



## How yoga impacts the substance use of people living with HIV who are in reentry from prison or jail: A qualitative study



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### ABSTRACT

**Objectives:** Nascent research reflects the promise of yoga as a complementary treatment for substance use. While putative mechanisms behind yoga's impact on substance use have been proposed, the research is limited. This manuscript aims to determine how a hatha yoga intervention impacts the substance use of people who are in reentry from prison or jail (returning citizens), and living with HIV and substance use problems.

**Design:** Semi-structured interviews were conducted with 28 returning citizens who participated in a yoga intervention. Guided by a qualitative descriptive methodology, thematic analysis was used to identify themes that answered how yoga impacted participant substance use.

**Setting:** A community organization in Philadelphia, PA, USA that connects people to health services, provides education and supportive services, and advocates for people with criminal justice involvement.

**Intervention:** A 90-minute hatha yoga class offered once a week for 12 weeks.

**Results:** Fourteen participants reported that yoga either reduced substance use or maintained non-use, via the mechanisms of purposeful distraction, stress coping (by cultivating mindfulness and reducing physical discomfort), social support and confidence. Eleven participants reported that yoga did not impact their substance use. Three participants did not discuss it.

**Conclusions:** By providing purposeful distraction, increased stress coping, social support and confidence; yoga may reduce substance use and maintain engagement in recovery. These mechanistic actions provide guidance for themes to highlight in yoga classes that aim to impact substance use among returning citizens living with HIV.

### 1. Introduction

Nascent research reflects yoga's promise to reduce substance use.<sup>1,2</sup> The most popular complementary health approach in the United States,<sup>3</sup> yoga is taught within some substance use treatment facilities,<sup>4,5</sup> and has been incorporated into a 12-Step intervention.<sup>6</sup> With its stress-reduction benefits,<sup>7</sup> yoga may be particularly helpful for individuals who use substances (defined here as illicit substances and alcohol) to alleviate negative feelings or sensations.<sup>8</sup>

While mechanisms behind yoga's action on substance use have been proposed, they have yet to be tested in research. It is generally believed that by improving stress coping, yoga reduces the need to use substances to alleviate uncomfortable or painful states,<sup>9</sup> including stress,<sup>9–12</sup> depression,<sup>10,13</sup> anxiety,<sup>10,13</sup> low self confidence,<sup>14</sup> and physical ailments.<sup>11,14</sup> One study found significantly greater decreases in depression, plasma cortisol, and ACTH among individuals in inpatient for alcohol dependence who participated in Sudarshan Kriya Yoga (a breathing technique) as compared with a control group; authors posited that yoga may reduce substance use via reduced

depression and stress.<sup>10</sup> It has also been hypothesized that yoga and meditation may disrupt pathways in the brain that reinforce drug use.<sup>1,12</sup> The mechanism of action may also depend on the content of yoga classes. Individuals assigned to yoga that incorporated spirituality found greater reductions in cortisol and anxiety than individuals assigned to yoga that did not incorporate spirituality, suggesting that instruction in spirituality may enhance outcomes.<sup>15</sup>

Building on this literature, the aim of this paper is to answer how yoga impacts the substance use of individuals who experience high stress: people in reentry from prison or jail (returning citizens), living with HIV and substance use problems. Reintegrating to the community following incarceration poses formidable challenges, challenges that are made more difficult by medical and behavioral health needs, such as HIV and substance use disorder.<sup>16,17</sup> The stress of reentry puts returning citizens at risk for resumed substance use. In turn, substance use (and stress) are associated with reduced adherence to antiretroviral therapy adherence (ART) among people living with HIV,<sup>18,19</sup> which leads to progression of HIV and ultimately, death.<sup>20,21</sup> In light of the dire outcomes that this population is at risk of facing, this paper aims to

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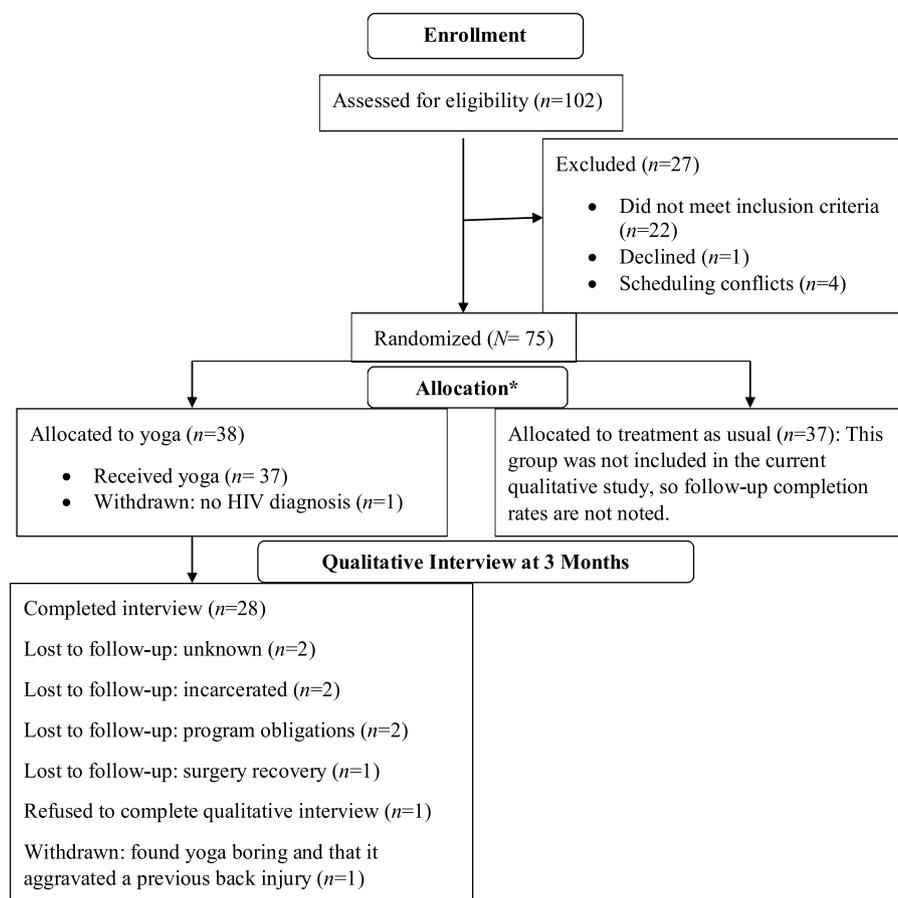


