., 2018).

One of the hallmarks of CF is the short-duration, high-intensity nature of most WODs. High-intensity exercise has been shown to have several physiological benefits including: increased VO_{2max} , decreased body mass index (BMI), increased insulin sensitivity, increased high-density lipoprotein (HDL) cholesterol, and decreased blood pressure (Kessler et al., 2012). Based on the current literature, it does appear that the intense nature of the workouts provides more than physiologic benefits to participants. An added benefit of high-intensity training appears to be long-term adherence. A small 2014 study concluded that participants in a CF-style HIIT training program spent less time exercising per week, but cited the enjoyment of the programming as one of the reasons they would likely continue with the program (Heinrich et al., 2014).

Few studies have examined CF's role in recovery, although none of the studies to this point have examined CF's influence on RC. A 2020 qualitative study on CF participants identified multiple social themes that suggested that CF's social environment may play an important role in adherence and health promotion (Lautner et al., 2021). An analysis of CF in the media concluded that while the CF methodology as a tool for SUD treatment is

not proven, the social support and exercise CF provides show promise for supporting individuals in recovery (Lautner et al., 2020).

CHAPTER 3

METHODOLOGY

This partnership was identified through an existing relationship with the Portsmouth Spartan Kettlebell Club, prior knowledge of the program, and various media outlets reporting on the program. Once an agreement and written consent to perform research was secured, two points of contact were identified. One point-of-contact was the director of TCC and the other point-of-contact was the owner of PSCK. This study was approved by the University of Kentucky IRB. A link to the REDCap (Research Electronic Data Capture) survey was sent to the points of contact at PSCK and TCC to distribute among eligible participants. The point of contact was not given specific instructions on distribution. Each point of contact has a unique understanding of their facility and population and therefore was given the freedom to distribute the survey link in a way that they felt would reach the most eligible participants. Eligible participants included those currently enrolled as clients at TCC and those who had previously completed an addiction program at TCC. The survey was open for approximately 4 weeks.

The survey was separated into four sections. The initial section of the survey was standard demographic information. Demographic information included: age, race, ethnicity, gender, education, marital status, and employment.

The next sections contained questions about the participant's substance use history and if the participant had any experience with recovery before beginning treatment TCC. The survey then asks questions regarding current depression and anxiety using the Patient Health Questionnaire for Depression and Anxiety (PHQ-4). The PHQ-4 questionnaire is a valid instrument for detecting both anxiety and depressive disorders (Kroenke et al., 2009) The final section of the survey is the brief assessment of the recovery capital (BARC-10) tool.

The BARC-10 (appendix I) is a 10-item measure that provides an index of recovery progress and also may help measure the positive outcome benefits as individuals navigate

recovery from SUD (Vilsaint et al., 2017). According to Vilsaint et al. (2017), the BARC-10 is potentially helpful tool for researchers to help explain the complex nature of individual recovery as well as aid in identifying potential issues and areas to address for those in recovery. The BARC-10, which was included as part of the survey tool was chosen over a similar 50-item measure titled Assessment of Recovery Capital (ARC). While the ARC may provide more data, for the sake of the participant's time, the validated BARC-10 was selected.

The survey (appendix I), which contains no identifiers, was available online through the University of Kentucky's Center for Clinical and Translational Science REDCap database system. No paper copies of the survey produced, distributed, or processed into the database. The survey was distributed via a link that was made available through a facility-wide announcement and then daily reminders from staff.

The study population was limited to those 18 years or older who are currently in treatment at TCC or who have previously completed the recovery program at TCC. Many of those who had completed the PSKC/TCC program remain engaged with the program through continued participation in CF classes at PSKC. Enrollment in the CF program is open to those who are clients at TCC. There are no qualifiers for the program other than enrollment at TCC.

CHAPTER 4

RESULTS

Of those invited to participate in the study, a total of 51 completed surveys. All surveys were completed by clients or former clients at TCC. Surveys were completed through REDCap over a time frame of 28 days. Clients and former clients were notified and invited to complete the study through various announcements at TCC and affiliated facilities.

Survey respondents were mostly female (60.8%) and between the ages of 25-44 (90%). A large majority of respondents reported working full-time (76.5%) or part-time (15.7%). Of the 51 respondents, most had either graduated from high school (33.3%) or completed some post-secondary education (39.2%). Concerning marital status, most were single (35.3%), in a long-term relationship (25.5%), or married (25.4%).

Previous health history or baseline health history was not included in this study. However, given the nature, intensity, and complexity of the program, inclusion may be prohibitive for elderly patients and those with preexisting health conditions. The program does provide scaleable workouts for all fitness levels, however, the scalability of the program was not interpreted for this study.

Demographics

Survey participants were asked which substance or substances they were primarily using before enrolling in TCC. The majority of respondents reported abusing heroin (52.9%), non-prescription pain killers (43.1%), cocaine/crack (39.2%), marijuana (39.2%), non-prescription stimulants (43.1%), non-prescription sedatives (27.5%), non-prescription suboxone (25.5%), and methadone (25.5%). Tobacco was included in the survey but was not included in the analysis since it is a legal substance.

