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Exploring The Relationship between Injury, Addiction, and Physical Activity: A Path to Recovery for Athletes

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1. Abstract

1.1. Aims

Elite, professional athletes face elevated levels of stress, anxiety, or depression, which sometimes lead to use of illicit substances to mitigate stress by self-medication.This study aimed to highlight the need for developing tailored, exercise mediated approaches to recovery from substance use disorders (SUD) and alcohol use disorders (AUD), offering significant benefits for athlete-specific rehabilitation, and reintegration into their social and professional environment.

1.2. Methods

Two cases, referring to patients who are elite athletes were studied prospectively, from admission to maintenance, describing the complexity of adapting rehabilitation strategies to meet the needs of this population.

1.3. Results

Case 1. A 32-year-old professional, male footballer diagnosed with alcohol use disorder (AUD) and a range of co-occurring disorders following a cardiac syncope. The patient's rehabilitation program included phased exercise regimens, and sport-specific training, in addition to psychological counseling.

Case 2. A 30-year-old professional, male beach volleyball player, diagnosed with mild AUD and depression. His outpatient treatment included moderate to high-intensity resistance training and reintegration into volleyball, fostering not only physical recovery but also social interaction and mental well-being. These cases illustrate that incorporating varied and specific exercise forms, including both aerobic and anaerobic activities, can enhance rehabilitation outcomes for athletes by boosting confidence, improving physical strength, and reconnecting them with their sporting identities.

1.4. Conclusion

This research showed the need for tailored exercise-based interventions in addiction recovery programs for athletes, proposing a shift from conventional methods to more holistic, sport-specific strategies that address both physical and psychological recovery components.

2. Introduction

Injuries are an inherent risk in sports, often leading athletes to confront significant physical and psychological challenges [1]. Coping with the stress of injury and the subsequent recovery process can lead athletes down the path of addiction and substance dependency as a means of managing pain, anxiety, depression, stress and loss of identity [2,3]. This is manifest as a drop in performance, leading to a vicious, downwards spiral, with the intense pressure to perform coupled with the demands of a highly competitive environment. This has contributed to the increased prevalence of substance misuse among athletes [4,5]. However, when properly structured and managed, physical activity can be a powerful tool in aiding the recovery of athletes from psychological stress [6,7]. Central to the athlete's identity is the pursuit of peak performance, the relentless drive to push boundaries, and the unwavering commitment to excellence. Yet, when confronted with the reality of injury, this identity can be shaken to its core [8]. The abrupt disruption of training regimens, the uncertainty surrounding recovery timelines, and the fear of losing one's competitive edge can all contribute to a profound sense of loss and vulnerability [9]. For many athletes, the journey of rehabilitation becomes not only a physical battle, but also a psychological odyssey, fraught with doubt, frustration, and existential questioning [10].In the ordeal of injury recovery, athletes are confronted with a heap of challenges that extend far beyond the margins of getting back to play. Coping with the physical pain, navigating the complexities of medical interventions, and grappling with the psychological toll of sidelined aspirations can create a prolific ground for maladaptive coping mechanisms [11]. In the quest to regain a semblance of control, some athletes may turn to substances as a means of numbing the pain, alleviating anxiety, or reclaiming a sense of agency in the face of adversity [12].In recent years, there has been a growing recognition of the preventative and therapeutic potential of physical activity in the context of addiction, SUD and psychological stress recovery [13,14]. Far from being merely a tool for building strength or endurance, physical activity offers athletes a pathway to reclaim their bodies, mind, and spirit in the wake of adversity [15,16]. While the benefits of exercise interventions have been well-documented among the general population with SUDs [17,18], there is a notable gap in the data specifically addressing how exercise modifications could be tailored for professional athletes dealing with SUDs and alcohol dependence. This highlights a significant deficiency in evidence-based research focused on this specific issue.