Fig. 1. Consort diagram.

understand how yoga may support reduced substance use among returning citizens living with HIV and substance use problems.

The following qualitative study is driven by the question: In what ways does yoga impact the substance use of a sample of returning citizens living with HIV and substance use problems, as described by the sample? This qualitative study complements quantitative findings from the parent randomized controlled trial that found returning citizens living with HIV assigned to yoga experienced a significantly greater reduction in stress than those randomized to treatment as usual at the completion of the 12-week yoga intervention. In addition, those assigned to yoga experienced a slight reduction in substance use, while those assigned to treatment as usual experienced an increase in substance use; a difference that was significant.<sup>2</sup> While the parent study demonstrated substance use reductions associated with yoga, it did not elucidate the mechanism behind yoga's impact on substance use. The current paper seeks to clarify these quantitative findings regarding the impact of yoga on substance use with insight from participants assigned to yoga.

## 2. Methods

### 2.1. Study overview

Study activities were based at a reentry service provider in Philadelphia, PA, USA where 80% of clients reentered the community from jail and 20% reentered from prison. The reentry center connects people to health and behavioral health services, provides education and supportive services, and advocates for people with criminal justice involvement. This setting was chosen because the clients they serve are returning citizens, many who also have substance use problems and live with HIV. Between December 2014 and October 2015, eligible clients

were randomized to either the yoga intervention or treatment as usual. The study included four cohorts. Each cohort was recruited 3.5 months apart. This paper includes feedback from only those participants randomized to yoga. The University of Pennsylvania and the reentry service provider's Institutional Review Boards approved the study.

### 2.2. Study procedures

Eligible clients of the reentry service provider were: released from prison or jail in the previous 12 months, at least 18 years old, English speakers, living with an HIV diagnosis, and experiencing problematic substance use (as determined by the Texas Christian University Drug Screen II).<sup>22</sup> After providing verbal agreement to complete the screening assessments, eligible participants provided written informed consent. Participants completed assessments at baseline, one, two, and three months to assess yoga's effect on stress, substance use, and ART adherence.<sup>2,23</sup> Qualitative interviews were completed at the three-month follow-up assessment. These interviews were audio recorded unless a participant requested that it not be recorded. Participants were asked to not say names during interviews to preserve confidentiality. This paper includes feedback from participants randomized to yoga who completed the three-month follow-up assessment ( $n = 28$ , see Fig. 1 for loss-to-follow-up reasons).

Most participants were African American men (see Table 1 for the baseline characteristics of the participants interviewed in this study). They attended an average of 4.22 ( $SD = 3.77$ ) yoga classes. Participants were not required to attend a minimum number of classes because we did not want to deter participation among those for whom regular attendance was difficult. In addition, we wanted to see the effect of the intervention as if it were implemented in a real world setting (without attendance requirements).

**Table 1**  
Baseline characteristics of yoga participants who completed qualitative interviews ( $N = 28$ ).

Gender, $n$ (%)		
Male	22	(78.57)
Female	5	(17.86)
Transgender	1	(3.57)
Race/Ethnicity, $n$ (%)		
Black	23	(82.14)
Latino	2	(7.14)
Multiple races	2	(7.14)
White	1	(3.57)
Age in years, $M$ ( $SD$ )	42.04	(9.64)
Employment, $n$ (%)		
Unemployed	17	(60.71)
Receive disability	8	(28.57)
Employed	3	(10.71)
Most problematic drug, $n$ (%)		
Crack cocaine	14	(50.00)
Powdered cocaine	5	(17.86)
Heroin	4	(14.29)
Alcohol	3	(10.71)
MDMA <sup>a</sup> (commonly known as ecstasy)	1	(3.57)
Methamphetamine	1	(3.57)
Substance use treatment, $n$ (%)		
No	15	(53.57)
Yes	13	(46.43)
Type of substance use treatment, $n$ (%)		
Intensive outpatient treatment	7	(53.85)
Outpatient	2	(15.38)
Alcoholics/ Narcotics Anonymous	2	(15.38)
Medication assisted treatment	1	(7.69)
Inpatient	1	(7.69)
Used substances in the 90 days prior to baseline	23	(82.14)
Days of substance use in the 90 days prior to baseline	20.79	(23.10)
Previous yoga classes, $n$ (%)		
None	17	(60.71)
1-5 classes	8	(28.57)
1 year (a few times a month)	3	(10.71)

<sup>a</sup> 3,4-methylenedioxy-methamphetamine.

