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Preprint
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Physical Activity during a Treatment for Substance Use Disorder: A Qualitative Case Study

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ABSTRACT

Background: Substance use disorders are frequently diagnosed mental disorders and patients have a higher mortality rate due to the presence of several chronic physical conditions. Physical activity is seen as a new solution to decrease mortality because of its benefits to overall health. Studies have observed improvement following physical activity, but most of them have omitted patients' perception of physical activity. Objective: To understand the physical activity perception of people undergoing treatment for substance use disorder. Methods: Thirteen people (69% men; 33.4 ± 8.3 years old) were interviewed after experiencing at least 12 sessions of physical activity during their treatment. Results: Following the content analysis, three predominant themes emerged: physical activity was (1) a way to take care of themselves, through the perceived improvement of health; (2) used as a protective mechanism against relapse, through the occupation time, behavior replacement and the creation of a healthy network; (3) served as a facilitator of treatment retention because participant developed social support. Conclusion: Practicing physical activity during treatment helps to develop healthy lifestyle habits that may support retention to treatment and built confidence in the ability to cope with future relapse.

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Please cite as: Piché, F., Girard, S., Plourde, C., & Romain, A. J. (2023). Physical Activity during a Treatment for Substance Use Disorder: A Qualitative Case Study. [Preprint]. *SportRχiv*.

INTRODUCTION

Substance use disorder (SUD) impacts about 4% of the Canadian population [1] and is defined as a pathological behavior pattern related to 11 psychoactive substances: alcohol, cannabis, hallucinogens, inhalants, opioids, sedatives, hypnotics, anxiolytics, stimulants, tobacco, and other substances [2]. SUD reduces life expectancy by up to 20 years compared with the general population [3], [4]. The leading causes of excess mortality (73%) are primarily related to physical health conditions such as cardiovascular disease, cancer, chronic respiratory disease, or diabetes [5], [6]. One promising avenue to manage physical health problems, and symptoms like craving, social impairment or withdrawal is physical activity (PA).

PA was found to improve several aspects of people with SUD, including improvement in abstinence rates among illicit drug users [7], depressive and anxiety symptoms [7]–[9], quality of life [8], [10] and moods [8], [9]. In addition, PA has been found to reduce self-reported withdrawal [7], [11], as well as craving among tobacco users [12], [13]. Very few of these studies did specify how participants perceived PA during their treatment. Dai et al. [14] studied participants' perceptions regarding the effects of a walking/running program aiming to prepare them for a race event. According to participants (80% with opioid use disorder), the PA intervention reduced craving, improved personal health, and provided a sense of accomplishment and belonging [14]. Another study from Fagan et al. [15] investigated PA offered on a voluntary basis (walking/running groups, aerobics classes, outdoor activities, and free gym time). According to participants (73% using multiple substances such as alcohol, opioids, and cocaine), PA was perceived as a method to replace the 'high' of drug use, and to regulate their emotions [15].

Although the results of these studies are of interest, several limitations in terms of intervention, methods, and design of PA as a complementary treatment have been identified. Firstly, in terms of intervention, participants reported a lack of diversity in the PA sessions [14], and a lack of supervision by an exercise professional [15]. Secondly, the fact that PA was not an integral part of treatment could have an impact on outcomes. Indeed, in one study, the PA intervention was an option offered at a community center located at a 15-minute walk of the treatment center [15]. In the other study, participants reported perceiving PA more as a competition to prepare for, rather than a regular activity to maintain in their daily lives [14], knowing this, we need more studies that integrate PA into the SUD treatment to be able to have a better understanding of the impact of PA on the outcome of SUD symptoms and have better well-controlled setting [16]. To overcome these limitations, a study considering participants'

perceptions in the context of a supervised PA intervention as part of a SUD treatment was needed. Thus, the aim of the present investigation is to explore individuals' perceptions regarding a 5-week supervised group PA intervention during SUD treatment in a residential center.

METHOD

The present study followed the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines and can be found in supplementary file 1 [17], [18]. The project was accepted by the ethics committee of the Université du Québec à Trois-Rivières (CER-20-268-07.10) and by the team of the residential center for SUD.

The context

Design.