3. Research Significance

There is an increasing awareness of athletes facing stress, anxiety, or depression turning to substances as a way to self-medicate, often leading to worsening of their mental health, creating a vicious cycle of dependency and psychological distress [19-21]. This research project aimed to illuminate the complex dynamics for developing tailored approaches to addiction recovery offering significant benefits for athlete-specific rehabilitation.

4. Cases Presentation

4.1. Case 1: In-Patient, Male Footballer

32-year-old male, footballer for Qatar Star league, the top football league in Qatar, who presented with alcohol dependence and psychological distress that had begun to detrimentally impact his professional performance and personal life. A multi-disciplinary intervention including counseling, psychology, physical therapy, and exercise physiology was initiated to address his complex needs.

The athlete had been actively engaged in sports since the age of 14 years, begun consuming alcohol at the age 26, initially drinking occasionally with teammates. His situation took a severe turn for the worse 4 years later when he suffered a cardiac syncope during practice, leading to the installation of a pacemaker. This event, coupled with ongoing pressure to perform, fear of failure, and emotional trauma from previous injuries, exacerbated his reliance on alcohol. Alcohol misuse escalated in two years up 0.5 L of whiskey 3 to 4 times per week. This pattern led to a general hospital admission due to severe intoxication. The patient was admitted to Naufar Addiction and Rehabilitation Centre eight months following a cardiac event, presenting with psychological distress, sleep disturbances, and a consistently low mood. Two months had elapsed since his last professional practice prior to his admission. Upon admission, he provided written informed consent and received a comprehensive orientation at Naufar, after which his tailored treatment plan was initiated. Extensive assessments diagnosed him with alcohol dependence, insomnia, depression, nicotine dependence, and alcoholic cardiomyopathy. The patient has actively engaged in an outpatient rehabilitation program, maintaining abstinence from alcohol, participating in gym sessions, and attending counseling (Table 1). Although he had not returned to his regular team practice, due to it being near the end of the season, he planned to rejoin them next season.

4.2. Intervention

Before initiating any exercise regimen, the athlete underwent a comprehensive cardiology evaluation at Hamad Heart Hospital, to assess heart functions and ensure the pacemaker was operating correctly. Cardiovascular responses under exercise-induced stress were measured using a submaximal VO2max test (COSMID, Fitmate MED) at Naufar hospital, which helped identify safe exercises that enhance cardiovascular fitness without excessive strain. Under qualified exercise physiologist, and physical trainers, light to moderate resistance training was predominantly incorporated into the treatment regimen, whereas vigorous activities were approached with careful consideration. Heavy weightlifting, which can increase intrathoracic pressure, was avoided to prevent any risk to heart health. Exercise intensity was meticulously regulated, with heart rate targets set at 40-70% of the estimated maximum for moderate activities, and 60-80% for more vigorous exercises [21]. Subjective exercise intensity was also monitored using the Borg Scale of perceived exertion, aiming for an RPE of 12-15 on the Borg 6-20 scale [11]. To minimize the risk of impacts that could potentially dislodge or damage the pacemaker, contact sports were avoided. Regular medical check-ups were recommended to monitor the athlete's evolving condition. Any occurrence of symptoms such as dizziness, chest pain, or palpitations during exercise was a signal to immediately stop the activity and seek medical consultation. Throughout this process, the athlete's condition and heart rate values were closely monitored by a clinical exercise physiologist during exercise sessions. Upon being admitted to Naufar as an inpatient, the patient underwent comprehensive physical assessments and had the opportunity to methodically progress through each stage of recovery, which included detoxification, early and advanced rehabilitation, and transitioning through a halfway house to daycare. Each stage was thoughtfully scheduled based on the patient's mental readiness to advance, ensuring they were well-prepared for reintegration into the outside world. In the detox phase, which lasted approximately one month, high-intensity exercises were avoided to prevent potential stress or injury. Instead, the patient began with light gym activities, such as 30-40 minute full-body circuit training three times a week and pool therapy twice a week. In the early rehabilitation phase, the regimen included moderate-intensity resistance exercises three times a week, high-intensity exercises once a week, and pool therapy once a week. Evening sessions incorporated walking and recreational sports like badminton and basketball. The late rehabilitation phase, spanning about three months, consisted of moderate-intensity resistance training three times a week,

Table 1: Outline of the treatment program developed for Case 1.