### 2.3. Qualitative interviews

A research assistant and the principal investigator (PI) conducted semi-structured qualitative interviews regarding stress, substance use, and impressions of yoga. This manuscript analyzes only the qualitative data pertaining to impressions of the yoga classes and yoga's impact on substance use (Appendix A). Qualitative interviews were conducted in-person at the reentry service provider as part of the final study assessment.

#### 2.3.1. Bias

To address potential biases, the interviewers were asked to reflect on their impressions of and experiences with yoga, and with people who have experienced similar challenges as the study population (see Appendix B for questions).

The research assistant and myself (the PI) regularly practice yoga. While we hold biases regarding the positive impact of yoga, we also are cognizant that the efficacy of yoga is variable and depends on individual preferences and needs. To address biases, interview questions were open ended and participants were encouraged to answer honestly so as to best improve services.

Bias also arises in the disparate life experiences of the interviewers and participants. The interviewers are White women who benefit from White privilege, and therefore can never fully understand the experience of being Black in the United States of America. White privilege is defined as assets that are unearned but expected.<sup>24</sup> These assets may be imperceptible to White people who view them not as *assets*, but as *rights* (i.e. easy access to good education and housing<sup>24</sup>). Participants, who were predominantly Black men, may not have felt comfortable discussing their experiences with White women, who because of White

privilege would not have experienced challenges due to racism. Some discomfort may have been attenuated because the interviewers were familiar faces at the reentry center. The research assistant worked as a case manager there and the PI was a volunteer yoga teacher at the center (unrelated to this study). While there was no indication that participants were impacted by the interviewers being White, this is unknown.

### 2.4. Reimbursement

Compensation for time spent conducting study assessments included \$35 at baseline, and \$40-\$50 at three-months, pending on whether they completed all the follow-up assessments. Tokens were provided for public transportation for any study related visit (including yoga classes and assessments).

### 2.5. Yoga intervention

The 90-minute hatha yoga intervention was conducted once a week for 12 weeks. The curriculum was developed by the PI who is a registered yoga instructor with 10 years of regular practice and two years of experience teaching hatha yoga. The curriculum included discussion of yoga principles and the application of those principles to stress coping (5–10 min), pranayama (breath control exercises, 5 min), asana practice (physical postures, 60–65 min), meditation (5 min), and savasana pose (corpse pose, 5–10 min). The overall goal of the curriculum was to foster stress-coping. The curriculum was developed based on feedback from people who attended yoga classes led by the PI at the reentry service provider. Handouts with instructions for asanas and meditations were provided at weeks four and eight. Classes were conducted at the reentry center during non-drop-in hours to ensure privacy.

The first yoga cohort was taught by a 30-year old female registered yoga instructor with nine years of regular yoga practice and six years of teaching Vinyasa and Yin yoga. She also had experience working in the criminal justice setting. The second, third, and fourth cohorts were taught by a 29-year old male registered yoga instructor. He is the co-owner of a yoga studio in Philadelphia with 12 years of regular yoga practice and six years of teaching Vinyasa, restorative, and therapeutic yoga. Instructors were urged to adjust the curriculum as needed and provided written and verbal feedback regarding adjustments. Both instructors reported that they added preparatory stretches when asanas were challenging for students, and added restorative poses. In the first cohort, the instructor substituted classes six and nine with a restorative class based on student reports of fatigue prior to starting class. The instructor of the second, third and fourth cohorts modified the sequencing of class practices, ending each class with 20–25 min of restorative poses.

### 2.6. Data analysis

Guided by a qualitative descriptive methodology, as described by Sandelowski, the goal of the analysis was to accurately convey participant descriptions<sup>25,26</sup> generated by the interview questions (Appendix A). This methodological approach was chosen because we asked pointed questions regarding participants' experiences with yoga (i.e. "How do you think the yoga classes affected your substance use?"); and in analyzing the responses, we sought to maintain the topic of the question (i.e. participant perceptions as to how yoga impacted their substance use). Thematic analysis<sup>27</sup> was used to answer the study's research question. This analytic method is not based on any particular theoretical framework, but provides methodological structure.<sup>27</sup> Three coders were randomly assigned interviews to code using NVivo software. Prior to coding, the coders met to discuss familiarity with the study population and yoga in order to have a better understanding of divergent codes and personal biases (see Appendix B for questions). The following steps of thematic analysis were used<sup>28</sup>:

- 1 Become acquainted with the data: After interviewing participants, interviewers wrote memos about key findings. The PI read through the transcribed interviews, listened to interviews when transcription was unclear, and wrote down initial thoughts.
- 2 Compile a list of codes: The PI created a list of inductive codes based on the interview questions and initial readings of the data. The three coders continued to add codes as subject matter became evident through the coding process.
- 3 Create a list of themes: The PI created a list of themes based on the codes. The PI checked that the themes corresponded to data by re-reading the interviews to identify memorable quotes, and verifying the themes with the coders.