Our study sample was asked a series of questions regarding their previous history of substance use and recovery attempts. The majority (66%) reported at least one previous episode of a substance overdose. A large majority (84%) responded that this was not their

first time in treatment nor their first time attempting to recover from SUD (84%). Additionally, the majority of participants (66%) reported that at some point in time in their history of SUD, they had stopped abusing substances for at least one year.

Results

For this study, I compared demographic characteristics, substance use and treatment history, and recovery capital between those that have or are currently participating in the PSKC/TCC exercise program and those that have been or are currently clients at TCC who have declined participation in the program. A more in-depth analysis will need to be conducted to assess the true differences between the two groups, however, the descriptive statistics obtained through this study do highlight elements that can be the catalyst for further studies.

One of the data points that stands out in this study is the number of respondents in the program who have reported an overdose and who have had multiple attempts at recovery. 66% of all respondents and 69% of those in the program report at least 1 instance of overdose. 85% of those in the program also report that the current treatment program they are enrolled in is not their first attempt at recovery. These data points would indicate that those who choose to join the program may have a long history of SUD and therefore understand the need for adjuvant therapies for long-term success.

One aspect that has been reported in the literature is the overall poor health, regardless of metric, of those who are in SUD treatment programs. Of those in the CF program, 58% of respondents reported being in excellent or very good health compared to only 36% of those not in the program.

The survey asked a series of questions regarding the feelings of respondents over the last 2 weeks before taking the survey. Those in the CF program reported not having feelings of hopelessness and depression (77%) within the last two weeks as compared to those not in the program (48%). Those in the program also reported not having any feelings of losing interest or not having pleasure in doing things at a slightly higher rate (77%) than those not in the program (70%).

One of the aspects of this study that will warrant further research is how this program may increase or affect RC. The results from this study showed relatively similar numbers between groups, however, the BARC-10 data did provide some insight into how the program could positively impact RC. Given the high rate of relapse following treatment programs, any program that could positively impact any aspect of RC is worth further study.

One of the larger differences between groups on the BARC-10 questions regards the amount of energy needed for self-appointed tasks. Those in the CF program overwhelmingly report having higher energy levels (88%) than those not in the program (70%).

A challenge of long-term recovery appears to be the lack of meaning, fulfillment, or challenge in life without the use of drugs or alcohol. Those in the program tend to strongly agree that life is challenging and fulfilling without drugs and alcohol (69%) at a higher rate than those not in the program (48%).

Table 1: Table 1: Demographic Characteristics of Respondents Participating Versus Not Participating in CrossFit Classes, and Overall Sample

	CrossFit Participants (26)	Non- participants (23)	Total Sample (51)
Work	%	%	%
<i>Full-time</i>	73	73	76.5
<i>Part-time</i>	5	13	15.7
<i>Temporary</i>	0	0	0
<i>Unemployed - looking</i>	0	0	0
<i>Unemployed - not looking</i>	0	4	2
<i>Unable to work/disabled</i>	0	4	2
<i>Other</i>	8	0	3.9
Prefer not to say	0	0	0
Age			
<i>25-34</i>	39	26	31
<i>35-44</i>	58	57	59
<i>45+</i>	4	17	10
Gender			
<i>Male</i>	39	43	39.2
<i>Female</i>	62	57	60.8
Education			
<i>Did not complete HS</i>	9	17	9.8
<i>HS diploma</i>	35	30	33.3
<i>some college/trade school</i>	35	44	39.2
<i>BS or Associates</i>	15	9	11.8
<i>Other</i>	12	0	5.9

Table 2: Primary Substance Use History & treatment history of Respondents Participating Versus Not Participating in CrossFit Classes, and Overall Sample

<i>Primary substance abused</i>	Participants (N=26)	Non- participants (N=23)	Total Sample (N=51)
	%	%	%
<i>Alcohol</i>	42	26	35.3
<i>Tobacco</i>	69	48	56.9
<i>Marijuana</i>	54	26	39.2
<i>Opiotes/pain killers (NP)</i>	54	35	43.1
<i>Methadone</i>	15	0	25.5
<i>Subutex/Suboxone (NP)</i>	31	22	25.5
<i>Heroin</i>	58	52	52.9
<i>Sedatives (NP)</i>	42	13	27.5
<i>Stimulants (NP)</i>	46	44	43.1
<i>Cocaine/Crack</i>	50	9	39.2
<i>Hallucinogens</i>	19	9	13.7
<i>Inhalants</i>	8	4	5.9
<i>Synthetics/Designer</i>	19	0	9.8
<i>None of the above</i>	7.7	17	13.7
<i>Other</i>	0	4	2
Ever OD'ed			
<i>Yes</i>	69	65	66
<i>No</i>	31	35	34
First Recovery Attempt			
<i>Yes</i>	8	26	16
<i>No</i>	92	74	84
First time in Treatment			
<i>Yes</i>	15	26	16
<i>No</i>	85	74	84
Stopped using drugs/alcohol for 1 year			
<i>Yes</i>	62	70	66
<i>No</i>	39	30	34