The present study used a qualitative approach with a case study design to investigate the people's perceptions regarding a 5-week group PA intervention during treatment for SUD.

The principle of case study has been defined by many authors. In our case, we used Simon's [19] definition: the case study acts as an approach that allows for in-depth research using multiple perspectives of a single, specific case in a real-world context, of which one of the purposes is to inform. In line with this definition, the present case study approach will not be used with the goal of generalization, but rather as a means of understanding the particularity of a case [20]. The case study was chosen because of the complexity of the phenomenon, as the case (PA intervention) is intrinsically related to the context (SUD treatment). In other words, the case study approach was selected because it allows taking the context into account [21], [22]. This method is also an excellent tool for studies that seek to understand a particular therapeutic practice, such as PA interventions [20].

Participants and setting.

Participants in the study followed a treatment in a residential SUD center (live-in 24h) in a mid-sized city (137,188 people) located in Quebec (Canada). It accommodates people from both Canada and Quebec correctional services (10%; 54%) and people on a voluntary basis (36%). The residential center is for adults and can accommodate up to 98 residents with a problematic alcohol or drug use. Participants are in the residential home 24/7, without access to a cellphone or the internet, and with only one TV for residents in the center. All residents have

group therapy from 9 a.m. to 5 p.m. Monday to Thursday, and the rest of the time is considered non-therapy, e.g., housework, social activities, or lectures, which takes place in the evenings and at weekends. Participants are quite supervised but with some free time.

To explain the project and release consent forms, an information session was held at the residential center. Residents were left with one week to agree with the project and to sign the consent form. To be included residents had to meet study inclusion criteria: a) more than two months remaining in SUD treatment, b) not being pregnant, and c) not having contraindications to PA participation. Fifteen residents were respecting the criteria and at the end of the PA intervention, because of the drop-out from the SUD treatment center, only 13 adults including 4 women (M_{age} = 26,8; *SD* = 2,5) and 9 men (M_{age} = 36,3; *SD* = 8,3) participated in the interview (figure 1). Participants' characteristics are in table 1. Over 13 sessions, the participation rate was 77.4%, and the principal reasons for non-participation were related to their treatment (e.g., mandatory therapy meeting).