Treatment stage • Naufar model	SUD treatment provided	Exercise intervention Phase
Engagement	Inpatient Detoxification (withdrawal management)	2 weeks: -Light gym activities (30-40 min full-body circuit training 3x/week) - Pool therapy (2x/week)
Stabilization	Inpatient detoxification	Continue for 2 weeks Light gym activities (30-40 min full-body circuit training 3x/week) - Pool therapy (2x/week)
Early recovery	Inpatient Rehabilitation program	8 weeks of -Moderate-intensity resistance exercises (3x/week) - High-intensity exercises (1x/week) - Pool therapy (1x/week) - Evening walking, badminton, basketball Followed by 8 weeks of -Moderate-intensity resistance training (3x/week) - High-intensity training (1x/week) - High-intensity plyometrics and agility training (1x/week) - Volleyball (3-4x/week evenings)
Sustained Recovery	Outpatient Recovery program	Ongoing Maintenance for XX weeks with -High-intensity agility, speed, plyometrics - Goalkeeper-specific strength training (4-5x/week)

The phases of the treatment as per the Naufar Model, the SUD treatment provide and the exercise intervention at each phase developed for Case 1 are described in Table 1. XX denotes variable number of weeks.

high-intensity training once a week, and high-intensity plyometrics and agility training once a week. Volleyball was introduced three to four times a week in the evenings to alleviate stress and reignite the patient's passion for sports.The final stages in the outpatient setting focused on sports-specific training. This involved high-intensity agility, speed, and plyometrics, along with goalkeeper-specific strength training in the gym four to five times a week. This comprehensive program was designed to not only facilitate physical recovery but also to prepare the patient mentally and emotionally for their return to everyday life and potentially his sporting career.

4.3. Case 2: Out-patient Male Professional Beach Volleyball Player

30-year-old professional beach volleyball player, who was diagnosed with mild AUD and major depressive disorder, and prescribed Escitalopram 20 mg for depression, Mirtazapine 15 mg for mood stabilization, and Melatonin 5 mg to address sleep disturbances.His struggles began during his academic years abroad, between the age of 19 to 23 years old, when he occasionally used cannabis. Upon returning home, the pressures of professional sports and recurrent injuries contributed to the development of his alcohol disorder.Initially resistant to treatment, the patient demonstrated improved engagement after acknowledging the need to manage his mood swings and expressing a willingness to resume antidepressant medication. Despite his successful athletic career, the athlete struggled with substance misuse and mental health challenges, prompting the need for intervention. Lacking confidence, he hesitated to return to his sport, avoiding both practice and participation in any competitive events.

4.4. Intervention

As an outpatient, treatment plan and duration differed from the inpatient program (Table 2). Initially, professional volleyball activities were suspended to alleviate psychological distress. Given the patient's relatively active lifestyle and access to a gym prior to involvement of Naufar, it was unnecessary to start with lower intensity exercises, unlike in Case 1. In the first two months following admission, the patient began a regimen of moderate-intensity resistance training three times a week, aimed at strengthening vulnerable muscle groups. As his condition improved, high-intensity resistance training was introduced twice a week for another two months. The exercise routine evolved to include volleyball in a therapeutic indoor setting three times a week, which helped facilitate social interactions and communication with other patients recovering from similar conditions for one month. This adaptation allowed the patient to reengage with a sport he loved, albeit at a lower intensity than his previous level, which reduced stress and increased enjoyment, as evidenced by consistent attendance and positive feedback.