Table 3: Recovery Capital Mean Scores for CrossFit Participants, Non-Participants, and Total Sample

BARC-10 1 = Strongly disagree; 2 = Disagree; 3 = Somewhat disagree; 4 = Somewhat agree 5 = Agree; 6 = Strongly agree	Participants	Non-participants	Overall Sample
There are more important things to me in life than using substances	5.4	5.4	5.4
In general I am happy with my life	5.4	5.2	5.3
I have enough energy to complete the tasks I set for myself	5.2	4.6	4.9
I am proud of the community I live in and feel a part of it	5.2	5.2	5.2
I get lots of support from friends	5.6	5.7	5.6
I regard my life as challenging and fulfilling without the need for using drugs or alcohol	5.3	5.4	5.6
My living space has helped to drive my recovery journey	5.4	5.2	5.3
I take full responsibility for my actions	5.8	5.9	5.8
I am happy dealing with a range of professional people	4.8	4.7	4.8
I am making good progress on my recovery journey	5.6	5.6	5.6

CHAPTER 5

IMPLICATIONS FOR PUBLIC HEALTH

Previous studies have indicated that those in treatment for SUD can expect to have a decreased life expectancy of 15-20 years due to cardiovascular disease (Stenbacka et al., 2009). Regardless of the long-term implications of this program in terms of sustained sobriety and increased RC, it would seem that integrating these types of high-intensity exercise programs into recovery programs would, at the very least, improve the overall health of those in SUD treatment programs by improving overall health and providing tools that clients can use in the future to aid in developing long-term health and fitness habits.

Beyond the improved fitness, there does appear to be a strong need for treatment programs to support and improve the long-term recovery capabilities of SUD clients. The literature supports improving RC as a method to sustain long-term recovery, therefore one of the goals of the TCC/PSKC program should be to establish methods that would positively impact RC. One way this program appears to impact RC is by improving participants' ability to sustain the energy needed to complete daily tasks.

This CF program is not designed to be easy. The workouts can not only be physically challenging, but they can challenge the participants mentally as well. However, the stress created by the program appears to have a positive impact on RC.

Recommendations

The goal of our research was to gain a broad understanding of how the TCC/PSKC partnership may affect recovery capital among those in treatment for SUD. Future studies should investigate the specific type of exercise programmed for clients, longitudinal outcomes, and other aspects of RC that were not investigated here. Specifically, there would be value in determining the social aspects and structure of this program and the sense of community created with participants. This social aspect could have a strong correlation with an increase in family/social and community RC.

SUD treatment centers that do not include a physical activity component in treatment may be missing an important aspect of SUD treatment by not taking into account the overall health of clients. This study does not conclude that high-intensity exercise programs are necessary for clients, however, the literature is clear that increased overall health is important for the long-term health of SUD clients. Some form of guided exercise program should be offered in SUD and OUD treatment programs. This type of program should focus on teaching clients about health and fitness habits that can be sustained over a lifetime.

Limitations

The major limitation of our study was a limited sample size. Our sample size was relatively small, with only 51 responses out of a possible population of 500-600 clients in TCC. The survey distribution was passive and without incentive, which could have led to a low response rate. The survey was also distributed without direct instructions to TCC, so it was left to the staff of TCC on how best to distribute it.

Conclusion

Establishing long-term sobriety following treatment for SUD or OUD is a difficult task. Improving RC appears to correlate with improved outcomes and therefore increasing RC should be a goal for SUD/ODU recovery. However, at this time, the ability to directly increase RC through treatment programs is unclear. Based on our data, there does appear to be some indication that a high-intensity exercise program is associated with higher levels of self-reported RC. Further studies are certainly warranted to explore this type of program and how it can help to increase RC as well as how it may impact the long-term recovery of those in SUD/ODU treatment programs.