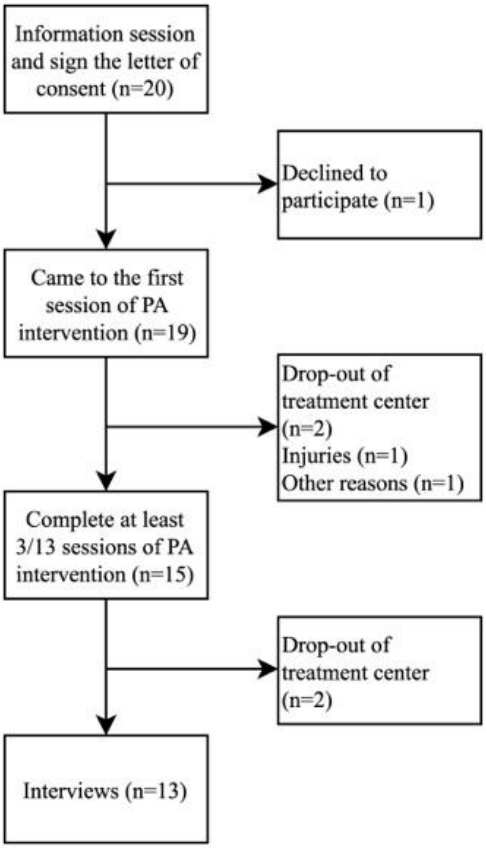

Figure 1. Participant flowchart

Name	Age	Sex	BMI	Level of education	Substance	Duration of problematic consummation		Number of therapies		Imposed by the judicial system	Presence of symptoms	Medication taken	PA (min/ weeks)
						Alcohol (years)	Drug (years)	Start	Finish				
Jean	43	M	22,4	Primary school	Tobacco, alcohol			3	1	Yes	None	Corticosteroids	90
Augustin	43	M	24,4	University Diploma	Tobacco, alcohol, stimulants		33	2	1	Yes	None	Amytriptiline	180
Arnaud	40	M	23,7	Secondary school	Tobacco, alcohol, stimulant	27	4	2	1	Yes	None	Methylphenidate, Pregabalin	No answer
Clara	30	F	23,4	Secondary school	Tobacco, alcohol, opioid, stimulant	10	3	1	0	Yes	Delirium, toxic psychosis, trembling	Zopiclone	90
Adam	41	M	24,2	University diploma	Stimulant	12	13	8	7	Yes	Anxiety, sleep disturbance	Mirtazapine	180
Gabriel	43	M	24	College diploma	Alcohol	17	31	1	0	Yes	None	Quetiapine	30
Charlotte	24	F	24	Secondary school	Tobacco, alcohol, hallucinogen, opioid, sedative, stimulant	0	8	2	1	Yes	None	None	120
Anthony	26	M	27,5	College diploma	Alcohol, stimulant	8	10	7	7	Yes	Irritability, craving, depression, mood swings, aggressiveness, insomnia, anxiety	Lisdexamfetamine	300
Jeanne	27	F	22,8	Secondary school	Alcohol, sedative, stimulant	13	13	3	0	No	Extreme fatigue	None	30
Rosalie	26	F	27,3	Secondary school	Alcohol	10	2	1	0	Yes	None	None	90
Loic	41	M	30	Secondary school	Tobacco, alcohol, hallucinogen, opioid, sedative, stimulant	13	20	1	0	Yes	None	None	150
Normand	25	M	27,3	Secondary school	Alcohol, stimulant	13	13	1	0	No	None	None	300
Keven	25	M	29,4	Secondary school	Tobacco, alcohol, stimulant	10	13	2	0	No	Depression, mood swings	None	130

Table 1. Participant characteristic

Physical activity intervention.

The PA intervention included a total of 13 supervised in-person group sessions (three times a week, 60-minute duration) for five weeks. During sessions, different types of exercises were proposed, such as yoga, cardiovascular and muscular circuits, running training, and cardio-boxing. Each week, one session focused more on balance, flexibility, and relaxation, while the other two focused on cardiovascular and resistance training. According to the type of exercises of each session, different PA intensity levels (i.e., low, moderate, high) were suggested by the professional and would vary between sessions, but participants were also encouraged to maintain a pace they felt comfortable with, allowing them to enjoy the sessions [23]. All sessions were supervised by an accredited kinesiologist with two years of experience, who is also the principal investigator of the study, which is frequent in case studies [20]. During the intervention, when a participant missed a session, a follow-up sheet was used to collect the reasons for absence. In what follows, when we refer to the PA program practiced by the participants, we will use the term PA intervention.

Procedure and Evaluation.

The study took place from September 2020 (information session) to November 2020 (figure 2). After the first session of PA intervention, a sociodemographic questionnaire was completed to further describe our sample. Also, a follow-up sheet at the end of each session was completed by participants about their perception of the intensity of the session, using the Borg scale on a scale from 1 to 10 0 = not at all; 10 =very very strong; , [24], and their level of satisfaction with the PA session on a scale from 1 to 10 (1 = *not satisfied at all*; 10 = *extremely satisfied*).