Then onwards, volleyball became the patient's primary activity within the treatment program, increasing to four to five sessions a week. The indoor volleyball sessions included friendly competitions every two weeks, sustaining the patient's engagement and enjoyment. Alongside this, the patient continued with the resistance training program prescribed by Naufar's exercise physiologists, performed at his local gym, maintaining a balanced and structured fitness regimen aligned with his recovery goals. The patient is currently active and has abstained from alcohol and cannabis. For more detailed information, please refer to Table 2.

5. Discussion

There is a significant gap in research addressing the customization of exercise interventions for athletes with substance use disorders (SUDs). The uniqueness of this population poses particular challenges when using exercise as a recovery tool, differing markedly from approaches used with the general population. Exploring this area offers insights into innovative strategies to help athletes manage stress and reconnect with their passion for sports. Furthermore, incorporating recreational aerobic activities such as volleyball and badminton has shown positive outcomes, providing these patients with new ways to cope with stress related to their sports. This finding diverges from traditional methods, such as steady-state aerobic exercises like brisk walking and jogging, highlighting the potential benefits of varied aerobic engagements. Existing literature predominantly supports the benefits of aerobic exercise in treating addiction and SUDs [13-16]. The evidence supporting the effects of anaerobic exercise remains limited [17]. In our cases, however, forth substantial positive outcomes have been observed with both aerobic and anaerobic exercise, particularly reports of increased confidence and improved overall physical fitness and strength. Furthermore, there were observable reductions in substance use, accompanied by significant improvements in mental well-being and the development of more robust coping mechanisms. Physical rehabilitation efforts were also fruitful, leading to enhanced athletic performance and functional capacity. Recognizing the deep psychological attachment athletes often have for their sport, which forms a significant part of their identity, the conventional SUD treatments, which primarily focuses on structured physical activities, were deemed potentially less effective. This is especially true when the sport has been a source of stress or associated with injuries. This enhanced self-perception and physical condition could be particularly significant for athletes, suggesting that exercise selection impacts this group differently compared to the general population.

Table 2: Outline of the treatment program developed for Case 2.

Treatment stage • Naufar model	SUD treatment provided	Exercise intervention Phase
Engagement	Outpatient start and treatment plan agreement	Preparation 4 weeks: -Professional volleyball activities suspended to alleviate psychological distress.
Stabilization	Outpatient community withdrawal management and behavior change support to reach abstinence	Continue for 12 weeks with -Professional volleyball activities suspended to alleviate psychological distress. The 8 weeks of: -Moderate-intensity resistance training three times a week.
Early recovery	Outpatient Intensive Rehabilitation initial recovery program (Matrix) Relapse prevention	8 weeks of -High-intensity resistance training twice a week. Followed by 4 weeks of -Volleyball in a therapeutic indoor setting three times a week; fostering social interactions and communication. Followed by 12 weeks of -Volleyball four to five times a week, including friendly competitions every two weeks.
Sustained Recovery	Outpatient Intensive Rehabilitation Advanced recovery program (Matrix) Abstinence Maintenance	Ongoing Maintenance for XX weeks with - Resistance training at local gym as prescribed by Naufar; Support active lifestyle with abstinence from alcohol and cannabis

The phases of the treatment as per the Naufar Model, the SUD treatment provide and the exercise intervention at each phase developed for Case 2 are described in Table 2. XX denotes variable number of weeks.

Table S1: Urine Drug Screening Results for Patients from March 5th to March 25th, 2024.

Patient	Case 1		Case 2	
Urine Drug Screening	Unit	Category	Unit	Category
Amphetamine	103	Negative	<100	Negative
Benzodiazepines	<18.6	Negative	<18.6	Negative
Cocaine	<40	Negative	<40	Negative
Ethyl Glucuronide	<100	Negative	<100	Negative
Fentanyl	0.1	Negative	0.2	Negative
Methadone	<10	Negative	<10	Negative
Opiates	<44.1	Negative	<44.1	Negative
THC (Cannabos)	<10	Negative	10.9	Negative
Tramadol	10.3	Negative	7.2	Negative

6. Patients Feedback

Both athletes reported a boost in confidence, motivation, and satisfaction with their personal and professional lives.