REFERENCES

- ARCOS : Automation of Reports & Consolidated Orders System*. (2011). Washington, D.C. : U.S. Department of Justice, Drug Enforcement Administration, 1980.
<https://search.library.wisc.edu/catalog/999648032302121>
- Ashford, R. D., Bergman, B. G., Kelly, J. F., & Curtis, B. (2020). Systematic review: Digital recovery support services used to support substance use disorder recovery. *Human Behavior and Emerging Technologies*, 2(1), 18–32.
<https://doi.org/10.1002/hbe2.148>
- Best, D., & Hennessy, E. A. (2022). The science of recovery capital: Where do we go from here? *Addiction*, 117(4), 1139–1145. <https://doi.org/10.1111/add.15732>
- Burns, J., & Marks, D. (2013). Can Recovery Capital Predict Addiction Problem Severity? *Alcoholism Treatment Quarterly*, 31, 303–320.
<https://doi.org/10.1080/07347324.2013.800430>
- Case, A., & Deaton, A. (2015). Rising morbidity and mortality in midlife among white non-Hispanic Americans in the 21st century. *Proceedings of the National Academy of Sciences*, 112(49), 15078–15083.
<https://doi.org/10.1073/pnas.1518393112>
- Chapman, A., Verdery, A. M., & Monnat, S. M. (2021). Opioid misuse and family structure: Changes and continuities in the role of marriage and children over two decades. *Drug and Alcohol Dependence*, 222, 108668.
<https://doi.org/10.1016/j.drugalcdep.2021.108668>
- Claudino, J. G., Gabbett, T. J., Bourgeois, F., Souza, H. de S., Miranda, R. C., Mezêncio, B., Soncin, R., Cardoso Filho, C. A., Bottaro, M., Hernandez, A. J., Amadio, A.

- C., & Serrão, J. C. (2018). CrossFit Overview: Systematic Review and Meta-analysis. *Sports Medicine - Open*, 4(1), 11. <https://doi.org/10.1186/s40798-018-0124-5>
- Cleveland, H. H., Brick, T. R., Knapp, K. S., & Croff, J. M. (2021). Recovery and Recovery Capital: Aligning Measurement with Theory and Practice. In J. M. Croff & J. Beaman (Eds.), *Family Resilience and Recovery from Opioids and Other Addictions* (pp. 109–128). Springer International Publishing. https://doi.org/10.1007/978-3-030-56958-7_6
- Colledge, F., Gerber, M., Pühse, U., & Ludyga, S. (2018). Anaerobic Exercise Training in the Therapy of Substance Use Disorders: A Systematic Review. *Frontiers in Psychiatry*, 9, 644. <https://doi.org/10.3389/fpsyt.2018.00644>
- Collinson, B., & Best, D. (2019). Promoting Recovery from Substance Misuse through Engagement with Community Assets: Asset Based Community Engagement. *Substance Abuse: Research and Treatment*, 13, 117822181987657. <https://doi.org/10.1177/1178221819876575>
- De Silva, M. J. (2005). Social capital and mental illness: A systematic review. *Journal of Epidemiology & Community Health*, 59(8), 619–627. <https://doi.org/10.1136/jech.2004.029678>
- Dolezal, B. A., Chudzynski, J., Storer, T. W., Abrazado, M., Penate, J., Mooney, L., Dickerson, D., Rawson, R. A., & Cooper, C. B. (2013). Eight Weeks of Exercise Training Improves Fitness Measures in Methamphetamine-Dependent Individuals in Residential Treatment. *Journal of Addiction Medicine*, 7(2), 122–128. <https://doi.org/10.1097/ADM.0b013e318282475e>

- Feito, Y., Burrows, E. K., & Tabb, L. P. (2018). A 4-Year Analysis of the Incidence of Injuries Among CrossFit-Trained Participants. *Orthopaedic Journal of Sports Medicine*, 6(10), 232596711880310. <https://doi.org/10.1177/2325967118803100>
- Fisher, J., Sales, A., Carlson, L., & Steele, J. (2017). A comparison of the motivational factors between CrossFit participants and other resistance exercise modalities: A pilot study. *The Journal of Sports Medicine and Physical Fitness*, 57(9). <https://doi.org/10.23736/S0022-4707.16.06434-3>
- Fitzgerald, C. M. (n.d.). *Capitalising upon the Physical: Exercise and Addiction Recovery*. 289.
- Gardiner, B., Devereux, G., & Beato, M. (2020). Injury risk and injury incidence rates in CrossFit. *The Journal of Sports Medicine and Physical Fitness*, 60(7). <https://doi.org/10.23736/S0022-4707.20.10615-7>
- Heinrich, K. M., Patel, P. M., O'Neal, J. L., & Heinrich, B. S. (2014). High-intensity compared to moderate-intensity training for exercise initiation, enjoyment, adherence, and intentions: An intervention study. *BMC Public Health*, 14(1), 789. <https://doi.org/10.1186/1471-2458-14-789>
- Hennessy, E. A. (2017). Recovery capital: A systematic review of the literature. *Addiction Research & Theory*, 25(5), 349–360. <https://doi.org/10.1080/16066359.2017.1297990>
- Kadam, M., Sinha, A., Nimkar, S., Matcheswalla, Y., & De Sousa, A. (2017). A Comparative Study of Factors Associated with Relapse in Alcohol Dependence and Opioid Dependence. *Indian Journal of Psychological Medicine*, 39(5), 627–633. https://doi.org/10.4103/IJPSYM.IJPSYM_356_17