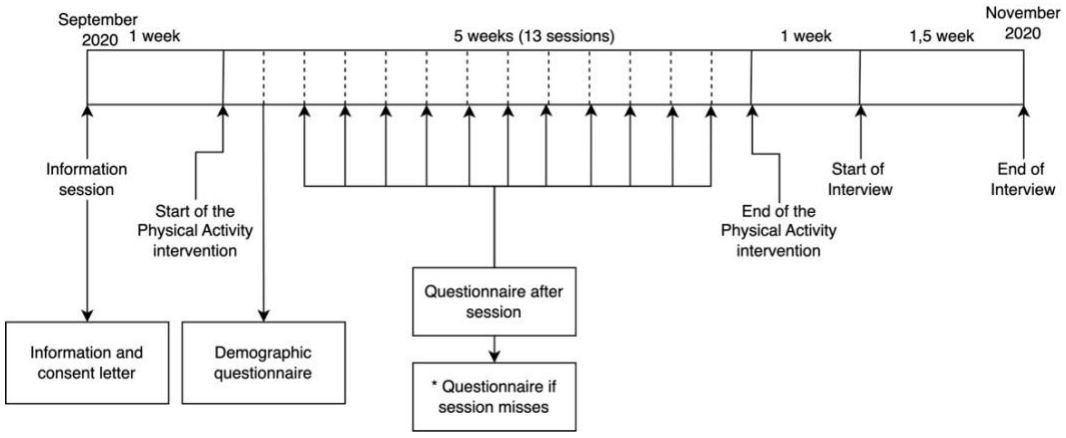

Figure 2. Procedure

As we wanted to understand each participant's perceptions regarding the PA intervention, we used individual interviews. A semi-structured guide was created and included 15 predefined questions. The questions were open-ended (available in supplementary file 2) and developed using the qualitative model of evaluation of care [25]. Interviews were scheduled after regular therapy hours and conducted by the principal investigator (PhDc) and took place in a room set aside for this purpose at the residential center. We chose to conduct the interviews with the same person as the one giving the intervention to allow a good relationship that is necessary to conduct good interviews, as well as an attitude of openness and a more secure environment so that the residents felt comfortable immediately. Although we know that this option will potentially lead to a social desirability bias towards the interviewer, we believe that having a good confidence link was more important for the relevance of the results. The interviews lasted between 33 and 55 minutes, with an average of 43 minutes.

***Data analysis*.**

Interviews were audio recorded. Contents were transcribed and deidentified (using pseudonymization to provide cover name) into verbatim by two members of the research team (F.P. and C.C.) prior to analysis using NVivo software, version 12 (QSR International). The verbatim were originally in French and we have therefore decided, for the benefit of transparency, to put them available as they were first transcribed (see supplementary file 2). Given the limited literature available on PA perception in the context of SUD treatment, we chose to conduct a conventional content analysis [26]. We used an inductive approach which allowed us to create our categories by emergence [27]. Analysis began with the first author who coded and made a preliminary list of codes, each one having a definition. All codes were discussed by the team (all authors) during a series of meetings and were then transformed into themes (i.e., several codes were gathered to form larger themes). After analyzing all 13 verbatim, data reached the point of saturation, which means that there was no more additional code [28]. Quantitative data (e.g., sociodemographic characteristics, depression, and anxiety symptoms) were used to describe the sample as these may nuance the responses given in the interviews [29].

Results

Three predominant themes emerged from the content analysis. Specifically, participants perceived PA intervention as (1) a way of taking care of themselves, (2) a protective factor against relapse, and (3) a facilitator for treatment retention (see table 2 for the number of participants

who named the themes). According to these results, PA seems to be beneficial for people undergoing treatment for SUD.

Main themes	Sub-themes	*n*, %
Taking Care of Themselves	Perception of PA to improve health in general	13, 100%
	Creation of a New Identity	4, 31%
Protective Factor Against Relapse	Avoiding Boredom	9, 69%
	Creation of a Healthy Social Network	5, 38%
	Maintaining a Healthy Weight	5, 38%
Facilitator of Treatment Retention	Social Support via the Group	11, 85%

Table 2. Main themes and sub-themes with prevalence.

Theme 1: Taking Care of Themselves

One of the main themes was that PA intervention was a way of taking care of themselves. Two subthemes emerged: 1) perception of PA to improve health in general; and 2) association of PA with the creation of a new identity.

Perception of PA to Improve Health in General.

Perception of PA to improve health was clearly the theme that emerged most often and who was unanimous among participants. The PA intervention was perceived as a time when all participants felt that they were taking care of themselves. In fact, during and following the PA intervention, participants experienced various positive effects on physical health. For example, participants mentioned: 'feel much more in shape', 'more energetic in daily life', 'less pain', 'slept well at night', and 'more flexibility compared to the beginning.' Beneficial effects were also reported about psychological health, like having a 'better mood', and being 'more zen'. Following the PA intervention, participants were feeling that they had better control of their emotions:

> I'm an anxious and hyperactive person and when I do sport and expend energy, I'm able to control my emotions and my impulsiveness. I'm able to take a step back and maybe make better decisions. Especially when I do cardio, I realize that after [that], then I'm calmer. (Anthony, V1; all the names have been changed and the number corresponds to the French version in the supplementary file 2)