### 3. Results

#### 3.1. Yoga's impact on substance use

Of the 28 participants, fifty percent ( $n = 14$ ) reported that yoga either reduced their use: "I think it [yoga] helped me, um, slow down a little bit more to tell you the truth, because. . . like I said I was a every day chronic user" (participant was not in treatment and their most problematic substances were crack and alcohol<sup>1</sup>); or supported continued non-use for participants not using drugs at the beginning of the study. Thirty-nine percent ( $n = 11$ ) reported that yoga did not impact their substance use. One participant cited depression as the leading driver of their substance use, which also prevented them from participating in yoga as they were unable to get out of bed when faced with depression. Others explained that there was no way to tell if yoga impacted their substance use because they were not using when they started yoga. Eleven percent ( $n = 3$ ) of participants did not discuss if yoga impacted their substance use.

#### 3.2. Mechanisms of action

Participants discussed the following ways in which yoga impacted their substance use.

##### 3.2.1. Purposeful distraction

For those whom idle time was associated with drug use, yoga provided an alternative activity: "Cuz, like I said, the idle—the idle time is kind of, like, a problem with me, you know? So, while I was there [at yoga class], you know, I knew it was—I was cool." (In treatment, most problematic substance: crack.) Another participant described:

It's [yoga] helped, uh, with-with-with my-my-my-my drug and alcohol use. . . You know, it may not have been the cure or stopped me, but it-it-at least it helped. . . You know, it gave me somethin' else to do, uh, sometimes, you know. (Not in treatment, most problematic substances: crack and alcohol.)

The distraction of yoga provided a reason to not use substances, which for some participants prevented substance use prior to class:

It [yoga] slowed it [substance use] down. . . Because then I can say, on the days, Mondays when I had to come here, I never used on Mondays. Not really. But I wasn't motivated to use an' to do anything, I was so motivated and focused on something else, that I didn't have time to think smoking, thinking about smoking, you know, or using at all. So it worked, it helped me. You know, to stay focused an' stay in that moment in that time, because I had priorities, I had that balance, and I had something to do. So I said ok, I have to come to yoga today, so I have to be my best—like Sunday, I didn't use, I went to sleep. You know, I ate, went to sleep, I know I

have routine, that structure, that, you know, purpose of you have something to do, you know. (Not in treatment, most problematic substance: crack.)

##### 3.2.2. Mindfulness

Yoga honed mindfulness both inside and outside of the classroom, which reduced mental stress that in other instances could be a reason to use substances. Mindfulness is defined as bringing attention to the present moment, on purpose, with a gentle and non-judgmental manner.<sup>29</sup> Yoga, practiced purposefully, redirected focus from stressors to the present moment: "Cuz it gives you that space to go there and get away from the negative. But you still aware that it's there, but you're not focusing on it." (Not in treatment, most problematic substance: crack.) Breathing was a key practice to "get out of (one's) head." (In treatment, most problematic substance: crack.) This participant discussed being on public transportation and feeling overwhelmed by all that they had to do:

I was thinking about all the stuff I had to do. . . and I was like, you know, stop worrying about it, you know. . . So I was just—started-started breathing and just thinking about my breathing. . . And it kind of took my mind, like, right off of it. Like, I don't even remember when I stopped thinking about it, but I know I did.

Another participant described: "it [yoga] allowed me to remain focused in the meantime and it allowed me to learn how to breathe and look at the world around me and find my balance within the world, you know." (Not in treatment, most problematic substance: crack.) One participant described concentrating on the instructor's voice and on the poses (that were at times challenging), which enhanced focus on the task at hand:

It did give me some [relaxation], I wasn't having racing thoughts, I was concentrating on the voice that I was hearing. You know what I mean, I was trying my best you know what I mean to get in the poses, you know what I mean, and breathe at the same time. You know what I'm saying, an it was a struggle at certain times but once I got it and felt it, it didn't feel bad, it didn't feel bad. . . Mmmhmm, it's just like you shut everything off, so I see how the meditation is attached to it, you know what I mean." (In treatment. Most problematic substance: crack.)

Another participant similarly discussed how breathing and posture practice brought focus to those practices as opposed to relationship stressors:

Because like the breathing, it helps me. It helps clear everything. Like even if, like when I was doing yoga, like the stretching, even if I start thinking about what my boyfriend is doing. Once I breathe in and out, it cleared my mind. Then it brought me back to what I, like, what I feel in my body, how my—how like for me stretching, the way I'm feeling that. (In treatment, most problematic substance: crack.)

After class, yoga continued to foster present focus:

After I take the class I always felt focused. I always felt more um, here and now. I felt relaxed, I felt energy, I felt that purpose, that I—this is what I need to do today and this is what I'm going to do and it overflowed into Tuesday. But it—after the class, it gave me the whole motivation to stay focused that whole day. Because I wasn't thinking about anything other than being in the moment. (Not in treatment, most problematic substance: crack.)