- Keane, M. (2011). *The role of education in developing recovery capital in recovery from substance addiction*. 49.
- Kessler, H. S., Sisson, S. B., & Short, K. R. (2012). The Potential for High-Intensity Interval Training to Reduce Cardiometabolic Disease Risk: *Sports Medicine*, 42(6), 489–509. <https://doi.org/10.2165/11630910-000000000-00000>
- Krisberg, K. (2014). Fatal heroin overdoses on the increase as use skyrockets: Health officials battling opiate epidemic. *The Nation's Health*, 44(4), 1.
- Kroenke, K., Spitzer, R. L., Williams, J. B. W., & Löwe, B. (2009). An Ultra-Brief Screening Scale for Anxiety and Depression: The PHQ–4. *Psychosomatics*, 50(6), 613–621. [https://doi.org/10.1016/S0033-3182\(09\)70864-3](https://doi.org/10.1016/S0033-3182(09)70864-3)
- Lautner, S. C., Patterson, M. S., Ramirez, M., & Heinrich, K. (2020). Can CrossFit aid in addiction recovery? An exploratory media analysis of popular press. *Mental Health and Social Inclusion*, 24(2), 97–104. <https://doi.org/10.1108/MHSI-02-2020-0007>
- Lautner, S. C., Patterson, M. S., Spadine, M. N., Boswell, T. G., & Heinrich, K. M. (2021). Exploring the social side of CrossFit: A qualitative study. *Mental Health and Social Inclusion*, 25(1), 63–75. <https://doi.org/10.1108/MHSI-08-2020-0051>
- Longabaugh, R., Wirtz, P. W., Zywiak, W. H., & O'malley, S. S. (2010). Network Support as a Prognostic Indicator of Drinking Outcomes: The COMBINE Study. *Journal of Studies on Alcohol and Drugs*, 71(6), 837–846. <https://doi.org/10.15288/jsad.2010.71.837>
- Mamen, A., Pallesen, S., & Martinsen, E. W. (2011). Changes in mental distress following individualized physical training in patients suffering from chemical

dependence. *European Journal of Sport Science*, 11(4), 269–276.

<https://doi.org/10.1080/17461391.2010.509889>

Mawson, E., Best, D., Beckwith, M., Dingle, G. A., & Lubman, D. I. (2015). Social identity, social networks and recovery capital in emerging adulthood: A pilot study. *Substance Abuse Treatment, Prevention, and Policy*, 10(1), 45.

<https://doi.org/10.1186/s13011-015-0041-2>

Morton, S., O'Reilly, L., & O'Brien, K. (2016). Boxing clever: Utilizing education and fitness to build recovery capital in a substance use rehabilitation program. *Journal of Substance Use*, 21(5), 521–526.

<https://doi.org/10.3109/14659891.2015.1077281>

Opioid Crisis Statistics _ HHS.gov.pdf. (n.d.).

Ortega, F. B., Silventoinen, K., Tynelius, P., & Rasmussen, F. (2012). Muscular strength in male adolescents and premature death: Cohort study of one million participants. *BMJ*, 345(nov20 3), e7279–e7279.

<https://doi.org/10.1136/bmj.e7279>

O'Sullivan, D., Xiao, Y., & Watts, J. R. (2019). Recovery Capital and Quality of Life in Stable Recovery From Addiction. *Rehab & Counseling Bulletin*, 64(2).

<https://doi.org/10.1177/0034355217730395>

Palmer, J. A., Palmer, L. K., Michiels, K., & Thigpen, B. (1995). Effects of Type of Exercise on Depression in Recovering Substance Abusers. *Perceptual and Motor Skills*, 80(2), 523–530. <https://doi.org/10.2466/pms.1995.80.2.523>

Peterson, M., & Johnstone, B. M. (1995). The atwood hall health promotion program, federal medical center, lexington, KY: Effects on drug-involved federal offenders.

Journal of Substance Abuse Treatment, 12(1), 43–48.

[https://doi.org/10.1016/S0740-5472\(99\)80001-4](https://doi.org/10.1016/S0740-5472(99)80001-4)

Read, J. P., Brown, R. A., Marcus, B. H., Kahler, C. W., Ramsey, S. E., Dubreuil, M. E.,

Jakicic, J. M., & Francione, C. (2001). Exercise attitudes and behaviors among persons in treatment for alcohol use disorders. *Journal of Substance Abuse Treatment*, 21(4), 199–206. [https://doi.org/10.1016/S0740-5472\(01\)00203-3](https://doi.org/10.1016/S0740-5472(01)00203-3)

Roessler, K. K. (2010). Exercise treatment for drug abuse—A Danish pilot study.

Scandinavian Journal of Public Health, 38(6), 664–669.

<https://doi.org/10.1177/1403494810371249>

Simpson, D., Prewitt-White, T., Feito, Y., Giusti, J., & Shuda, R. (2017). Challenge,

Commitment, Community, and Empowerment: Factors that Promote the Adoption of CrossFit as a Training Program. *The Sport Journal*.