The PA intervention represented an opportunity to reinvest some of the competencies that residents had learned in therapy, which made them proud of themselves and reinforced their self-esteem:

> I didn't have a strong self-esteem, so by doing that [PA intervention], it increased my self-esteem. Because basically, I gave myself challenges, I gave myself objectives, and when I achieved them, I went to look for my pride by myself and not by others. I'm an emotional addict, because I often tend to look for my pride in the eyes of men, but this [PA intervention] gave me a way to look for my own pride because once I'd done it, I was proud of myself, I went to bed and I slept even better, so no, it gave me a pride there. (Charlotte, V2)

Experiencing these benefits during their voluntary participation in the PA intervention made them feel like they were taking better care of themselves, instead of just doing therapy without concern for their physical health.

> The whole therapy is about taking care of myself so I'm proud to take care of myself and my body. I've been doing everything wrong with my life for a long time now and I'm on the verge of losing everything, let's say I've lost half of it. Because I don't take my responsibilities in hand and I take everything too lightly, so just taking care of myself concretely with my body makes me proud. (Jeanne, V3)

> It's good to get back into shape and these things, given where we've come from, we didn't take care of ourselves, we've destroyed ourselves, and just the effect of taking care of ourselves, yes it helps us mentally and physically. (Gabriel, V4)

It is also important to note that some participants came into therapy after experiencing a traumatic event in their life (e.g., being arrested, road accident), which could impact their health or even their motivation to practice PA. However, it appears that these events did not stop participants from wanting to do the PA intervention. 'Understand that when you normally come to therapy, you don't arrive in good shape, you come out of a rather disastrous episode, but I saw it as an opportunity to get back into shape, and yeah it worked.' (Adam, V5) Most participants also felt that they were more likely to adopt new healthy behaviors in accordance with their PA

participation. For example, they mentioned that they were having more consideration for their diet following the PA intervention.

> Since you started coming, I've started to pay more attention to what I eat too. Before I used to have dessert all the time, now I don't have dessert [...] I just take glasses of water, no more juice. And yeah, I'm careful about what I eat, I don't take soup either, it's often cream, I don't take it. Yeah, I try to be as careful as possible. (Normand,V6)

Another example of healthy behavior was the willingness to cease tobacco, which was the case for four participants (Jean, Adam, Gabriel, and Anthony). They were all in the process of tobacco cessation and remarked that PA intervention was congruent with their process. Indeed, the fact that they were seeing progress due to PA intervention was a source of motivation for them (e.g., the breath becoming 'longer' as opposed to 'short' at the beginning when they were smoking).

> I've been thinking about quitting smoking for a long time, but I didn't know how, but doing this activity helped me a lot to take care of myself and my body and my health and it helped me to quit smoking. (Jean, V7)

Creation of a New Identity.

PA intervention brought back positive memories for participants that they identified as 'good days' i.e., when they were healthier, which gave them hope. Participants were able to project themselves into the future through their past practice of PA. 'It [PA intervention] gave me back the taste of doing sports again, doing the old stuff I used to do when I was younger...' (Arnaud, V8) PA was also associated with a better life and the achievement of becoming a 'better person'. In fact, PA was often associated with the positive moments in participants' lives. 'I'm sorry, but I would say that when I had that [PA] in my life, when I was training, generally, my life was fine!' (Anthony, V9) The SUD treatment offered the opportunity to get a new beginning: participants came to therapy to change their lifestyle habits, and to stop misuse of substance. To achieve this goal, PA was seen as a needed lifestyle change to be successful in their therapy.

> [...] you know I come here to educate myself, to help me, to change my life, to stop consuming, but I want to include that [PA] too. Yeah, for me it's like, you know, it's a healthy lifestyle, because if I'm going to stop consuming, well, it's simple, I'm going to do PA as well. (Rosalie, V10)

The perceived incompatibility between PA and substance abuse was disparate among participants. For some, it was associated with the period during which they were able to avoid

consumption of substance, while for others, PA did not interfere: 'Sport also helped me a lot because when I wasn't doing it, I was consuming.' (Jean, V11) 'In the evening, I drank like two big cans of beer, but I was still going to train the next day, but I didn't really think it had any impact, except that I was more tired for sure.' (Rosalie, V12)

Theme 2: Protective Factor Against Relapse

PA was considered as a strategy to avoid thinking about consumption during treatment, but also as a way to prevent relapse once at home after the end of treatment. In this sense, three subthemes emerged: 1) avoiding boredom, 2) creating a healthy social network, and 3) maintaining a healthy weight.