In addition to fostering focus on the present, yoga cultivated a non-judgmental attitude towards one's self. One participant described the potential of yoga to reduce substance use and associated guilt if practiced regularly:

Yeah, I think it could be-um, it could affect it especially if it was

<sup>1</sup> Note: Following each quote in parentheses it is noted whether the participant is in treatment and what substance creates the most problems for them.

done more on a consistent basis. Once again, in the battle I go through because a part of my guilt with my substance abuse is at that moment, I'm not taking care of my body. If yoga probably was done more, at least like three times a week, yeah, it would lessen the abuse or-or the-the rebellions against using, I feel. (In treatment, Most problematic substance: crack.)

### 3.2.3. Physical comfort

In addition to providing relief from mental stressors by cultivating mindfulness, some participants reported that yoga posture practice reduced physical pain. In particular, participants described how yoga alleviated leg cramps, lower back pain, constipation, COPD, and arthritis. Participants appreciated that the instructor provided modifications and recommended specific poses based on individual ailments. One participant described: "I always felt good afterwards. I know that. Like-like, my body just felt more, uh—I guess I would say less tension." (In treatment, most problematic substance: crack.)

### 3.2.4. Stress coping

By providing techniques to relieve physical and mental stress, yoga may have reduced the need to use substances to cope with stress:

By the time you finish [with yoga class], you don't want it [drugs]—it's like, okay. Everything's okay. . . Um—it definitely helps [reduce substance use]—um—because first of all it-it-it gets your mind off of the—um—the particular usage—you know what I mean? Um—it relaxes your body. So, like—um—you don't think about it no more. You know what I mean? Like, you like, man, I feel like so good and energized—(In treatment, most problematic substance: crack.)

One participant noted that yoga reduced their alcohol use, which they used to relieve stress. However, yoga did not impact their cocaine consumption, which for that participant was connected to social gatherings. (Not in treatment, most problematic substance: cocaine.)

Another participant discussed how the relaxation from yoga was different from relaxation experienced after using marijuana:

But it [yoga] really relaxes me, I mean, the weed, it relaxes me in a different way. You know, it's like, this here [yoga] is for myself. For me. You know, for my brain, and everything. And it just—it feels really good, you know. I feel good about myself afterwards. . . Yeah, like I did something, like I cleansed myself or something." (Not in treatment, most problematic substance: cocaine.)

Improved stress coping experienced from yoga was important not only to reduce the need to use substances to feel better, but also to maintain other recovery activities. One participant described that "when I leave here [yoga class], I won't be stressed," which helped them maintain activities that supported their recovery such as reading classes, attending recovery groups, and home cooking. (In treatment, most problematic substance: crack.)

### 3.2.5. Social support

Yoga provided a forum to meet other people focused on recovery:

I-I-I truly believe that—yes, yes, it [yoga] can help people in their recovery. . . cuz it shows you—uh—another way a livin'. Like, you meet people that aren't usin'. The average people— that's in yoga, they-they are not usin', so you have a new support system, or you have a new group of friends—that aren't usin'. That's important. (In treatment, most problematic substance: heroin.)

The atmosphere of the yoga class was different than recovery groups: "Everybody's trying, you know, do their thing. . . But not everybody tryin' to tell me how to do my thing." (In treatment, most problematic substances: crack and alcohol.)

Similarly, another participant described the atmosphere as non-judgmental:

Like I was in a class of people that they didn't judge me, wasn't mean to me, wasn't angry at me. They were all smiling, laughing and giggling. I made them laugh. They made me laugh. That's very rare that I don't have not one person that just gotta be the one to get on my damn nerves. (Not in treatment, most problematic substance: ecstasy.)

Participants also described how it was important that fellow participants were open to learning about yoga and were dedicated to their recovery:

They was in there for the same thing I wanted. That helped me a whole lot, that it wasn't people just for the money or just to get out of the cold. Or you know, it was people in need that wanted to get what yoga was offering. That was the favorite part, that I was with people that wanted the same thing I wanted. (In treatment, most problematic substance: crack.)

Several participants described how they were particularly comfortable in the yoga classes because it was "everybody, every shape, size—" as opposed to classes seen in the community where:

I would have-not have been able to do it [yoga] there [community classes]—cuz it was just nothing but skinny White women, some men. But they were all, like, of a certain class. You know what I mean? I don't think I would have been comfortable there. I mean, they would have pretended like I was welcome, but- it wasn't like this one [study yoga classes]. (Not in treatment, most problematic substance: crack.)

### 3.2.6. Confidence

Feeling socially supported, relieved of mental and physical stressors and having a kinder attitude towards themselves, participants described having greater confidence to prioritize their recovery:

One hundred percent it [yoga] did [impact their decision to enroll in inpatient substance use treatment]. . . Before I even signed up for this yoga class, before I even went, that was the last thing on my mind was like to stop. I-I just accepted the fact that "ok, this is what it is. This was gonna be. Ok. Deal with it. . . But you know, it started—when I started goin' to the yoga classes and I really got into it, and you know, I started feelin' good about myself, you know what I'm sayin'? Which was a totally different feeling that I had not experienced in quite a long time. . . It [yoga] had a big factor in goin' there [recovery]. (In treatment, most problematic substance: crack.)