Sinyor, D., Brown, T., Rostant, L., & Seraganian, P. (1982). The role of a physical fitness

program in the treatment of alcoholism. *Journal of Studies on Alcohol*, 43(3), 380–386. <https://doi.org/10.15288/jsa.1982.43.380>

Stenbacka, M., Leifman, A., & Romelsjö, A. (2009). Mortality and cause of death among

1705 illicit drug users: A 37 year follow up: Mortality among illicit drug users.

Drug and Alcohol Review, 29(1), 21–27. <https://doi.org/10.1111/j.1465-3362.2009.00075.x>

Szeles, P. R. de Q., Costa, T. S. da, Cunha, R. A. da, Hespanhol, L., Pochini, A. de C.,

Ramos, L. A., & Cohen, M. (2020). CrossFit and the Epidemiology of Musculoskeletal Injuries: A Prospective 12-Week Cohort Study. *Orthopaedic*

Journal of Sports Medicine, 8(3), 232596712090888.

<https://doi.org/10.1177/2325967120908884>

Unhjem, R., Flemmen, G., Hoff, J., & Wang, E. (2016). Maximal strength training as physical rehabilitation for patients with substance use disorder; a randomized controlled trial. *BMC Sports Science, Medicine and Rehabilitation*, 8(1), 7.
<https://doi.org/10.1186/s13102-016-0032-2>

Vilsaint, C. L., Kelly, J. F., Bergman, B. G., Groshkova, T., Best, D., & White, W. (2017). Development and validation of a Brief Assessment of Recovery Capital (BARC-10) for alcohol and drug use disorder. *Drug and Alcohol Dependence*, 177, 71–76. <https://doi.org/10.1016/j.drugalcdep.2017.03.022>

APPENDIX 1

Demographics

1. Age

- A. 18-24 B. 25-34
- C. 35-44
- D. Over 45
- E. Prefer not to say

2. What race(s) do you consider yourself to be (select all that apply)?

- A. Asian
- B. African American/Black
- C. Native-American/Native Alaskan
- D. Mixed
- E. Caucasian/White
- F. Other

3. Ethnicity

- A. Hispanic
- B. Non-Hispanic

4. Gender

- A. Male
- B. Female
- C. Non-binary
- D. Other (blank)
- E. Prefer not to answer

5. What is the highest education you have completed?

- A. Did not complete high school
- B. High School diploma
- C. GED or equivalent
- D. Some college (at least 1 semester)
- E. Bachelor's Degree
- F. Associates Degree
- G. Military/Occupational Training
- H. Technical/Vocational School
- I. Advanced degree (Masters or Doctoral)

6. Marital Status

- A. Married
- B. Divorced
- C. Partner/significant other
- D. Legally separated
- E. Single (never been married)
- F. Widowed

7. What best describes your employment status?

- A. Full-time
- B. Part-time
- C. Contract/temporary/seasonal
- D. Unemployed
- E. Unemployed – student
- F. Unemployed – homemaker/caregiver
- G. Retired
- H. Disabled
- I. In a controlled environment (jail, hospital, etc.)

SUBSTANCE USE HISTORY

8. At what age did you start using alcohol and/or drugs? _____
9. When did you last use substances (please provide your best estimate): [*Calendar for participant to select month, date, year*]?
10. Prior to entering this treatment program, please select the primary substance(s) that you used in the past 6 months that were not prescribed to you by a medical professional (select all that apply):
- A. Alcohol including beer, wine, and hard liquor
 - B. Tobacco/nicotine (cigarettes, cigars, e-cigarettes/vaping)
 - C. Marijuana (pot, weed)
 - D. Opiates, analgesics, pain killers (not prescribed) (morphine, Percocet, Oxycontin, Lortab, hydrocodone, oxycodone, etc.)
 - E. Methadone (not prescribed)
 - F. Subutex/Suboxone or buprenorphine (not prescribed)
 - G. Heroin
 - H. Sedatives (not prescribed) (benzodiazepines (valium, Xanax, Librium, and Halcion) GHB, liquid ecstasy, Ketamine (Special K, Vitamin K), nerve pills)
 - I. Stimulants (not prescribed) (methamphetamine, Dexedrine, Adderall, crystal, uppers, speed, MDMA, Ritalin, Ecstasy)
 - J. Cocaine/crack (cocaine crystal, free-base cocaine, crack, or rock cocaine)
 - K. Hallucinogens/psychedelics (PCP, LSD, Mushrooms, Mescaline, psilocybin)
 - L. Inhalants (poppers, Rush, whippets, “huffing” paint, glue, aerosol can spray)
 - M. Synthetic/designer/novel drugs (synthetic marijuana, K2, spice, bath salts, kratom, flakka)
 - N. None of the above
 - O. Others
If (O), please describe: _____