6.1. Case 1:

The patient reported a complete cessation of alcohol cravings and abstained from alcohol throughout the entire daycare program. They noted enhanced coping skills for managing stress and psychological distress, which included trying new sports and spending more time outdoors. These activities led to noticeable reductions in stress and anxiety levels. The patient expressed, "The physical rehabilitation and the high-intensity gym efforts significantly improved my agility and performance, enhancing my athletic abilities and endurance." They also planned to continue attending gym sessions and maintain regular follow-ups, recognizing these as crucial for sustaining positive outcomes and preventing relapse. Furthermore, the patient experienced increased confidence and motivation, highlighting that the enjoyment derived from engaging in physical activities played a crucial role in promoting a sense of fulfillment and happiness, significantly contributing to the reduction of depression symptoms.

6.2. Case 2:

The patient acknowledged, "Going to the gym and exercising has played a major role in managing my cravings and mood fluctuations, with noticeable improvements in both my psychological well-being and physical fitness." He also reported increased enthusiasm for participating in group activities and greater involvement in their sport, which contributed to a reduction in depression symptoms and increased fulfillment.

The patient successfully regained his confidence in beach volleyball, achieving a notable milestone by competing in and winning third place at a recent event held during the holy month of Ramadan in March. His renewed enthusiasm and motivation for the sport were evident as he expressed, "With all my 12 years of playing volleyball, I have never felt this encouraged and motivated to be part of it again. I almost forgot how amazing it feels to compete. It's good to be back." This statement highlights the significant emotional and psychological recovery he has experienced through re-engaging with the sport he loves.

7. Conclusion

The current report underscores the efficacy of comprehensive, tailored interventions designed to address the unique challenges faced by professional athletes with alcohol dependence and psychological distress. The integration of multidisciplinary approaches, including counseling, psychotherapy, exercise physiology, physical therapy, and pharmacological treatments, is essential in navigating complex issues and fostering successful recovery. Moreover, fostering collaboration among healthcare professionals, sports organizations, and athletes is vital for addressing substance use disorders and promoting a culture of wellness within the sports community. Although direct research on exercise interventions for athletes with specific substance use disorders is limited, the general evidence supporting exercise as a complementary treatment suggests potential benefits [18]. Healthcare professionals working with athletic populations should consider these advantages while also addressing the specific needs and risks associated with this group. Referencing Naufar Model of Care, physical rehabilitation and exercise physiology, stands out as a crucial element of their holistic approach. Naufar has developed advanced physical rehabilitation facilities and staffed these with experts qualified in exercise physiology sports rehabilitation, and physical coaches, positioning it uniquely for specialized research in this field. Additionally, reintegrating patients with substance abuse disorders into society and the workplace is essential, yet challenging. For professional athletes, this process is particularly complex as it involves not only social readjustment but also the restoration of specific physical fitness levels and mental coping capabilities, necessary for their return to professional sports.

8. Considerations for Future Research

Future studies could focus more specifically on how athletes with substance use disorders respond to different types of exercise interventions. Considering factors like the athlete's sport, level of competition, and the nature of their relationship with exercise (whether it is potentially compulsive or used as a coping mechanism). Research could also explore how exercise programs for athletes with SUD should be tailored differently compared to the general population to account for their higher levels of initial fitness and unique psychological stresses.

8.1. Limitations:

Given that this study is a retrospective case report, certain details might have been more accurately captured had the research been designed as a prospective study. Employing quantitative stress and depression scales at each phase of recovery would have provided more precise data compared to relying solely on qualitative, subjective feedback from patients.

9. Ethical Considerations

The patients have signed an informed consent form upon admission, acknowledging and consenting to the use of their personal and health information for research purposes in accordance with the terms outlined in the consent document.

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