Another participant described:

You know, I'm learning that, you know, I'm worth something. I'm worth something. Yeah. Yeah, and it [yoga] was helping me. You know, and it helped. You know, it wasn't no—it wasn't no doctor. I wasn't taking no pills. You know, it wasn't just, you know, somebody made me do it. . . Yoga give you the confidence that you need. Nobody don't have to say, "You feel good. You look good." Yoga make you feel inside yourself. Nobody else don't have to tell you. . . It gives you that self-worth, that—that pride." (In treatment, most problematic substance: crack.)

This same participant described how yoga helped them communicate to a friend that they no longer wanted to use substances:

I—I believe if I didn't have the meditation and the counseling that yoga gave me, that she would still be coming in my door. You know?. . . To be able to go inside myself and know how good I feel, and what yoga gave me, like you worth it. I wouldn't have been—she would still be coming over. So yeah, it helped. It gave me enough confidence to say that it's not more important than my self-worth or my health. (In treatment, most problematic substance: crack.)

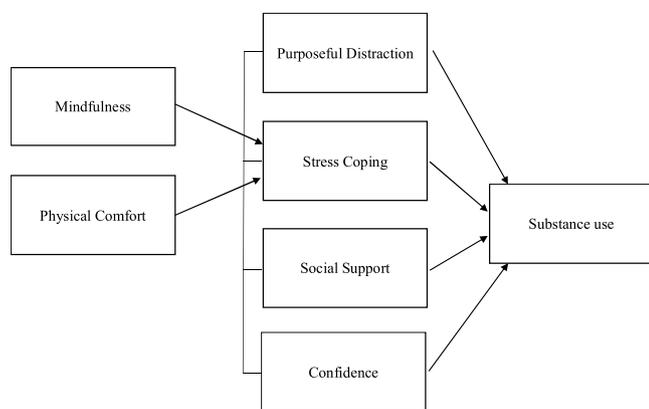


Fig. 2. Yoga's impact on substance use: Hypothesized mechanisms.

#### 4. Discussion

This qualitative study asked how yoga impacted the substance use of a sample of returning citizens living with HIV and substance use problems. Half of the participants reported that yoga reduced substance use or maintained non-use. Thirty-nine percent of participants reported that yoga did not impact their substance use because their use was predicated by other issues (such as depression), or because they were not using at the study outset. Eleven percent did not discuss the relation of yoga to substance use. Among participants who did report that yoga impacted their substance use, several mechanistic themes emerged, including purposeful distraction from substance use, stress coping (via cultivation of mindfulness and alleviation of physical discomfort), social support, and confidence (see Fig. 2).

For some participants, yoga provided purposeful distraction from idle time that might otherwise have been occupied with substance use. It was an effective distraction because people enjoyed and were engaged in the class, positively reinforcing further practice of yoga as opposed to other behaviors, such as drug use. Scheduled yoga class also provided a purpose to not use substances the day prior to class, to ensure they were able to attend yoga.

Yoga facilitated stress coping through mindful awareness of the present and by relieving physical tension through posture practice. Participants discussed how focusing on the breath both within and outside of class could reduce worrisome thoughts. Focus on present sensations, as by breathing exercises, could supplant negative self-talk that in other instances precede substance use. Yoga did not remove stressors, but reduced rumination that could impede one's ability to cope with the stressor. There was also indication that yoga fostered a kinder and gentler approach towards one's self, as by reducing guilt associated with substance use and increasing feelings of self worth. The actual yoga poses also worked to reduce body ailments, eliminating the need to use substances for relief of body discomfort.

Participants also enjoyed yoga because they felt socially supported. They appreciated the lack of judgment among classmates and appreciated that participants were similarly focused on their recovery. While all group interventions provide social support, the social support from a yoga class may be unique because people are engaging in an activity that fosters non-judgment, acceptance, support, and adventurousness. Indeed, one participant remarked that he found yoga class a welcome change to recovery groups where "everybody tryin' to tell me how to do my thing." Some participants appreciated that it was a class predominantly composed of African American people as opposed to White people, and that the class was composed of all body types. Participants therefore felt welcome and at ease in the classes. This social support may be especially important for a population who experiences three stigmatizing and socially isolating categories (HIV, substance use, and criminal justice involvement).

Finally, yoga could instill confidence to reduce substance use, as by participating in recovery activities and refusing substances from friends. Some participants discussed looking at themselves in a different light, which provided confidence to not use substances and to engage in treatment. One participant described how they started to "feel good" about themselves from yoga class, a self-described foreign feeling, which engendered thoughts about reducing substance use. Feeling good and maintaining this feeling through continued yoga practice provided an alternate purpose other than relief of distressing states via substance use.