Avoiding Boredom.

Participants mentioned that, during treatment, they had a lot of free time during which they didn't know what to do. Therefore, PA was seen as a way to occupy oneself outside of therapy hours. 'Well, sometimes the week is long here, but I found that having this extra stuff [PA intervention] filled up my weeks more.' (Charlotte, V13) Even though there were other activities offered at the residential center to occupy residents (e.g., listening to TV, reading, meditation), PA intervention was the activity that participants found the most meaningful. 'Well, because it's fun and you don't see the time passing and it feels good. You feel like you're doing something with your own skin.' (Jeanne, V14) Participants felt that PA could be used in the future to prevent their consumption. Indeed, by keeping them occupied with a healthy behavior, it decreased the risk to consume. 'An addict has to occupy his time as much as possible because when you fall into boredom for me, if I don't have a routine where my time is really filled, it's dangerous.' (Adam, V15)

> For me, boredom is a relapse process, because I know that outside of here, of course, there's Covid, but I can go running outside, I can train by myself, and it's something that I'm going to have to continue outside, because I have to stay in the action so that I don't fall into boredom so that I don't relapse. (Charlotte, V16)

Creation of a Healthy Social Network.

Participants felt that they developed positive relationships during PA intervention, which encouraged them to continue PA outside as well. Which makes PA also viewed as a promising strategy to develop future healthy relationships.

> I realized when I was doing it that it was a lot of fun, [...] everyone is respectful, and it encourages me to make a new circle of friends outside, like doing yoga in a fitness center, [...] because those who are there are not so much down to go and get high afterwards, they are not drug addicts, theoretically no, maybe they are regular users, but not drug addicts, it gives a new circle of friends. (Loic, V17)

In addition, some participants were planning to have a new start after the treatment, starting 'a new life', in another city, where everything is new, and PA was going to be a new and easy way of making a group of friends with a lower possibility of meeting problematic consumers.

Maintaining a Healthy Weight.

'Lose weight' and 'get in shape' were sources of motivation to start the PA intervention for some participants. Women participants explained that, depending on the type of substance they consumed (or stopped consuming), it could have a different impact on their weight (gain or loss): 'Speeds to death, really a lot of speed, enough to not sleep, not eat, and to be in shape, well to look in shape.' (Jeanne, V18) Participants also mentioned that PA was a new strategy to help them to get 'in shape' without substance consumption and to prevent weight gain during therapy, which was associated with a relapse process for some participants.

> I had already done another therapy before, and when I came out of the other therapy, I had gained a lot of weight, and it was a relapse process for me because I wanted to lose weight quickly, that's why I want to continue [PA] outside. (Charlotte, V19)

Theme 3: Facilitator of Treatment Retention

Social Support via the Group.

Doing PA intervention in group sessions was perceived as a facilitator for treatment retention because of many factors including the overall good participation, the supportive environment created by the kinesiologist, the mutual help between participants, and the enjoyment experienced during PA intervention.

In fact, not only participants considered the group as a crucial support during SUD treatment, but they also recognized that the PA intervention facilitated the creation of trusting relationships between patients. The fact that participants felt that everyone attending the exercise sessions really wanted to be there really enhanced their positive experience as a group. 'Everyone was open, everyone was motivated, in fact, there was no one who just wanted to save time.' (Keven, V20) 'We didn't hear grumbling or complaining, not that again, no there was a nice

atmosphere.' (Adam, V21) During PA intervention, participants were helping and supporting each other, and this resulted in the creation of trusting relationships between patients.

> [...] it [PA intervention] also allowed me to have trust in the others and to become aware that they are there to help me and that I could also ask them what movements [to do] because sometimes I didn't see you, so I asked them. (Jean, V22)

The feeling of enjoyment was also considered by participants as a retention factor.