- 11.** Have you ever overdosed?
A. Yes B. No
If (A.), how many times? _____

RECOVERY HISTORY

- 12.** Is this your first recovery attempt?
A. Yes
B. No
If (B). How many recovery attempts? _____
If (B). How old were you when you first tried to stop using? _____
- 13.** Is this the first time you have participated in a treatment program?
A. Yes
B. No
- 14.** Have you ever stopped using substances for at least one year?
A. Yes
B. No
If (A). If yes, how many times were you able to stop using for at least one year? _____ times
If (A). What was your age the first you stopped substance use for a year? _____
- 15.** What types of recovery support services are you currently using? (Check all that apply)
- A. 12 – Step (AA/NA Meetings)
 - B. Intensive outclient program
 - C. Individual counseling
 - D. Medical services including medication for alcohol or opioid condition
 - I. None of the above
 - J. Other (please list): _____

***In the next section, we would like for you to answer questions regarding your current well-being:**

Over the last 2 weeks how often have you been bothered by the following:

	Not at all	Several Days	More than Half the Days	Nearly Every Day
16. Feeling nervous, anxious, or on edge	0	1	2	3
17. Not being able to stop or control worrying	0	1	2	3
18. Feeling down, depressed, or hopeless	0	1	2	3
19. Little interest or pleasure in doing things	0	1	2	3

Return to Use Potential

20. On a scale from 0 to 10, with 0 being “none” and 10 being “very likely”, how would you describe your desire/urge to use substances?

None 0 1 2 3 4 5 6 7 8 9 10 Very Likely

21. On a scale from 0 to 10, with 0 being not at all important and 10 being very important, how would you describe how important it is to you to not use substances.

Not at all important 0 1 2 3 4 5 6 7 8 9 10 Very Important

CDC General Health Measure

22. Would you say that in general, your health is:

- A. Excellent
 - B. Very Good
 - C. Good
 - D. Fair
 - E. Poor
-

Brief Assessment of Recovery Capital (BARC-10)

Please indicate your level of agreement with each statement by circling one of the choices to the right of each statement.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
23. There are more important things to me in life than using substances	1	2	3	4	5	6
24. In general I am happy with my life	1	2	3	4	5	6
25. I have enough energy to complete the tasks I set for myself	1	2	3	4	5	6
26. I am proud of the community I live in and feel a part of it	1	2	3	4	5	6
27. I get lots of support from friends	1	2	3	4	5	6
28. I regard my life as challenging and fulfilling without the need for using drugs or alcohol	1	2	3	4	5	6
29. My living space has helped to drive my recovery journey	1	2	3	4	5	6
30. I take full responsibility for my actions	1	2	3	4	5	6
31. I am happy dealing with a range of professional people	1	2	3	4	5	6
32. I am making good progress on	1	2	3	4	5	6

my recovery journey						
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33. Are you currently or have you within the last year participated in TCC/PSKC-sponsored CF classes?

A. Yes

B. No

Curriculum Vitae
Aaron M. MacDonald

April 2022

Eastern Kentucky University
Assistant Professor
Department of Health Promotion and Administration
Office Phone: 859-622-6334
Email: aaron.macdonald@eku.edu

EDUCATION

Doctor of Public Health

May 2022

University of Kentucky, Lexington,
Kentucky

Program: Health Management and Policy

Master of Public Health

May 2015

University of Kentucky, Lexington,
Kentucky

Program: Health Management and Policy

Advisor: James W. Holsinger Jr., MD, PhD

Post-Baccalaureate in Athletic Training

May 2007

Eastern Kentucky University, Richmond, Kentucky

Bachelor of Science in Exercise Science

August 2003

Morehead State University, Morehead, Kentucky

Emphasis: Corporate Wellness

EMPLOYMENT

Assistant Professor

July 2019 – current

Eastern Kentucky University, Richmond, Kentucky

Administrative Staff Officer

June 2015 – June 2019

University of Kentucky, Lexington, Kentucky

Outreach Athletic Trainer

September 2007- May 2016

University of Kentucky, Lexington, Kentucky

PROFESSIONAL AFFILIATIONS

American Public Health Association
American Health Information Management Association
Kentucky Health Information Management Association

GRANT FUNDING

2012 Kentucky and Appalachia Public Health Training Center grant

PUBLICATIONS

MacDonald, A., "Rural Healthcare Worker's Willingness to Report to Work During Catastrophic Events" *Injury*,

(2015). *Theses and Dissertations--Public Health (M.P.H. and Dr.P.H.)*.46. https://uknowledge.uky.edu/cph_etds/46

MacDonald, A., Hosey, R.G., and Kanga, J. F., (2011). Vocal Cord Dysfunction in A High School Football Player. *Journal of Athletic Training*, 46(Supplement)(3), S-93. <https://www.nata.org/sites/default/files/Journal-Supplement-46-3.pdf>.