These four themes of purposeful distraction, stress coping (via cultivation of mindfulness and physical comfort), social support and confidence could also interact with each other to impact substance use (Fig. 2). For example, feeling confident to not use substances may have been impacted by feeling socially supported and by having increased mental capacity due to decreased stress rumination. Conversely stress coping may have been impacted by having greater confidence in one's capacity to address stressors. In sum, this study found that there are multiple interacting ways that yoga may have impacted the substance use of the participants in this study. Yoga interventions for substance use may want to incorporate the mechanisms identified here, and could do so in the following ways: 1.) To foster stress coping, content of instruction can include cultivation of mindfulness by focusing on current sensations and breath in a gentle manner. Additionally, posture practice can be modified to address participants' particular physical needs. 2.) To engender social support, instructors can encourage a non-judging and non-competitive environment. It may also be helpful that the class consist of people who are going through similar life circumstances, such as living with HIV and substance use problems, with a recent incarceration. 3.) Class instruction can center on engendering feelings of self worth to facilitate the confidence to reduce substance use.

##### 4.1. Strengths and limitations

Participants may have responded more favorably about yoga due to social desirability bias. In addition, they may have been feeling more positive about the intervention because they were reimbursed for the three-month assessment after the qualitative interview. To mitigate this, interviewers reinforced that positive and negative feedback was welcomed for program improvement. An additional limitation is the study did not conduct an in-depth exploration as to why yoga did not impact substance use (among those who responded that yoga didn't impact their use). Interviewers did probe participants who answered negatively, but it was not a focus of the interview and participants did not provide much feedback to this probe. Another limitation is that this study did not consider the effect of individual factors (such as gender, and time in recovery) on yoga. However, the small sample size of this study precluded such an analysis. An additional limitation is that this study is not generalizable. However, the findings support yoga research with populations facing similar challenges. Finally, this study was limited by having only White interviewers with a predominantly Black sample, which may have impacted the comfort level of interviewees. Future studies could include interviewers that match the racial make-up of participants and include a protocol as to how to address biases.

Strengths of this study include that it begins to answer what are the mechanistic actions behind yoga's impact on substance use and does so by highlighting the voices of yoga practitioners. Additionally, this study provided yoga (an intervention largely practiced by educated White people<sup>30</sup>) to people who have limited access to yoga.

#### 5. Conclusion

This paper offers insight into how yoga may be an effective complementary approach to substance use reduction for returning citizens living with HIV. While distracted from substance use and distressing thoughts, yoga may provide stress-coping techniques and social

support. Feeling better, one may have confidence and a purpose to make decisions that support recovery. This is valuable information for designing yoga classes for this population, as these themes can be incorporated into discussion. In addition, breathing exercises and postures that target stress coping can be included. This study's importance lies in its establishment of potential mechanisms of action behind yoga's effect on substance use. Future research can test whether these mechanisms of action mediate the relationship between yoga and substance use. For practitioners, yoga can be offered as one complementary approach that supports substance use recovery among returning citizens living with HIV.

### Declarations of interest

None.

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### Note

Please email awimberly@ssw.umaryland.edu for an electronic copy of the curriculum.

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### Appendix A

#### Interview questions<sup>2</sup>

- What were your overall impressions of the yoga classes?
- How did you feel after taking the classes?
- What did you like about the classes?
- What did you dislike about the classes?
- Did you practice anything you learned in the yoga classes outside of class? If yes, what did you practice?
- Were there some poses that were more difficult for you than others—if so, which ones?
- How did you feel after doing more difficult poses versus easier poses?
- Did the teacher support you in doing difficult poses and/or modifying difficult poses for you?
- Which activity did you most prefer, pranayama (breathing exercises), meditation, or asanas (physical postures)?
- On days when you felt more stress (were having a difficult day), what was it like taking the yoga classes?
- What was the leading reason that you did not attend classes?

<sup>2</sup> Answers to these questions were only analyzed in this manuscript if they pertained to the research question. Interviews were semi-structured, so while interviewers asked these questions, they also asked follow-up questions based on the particular interview.

- What was the leading reason that you did attend classes?
- How do you think the yoga classes affected your substance use?
- How likely are you to continue to attend yoga classes?
- What would you tell your friends and family about yoga?
- Any final thoughts or recommendations about how to improve the yoga classes?

### Appendix B

#### Questions for coders and interviewers to address biases

- What are your general impressions of yoga? Have you practiced yoga? (If yes, how often have you practiced it and what were your thoughts about the experience?)
- How would you define yoga?
- What is your general impression about people who practice yoga?
- Do you know any people who live with HIV, who have substance use problems, and/or who have spent time in prison/ jail? If yes, how do you know them? If no, do you have any general impressions of people who meet the above criteria?