> Well, I thought it was funny, I mean it was good, you could see that everyone was smiling, and it brought joy to the house, in the morning we said ah it's evening training with [redacted]! Really, everyone was happy, it gave joy in the house, there are not really activities, the activities are more on the weekend here, and that put something more in the week, it seems like it passed more quickly, it gave something more to the therapy. (Charlotte, V23)

The fact that PA intervention was seen as uniquely different from therapy (lighter, voluntary, less loaded) really enabled participants to stay motivated and engage themselves into treatment, as well as into PA intervention.

> Because at some point you disconnect, especially given you're in therapy all the time, it becomes heavy, it's all very well to be sad all the time and to share, but this [PA intervention] frees you up, you don't need to think about anything, you come here and it frees up your mind, you don't think about anything else, and it's more on the physical side, you don't think about your problems, you just disconnect a bit, it allowed me to do that during the activities. (Arnaud, V24)

During the PA intervention, competition between participants was experienced differently: some were perceiving it as encouraging, and others as discouraging. The competition was sometimes associated with encouraging each other and seeing other people doing better was helping some participants to surpass themselves.

> When you see people push more, it pushes you to go a little bit further, when you see the people, like me, sometimes I stopped, and you see the people going on, and go, go, go ahead, it's still a little bit more, it's for sure that it's fun, it takes a group to do it, I think that it motivates you a little more. (Gabriel, V25)

For other participants, they saw people better than them as a threat and were 'afraid of looking ridiculous.' The competition was a lot based on the comparison between people in the group.

Discussion

The objective of our study was to explore individuals' perceptions regarding a 5-week supervised group PA intervention during SUD treatment in a residential center. Results indicated that PA was perceived as a way of taking care of themselves because of its positive effects. PA was also perceived as a way to improve residents' health in general, to create a new identity with new lifestyle habits like eating better and diminishing smoking. PA was a protective factor against relapse because it helps to avoid boredom, it facilitates the creation of a healthy social network and make easier the maintenance of a healthy weight. Finally, PA was found to be a facilitator of treatment retention through the social support created in the group PA intervention.

The theme that was identified most often by participants, improving overall health, is consistent with the results of previous studies [9], [14], [15], [30], [31]. Benefits in terms of lifestyle habits were brought by the participants, one of them was smoking cessation because SUD treatments are renowned moment to encourage people to stop smoking, and a lot of patients wanted to achieve this goal during their SUD treatment time (55%) [32]. So, it was not surprising that four participants were on this path during PA intervention time. They reported that PA helps them, which is congruent with the literature [12], [13]. Also, the benefits were related to the fact that PA intervention was really considered as an important part of the therapy because it was voluntary (participants were free to come or not) compared with the therapy, which was mandatory. It makes them feel more responsible for all the benefices they acquired during these interventions and that did come out important to participants in the result compared to other studies [14], [15].

Relapse is a major concern in treatment, as it is one of the most important challenges and predictor of success following their therapy. Participants are constantly looking for ways to prevent it. Using PA to help in the relapse prevention was seen as a viable and secure option, and some mechanisms have been proposed in the literature [33]. First, PA could help to diminish boredom and therefore have a better occupation time which has been seen in this population before [9], [34]. As in previous studies, it is not just about being busy, it is about keeping occupied with a meaningful alternative during the therapy, which increased the likelihood that participant would continue PA afterwards [34]. Also, a critical part of the intervention was the fact that PA has a fun side to it [34], [35] and a detachment side participants could forget about the problem [9]. Counterconditioning is a strategy developed in treatment for SUD to identify the links between cues to the use of a substance and replace it with healthier behaviors [36]. This strategy is congruent with our result, as stated by participants from this study, PA represents a good

strategy to replace substance use. Boredom was seen as a high-risk situation for relapse by the participants and PA as a coping response which, if done, will increase self-efficacy into the ability to cope with relapse and decrease the likelihood of relapse [14], [37]. Second, using PA to maintain a healthy weight is a practice known in the literature for persons with SUD [9], [14], [34]. One specificity from our study is the association between weight and the prevention of relapse. One of the potential explanations is the fact that certain drugs are known to decrease weight [38], [39]. Besides, more than 30% of users started using substances to induce weight loss [40], so cessation could lead to weight gain, due to the normalization of metabolism or increased food intake [41]. Further, weight gain is also associated with the risk of relapse after treatment because drug use is perceived to be linked to a more attractive appearance and more than 45% of people after treatment in SUD are afraid to relapse because of that [40]. This theme was most prevalent among women in our study, which is also congruent with the literature on this topic [9], [34], [40].