MacDonald, A., Johnson, D., Branam, B., and Krueger, M. (2009). Complex Lateral Meniscus Tear in a High School Football Player. *Athletic Therapy Today*, 14 (1), 39-40. doi:10.1123/att.14.1.39

CONFERENCE PRESENTATIONS

MacDonald, A., Bardo, A. (2022). The current state of rural health coalitions. Kentucky Public Health Association Annual Meeting (April 2022)

MacDonald, A., Bardo, A. (2021). The current state of rural health coalitions. Kentucky Rural Health Association Annual Meeting (November 2021) (virtual poster)

MacDonald, A. (June 2021) The current and future role of artificial intelligence in health records management.

Kentucky Health Information Management Association Annual Meeting (virtual presentation)

Shepherd, S., **MacDonald, A.** (April 2021) *Perceptions of Covid-19 vaccines among college students*

Eastern Kentucky University Scholar's Day (virtual)

MacDonald, A. (April 2015) Rural healthcare workers willingness to report during a disaster. Poster presented at the

University of Kentucky's 2015 Center for Clinical and Translational Science 10th Annual Spring Conference, Lexington, KY.

MacDonald A., Carlson, A. (June 2012) Prevention and management of concussions in the high school athlete.

University of Kentucky Sports Medicine Coaches Symposium, Lexington, KY.

MacDonald A, Hosey R, Kanga J. (June 2011) University of Kentucky Orthopaedic Surgery and Sports Medicine,

Lexington, KY, and University of Kentucky Pediatric Pulmonology, Lexington, KY.
Vocal cord dysfunction in a high school football player. Poster presented at the 2011 National Athletic Trainers Association Annual Meeting and Clinical Symposia, New Orleans, La.

TEACHING EXPERIENCE

Eastern Kentucky University

HSA 200 – Medical Terminology, Fall 2019/Spring 2020/Winter 2020-21/Spring 2021/Summer 2021/Fall 2021

HSA 375 – Health Services Administration, Fall 2019/Spring 2020/Fall2021

HSA 407 – Advanced Health Services Administration, Fall 2020/Spring 2021/Fall 2021

CPR and First–Aid, University of Kentucky, 2010-2014

CLINICAL and ACADEMIC SUPERVISION

Eastern Kentucky Undergraduate Athletic Training Program Preceptor

Jantzen Merriman (University of Kentucky Orthopaedic Surgery)

Michelle Meeks (Highlands Regional Medical Center)

Even Goodin (Cincinnati Christian University)

Michael Valenzuela (Cypress Lake High School)

Katie Morris (The Lexington School)

Josh Heines (KORT Physical Therapy)

Sarah Beatty (Paris High School)

Samantha Styer (Larue County High School)

Shelby Davis (Hendrix College)

Ricky Morse (John Hardin High School)

Stacy Gibson (Georgetown College)

Jared Estridge (California University of Pennsylvania)

Katie Kendall (Harrison County High School)

Caitlin Adams (Premise Health)

Kelsey Todd (Premise Health)

Katie Osborne (United Health Services, Binghamton)

Eastern Kentucky University Honors Program

Sydney Shepherd – Awarded “Outstanding Traditional Research” at Eastern Kentucky University Scholar’s Day (2021)

Lauren Fuller

University of Kentucky of Kentucky Masters in Health Administration Internship

Erin Alenciks (Geisinger Wyoming Valley Medical Center)

INVITED LECTURES:

SME Lecture: The current state of COVID and History of Pandemics

Eastern Kentucky University Homeland Security Program, Richmond, KY
April 2022

Test, Track, and Trace: Contact Tracing COVID-19

University of Kentucky Emergency Medicine Residency Program, Lexington,
KY
October 2020

SME Lecture: Pandemics/Epidemics

Eastern Kentucky University Homeland Security Program, Richmond, KY
November 2019

Capstone Prep and Research

University of Kentucky College of Public Health, Lexington, KY
January 2019

Capstone Prep and Research

University of Kentucky College of Public Health, Lexington, KY
January 2018

Capstone Prep and Research

University of Kentucky College of Public Health, Lexington, KY
January 2017

Capstone Prep and Research

University of Kentucky College of Public Health, Lexington, KY
October 2015

PROFESSION SERVICE:

October 2021: Host/Co-Host, American Public Health Association Annual Meeting

June 2021: Abstract reviewer, American Public Health Association's 2021 Annual Meeting and Expo

May 2020: Abstract reviewer, American Public Health Association's 2020 Annual Meeting and Expo

March 2020 – Present: Research and Funding Opportunities Kentucky Telehealth Subcommittee Workgroup #3

March 2020 – Present: Kentucky Telehealth subcommittee workgroup – Disaster response (workgroup lead)

February 2020 – July 2021: American Public Health Administration Section Strategic Planning Committee

ACADEMIC SERVICE:

Fall 2019 - Current – current: CHS Interprofessional Committee – preceptor IPE case study event

Spring, 2020 - Eastern Kentucky University Diversity and Inclusion Committee

Spring, 2021: Academic Curriculum workgroup (Chair)

COMMUNITY SERVICE

Spring 2020: Mentorship program – Bryan Station High School (Lexington, KY)