### References

1. Posadzki P, Choi J, Lee MS, Ernst E. Yoga for addictions: a systematic review of randomised clinical trials. *Focus Altern Complement Ther.* 2014;19(1):1–8.
2. Wimberly AS, Engstrom M, Layde M, McKay JR. A randomized trial of yoga for stress and substance use among people living with HIV in reentry. *J Subst Abuse Treat.* 2018;94:97–104.
3. Clarke TC, Barnes PM, Black LI, Stussman BJ, Nahin RL. *Use of yoga, meditation, and chiropractors among U.S. adults aged 18 and older. NCHC Data Brief, no. 325.* Hyattsville, MD: National Center for Health Statistics; 2018.
4. de Miranda C. Yoga moves toward mainstream of treatment. *Addiction Professional.* <https://www.addictionpro.com/article/yoga-moves-toward-mainstream-treatment>. Published June 10, 2016. Accessed April 9, 2019.
5. Lohman R. Yoga techniques applicable within drug and alcohol rehabilitation programmes. *Ther Communities.* 1999;20(1):61–72.
6. Y12SR. Yoga of 12 step recovery. <http://y12sr.com/>. Accessed September 1, 2016.
7. Streeter CC, Gerbarg PL, Saper RB, Ciraulo DA, Brown RP. Effects of yoga on the autonomic nervous system, gamma-aminobutyric-acid, and allostasis in epilepsy, depression, and post-traumatic stress disorder. *Med Hypotheses.* 2012;78(5):571–579.
8. Khantzian EJ. The self-medication hypothesis of substance use disorders: a re-consideration and recent applications. *Harv Rev Psychiatry.* 1997;4(5):231–244.
9. Raina N, Chakraborty BPK, Basit MA, Samarth SN, Singh H. Evaluation of yoga therapy in alcohol dependence syndrome. *Indian J Psychiatry.* 2001;43(2):171–174.
10. Vedamurthachar A, Janakiramaiah N, Hegde JM, Shetty TK, Subbakrishna DK, Sureshbabu SV, et al. Antidepressant efficacy and hormonal effects of Sudarshana Kriya Yoga (SKY) in alcohol dependent individuals. *J Affect Disord.* 2006;94:249–253.
11. Kissen M, Kissen-Kohn DA. Reducing addictions via the self-soothing effects of yoga. *Bull Menninger Clin.* 2009;73(1):35–43.
12. Khanna S, Greeson JM. A narrative review of yoga and mindfulness as complementary therapies for addiction. *Complement Ther Med.* 2013;21(3):244–252.
13. Marefat M, Peymanzad H, Alikhajeh Y. The study of the effects of yoga exercises on addicts' depression and anxiety in rehabilitation period. *Procedia - Soc Behav Sci.* 2011;30:1494–1498.
14. Sharma K, Shukla V. Rehabilitation of drug-addicted persons: the experience of the Nav-Chetna Center in India. *United Nations Off Drugs Crime database.* 1988;40(1):43–49.
15. Smith JA, Greer T, Sheets T, Watson S. Is there more to yoga than exercise? *Altern Ther Health Med.* 2011;17(3):22–29.
16. Mallik-Kane K, Visher CA. *Health and prisoner reentry: How physical, mental and substance abuse conditions shape the process of reintegration.* Washington D.C: The Urban Institute; 2008.
17. Western B, Braga AA, Davis J, Sirois C. Stress and hardship after prison. *Am J Sociol.* 2015;120(5):1512–1547.
18. Clements-Nolle K, Marx R, Pendo M, Loughran E, Estes M, Katz M. Highly active antiretroviral therapy use and HIV transmission risk behaviors among individuals who are HIV infected and were recently released from jail. *Am J Public Health.* 2008;98(4):661–666.
19. French T, Tesoriero J, Agins B. Changes in stress, substance use and medication beliefs are associated with changes in adherence to HIV antiretroviral therapy. *AIDS Behav.* 2011;15(7):1416–1428.
20. Paterson DL, Swindells S, Mohr J, Brester M, Vergis EN, Squier C, et al. Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Ann Intern Med.* 2000;133(1):21–30.
21. Sethi AK, Celentano DD, Gange SJ, Moore RD, Gallant JE. Association between adherence to antiretroviral therapy and human immunodeficiency virus drug resistance. *Clin Infect Dis.* 2003;37(8):1112–1118.
22. Institute of Behavioral Research. Texas Christian University Drug Screen II. <http://>

- [ibr.tcu.edu/wp-content/uploads/2016/10/TCU-Drug-Screen-II-v.Dec07.pdf](http://ibr.tcu.edu/wp-content/uploads/2016/10/TCU-Drug-Screen-II-v.Dec07.pdf).  
Published 2007. Accessed April 9, 2019.
23. Wimberly AS, Gross R, Layde M. Effect of yoga on antiretroviral adherence post-incarceration in HIV+ individuals. *J Correct Heal Care* (in press).
  24. McIntosh P. *White privilege: unpacking the invisible knapsack. Race, Class and Gender in the United States*. 6th Ed. New York, NY: Worth Publishers; 2004:188–192.
  25. Sandelowski M. Whatever happened to qualitative description? *Res Nurs Health*. 2000;23(4):334–340.
  26. Sandelowski M. What's in a name? qualitative description revisited. *Res Nurs Health*. 2010;33:77–84.
  27. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77–101.
  28. Clarke V, Braun V. Thematic analysis. In: Teo T, ed. *Encyclopedia of Critical Psychology*. New York: Springer; 2014:1947–1952.
  29. Kabat-Zinn J. *Full Catastrophe Living: Using the Wisdom of your Body and Mind to Face Stress, Pain, and Illness*. New York, NY: Delacorte; 1990.
  30. Ross A, Friedmann E, Bevens M, Thomas S. National survey of yoga practitioners: mental and physical health benefits. *Complement Ther Med*. 2013;21(4):313–323.