Several of our themes could be explained by the identity theory by Burke [42], [43]. This psychological theory is also very seen in SUD treatment (consumer identity vs. recovery identity) and contains three components: personal identity (the way a person can define himself as a unique individual independent of others), role identity (expectation and related to social position), and social identity (related to the group). Our results can be interpreted considering the personal and social components. Change in identity is often made during a critical period such as the treatment of SUD. The present study observed a desire for participants to return to a past identity who was active, which is congruent with previous research [34]. In other populations, past behavior has been found to be an important predictor of future change in identity [43], [44]. Also, these changes in behaviors could possibly lead to a healthier identity as hypothesized in previous studies [14], [34]. The existence of an identity conflict between PA practice and substance use simultaneously could prevent future relapse, according to the theory, because the PA identity would act as a protector against substance use. This process has been seen in tobacco use [45]. Nevertheless, our explanation about the conflict between identities should be interpreted carefully given for some participants, there was no conflict between both, the consumer and PA, identities. Regarding the social identity, which is based and tied to the social group, it is likely that a social identity was created during the PA intervention as it is likely the case in PA groups [46]. In previous PA intervention among people with SUD, and similarly to what was reported by participants in our intervention, bonds of trust were created between the participants who in turn promoted group cohesion [9], [10], [46], [47].

Our study has several strengths that should be mentioned such as the use of the COREQ criteria grid [17] to better report all necessary elements. Second, the fact that the first author was familiar with the clinical environment led to a better knowledge of the environment (equipment, practitioner, therapy house) and therefore a greater familiarity with the PA intervention. Finally, the use of the case study method allowed us to go in-depth into the topic and to really integrate the environment (treatment residence). The present study also has limitations such as a potential social desirability bias as the kinesiologist was the same person as the interviewer and this situation could have had repercussions on the interview, hence the results. Nevertheless, this situation was counterbalanced by a better alliance between participants and the research, which in turn provided us with richer analytical content. Another limitation is the fact that the intervention was given during COVID-19 which may have prevented some people from participating, as some were uncomfortable or afraid of being contaminated. It is also important to consider that participants were in treatment during their intervention, so it is difficult to distinguish the effects of the therapeutic program from the PA intervention. Finally, given participants were volunteers to participate, it should be considered that they were probably more likely to engage in PA and motivated to do so.

Conclusion

The present study showed that PA should be used during SUD treatment, given its many perceived benefits. In particular, all participants acknowledged that they had benefited from PA and thus felt that they were taking better care of themselves. PA also appears to prevent relapse and create a healthy social network. To promote these effects, we recommend a group PA intervention with varied exercise sessions of 60 minutes, more than 3 times a week, supervised by an exercise professional. We strongly believe that treatments for SUD can be improved by adding a PA component to their current treatment and thus allow for optimal recovery during and after treatment.

Further studies are needed to better understand the role of PA initiation in personal and social identity formation during SUD treatment. Also, future studies may look at the effects of PA on weight loss during treatment of women, which seemed to be a very important aspect both in terms of motivation to do PA and fear of relapse following treatment.

Contributions

Contributed to conception and design: FP, SG, CP

Contributed to acquisition of data: FP

Contributed to analysis and interpretation of data: FP, SG, CP, AJR

Drafted and/or revised the article: FP, SG, CP, AJR

Approved the submitted version for publication: FP, SG, CP, AJR

Acknowledgements

We would like to thank Christine Cyr for helping with the transcription of the verbatims.

Funding information

FP was supported by the IUD (Institut Universitaire en Dépendance) and FRQS (fond de recherche du Québec en santé).

Supplementary files

Supplementary files can be found at
https://osf.io/fe96r/?view_only=1f44bb03c4354ffb88543a63a3869961

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