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Effects of Mindfulness and Holotropic Breathwork on the Rehabilitation of Adolescents Who Use Psychoactive Substance Users: A Pilot Study

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This pilot study aims to compare the effects of mindfulness and holotropic breathwork treatments on adolescents in the rehabilitation process for psychoactive substance use. Participants comprised 18 female adolescents aged 15–18 admitted to the Fundación Grupo de Apoyo, affiliated with the Colombian Family Welfare Institute. The Fundación is dedicated to rehabilitation from, detoxification from, and prevention of psychoactive substance use. The study utilizes a mixed methods approach with an exploratory design. Heart rate is used as an important indicator of psychological well-being and overall cardiovascular health, and the mean pretest/posttest heart rates of the control and experimental groups are compared quantitatively. The effects of both treatments on the study population are described qualitatively. The results show a reduction in heart rate in the mindfulness group compared to the control. The narratives of the participants and the institution's workers show positive changes in emotional regulation and coping, better communication, and a reduction in stress and anxiety or the desire to use, as a result of both experimental treatments.

Keywords: *mindfulness, holotropic breathwork, psychoactive substances, heart rate, craving*

Use of psychoactive substances often begins at a young age as a result of multiple psychosocial factors (ODC, 2020). Anxiety has been associated with substance abuse behavior (Francis & Robbins, 2009), and is expressed through physical symptoms such as heart rate, breathing, and perspiration (Del Toro Añel, González, & Arce, 2014). However, little research has been conducted on the influence of mindfulness and holotropic breathwork on the underlying mechanisms of addiction, including psychological anxiety and craving.

Craving is a subjective experience of intense desire (Tapper, 2018) associated with various behaviors such as psychoactive substance use, compulsive gambling, and sex addiction (Sánchez-Hervás et al., 2001). This experience of desire is

present in all substance-dependent individuals; it is dynamic, operates differently among individuals, and plays an important role in the persistence of addictive behavior (Skinner & Aubin, 2010). The several models of craving (Jiménez et al., 2002) include associations with a lack of purpose in life or a sensation of existential emptiness, limiting volition and hindering felt connection with a spiritual dimension of life (Francis & Robbins, 2009).

In a transpersonal approach to psychology addictive behaviors may be explained as a spiritual emergency arising from a lack of wholeness or unity of body, mind, and spirit (Grof, 1992; Grof & Grof, 1995; Grof, 1996; Viggiano & Krippner, 2010). Transpersonal psychology has developed techniques to improve the relationship between health and

spirituality, fostering a new understanding of awareness with respect to the human psyche's health and illness (Walsh & Vaughan, 2008; Grof, 2008). One technique developed and used in transpersonal psychotherapy is holotropic breathwork. According to Grof (2010), this technique combines simple means of inducing holotropic states of consciousness through accelerated breathing, evocative music, and liberating bodywork, activating mechanisms for psychological healing and personality transformation. This technique provides access to holotropic states of consciousness and the psychospiritual roots of emotional and psychosomatic disorders (Grof & Grof, 1995). It allows for a better understanding of a person's perinatal, biographical, and transpersonal domains in a new cartography of the human psyche (Grof & Grof, 2010).

Based on holotropic breathwork, other similar hyperventilation programs have emerged (Meuret et al., 2005; Puente, 2008) with open and democratic protocols for the hyperventilation process with adolescents (Cervantes & Puente, 2014). In this study, holotropic breathwork has been adapted to preserve the original principles but include context-specific adaptations (described below in the Intervention section) in accordance with the institutionalized participants' age, needs, restrictions, and capabilities, but it still includes techniques such as hyperventilation, evocative music, bodywork, and creative expression (Grof & Grof, 2010). These aspects provide an internal, non-verbal experience.

Before a holotropic breathwork intervention begins, participants receive information about experiences that may emerge during the process. They then arrange themselves in a therapeutic circle, in a supine position with eyes closed, and the hyperventilation practice begins, accompanied by evocative music. After the breathing session, artistic and integrative expression (mandala drawing) is encouraged, along with verbal sharing of their experiences (Minda, 2015; Grof, 2008).

Studies show the effectiveness of holotropic breathwork in reducing the anxiety of adults with alcohol dependence syndrome (Brewerton et al., 2012), as well as in reducing anxiety and avoiding relapse (Nedumpillil, Malarvizhi, & Neelakshi, 2014). Further, they show long-term effectiveness

after reliving traumatic situations and in decreasing stress levels in patients who use psychoactive substances (Brewerton et al., 2012). Another similar hyperventilation technique (holorenic breathwork) has shown important improvements in heart rate, associated with anxiety level reductions (Cervantes & Puente, 2014). Studies with adolescents report favorable results in the form of reinterpretation and development of tools to deal with personal conflicts and discover purpose in life (Contreras & Zenteno, 2014).

The main reported benefits of these practices in spiritual transformation processes are as follows: increased trust, life meaningfulness, self-confidence, satisfaction, ability to feel joy and happiness (Afanasenko, Emelianenko, & Emelianenko, 2014), transformative potential during adolescence, effectiveness from the perspective of a bodily experience, integration, personal change, its effects and phenomenology (Landaeta, 2014; Mazorco, 2014; Fericgla & Guarch, 2014).

Although there are not enough scientific studies evaluating the effectiveness of this type of procedure in Latin American adolescents in vulnerable contexts, therapists have reached an agreement regarding the relationship between altered consciousness and voluntary hyperventilation (Puente, 2008; Meuret et al., 2005) and the fostering of a setting of emotional support to provide exposure to stimuli with resulting extinction or reduction of covert avoidance behaviors (Rhinewine & Williams, 2007). Bemak and Young's studies (1998) explore the role of catharsis in group psychotherapy. Research on complexity and transpersonal psychology also reveals self-organization processes through peak experiences in hyperventilation techniques (Puente, 2014). Using transpersonal psychology approaches, Ferreira and colleagues (2017) reported successful experiences of supporting adolescent groups in socially marginal contexts of Brazilian favelas.

Mindfulness, as a third-generation therapy (O'Donohue, 1998), is the second technique of interest for this study, which used an adapted version of the "Consciencia Plena del Sentido en la Vida" program (Sánchez, 2016) described below in the Intervention section. Various definitions have been assigned to the term *mindfulness*, and in Spanish, it

has been translated as *atención plena* (full attention). It is the “the universal and basic human capacity that consists of the possibility of being aware of the mind’s contents at all times; the practice of self-awareness” (Simón, 2006, p. 7).

Mindfulness therapy has been shown to reduce psychoactive substance use (Li et al., 2017) and associated craving, anxiety, withdrawal symptoms (Alfonso, 2012; Bien, 2009), and prevention of relapse (Bowen, Chawla, & Marlatt, 2011). In addition to reducing stress and unwanted impulses, thoughts, and negative emotions and moods, mindfulness interventions have also been shown to increase optimism (Li et al., 2017), enhance working memory, improve response inhibition and decision-making (Alfonso et al., 2011), as well as improve quality of self-perception (Chen et al., 2010), awareness, well-being, gratitude, and attention toward the other and oneself in the context of relationship (Mazorco & Cuenca, 2019). The main effects of mindfulness can be summarized as enhancing potentials for behavior change and abilities to counteract autonomic reactivity to stressful stimuli (Siegel, 2010).

Spanish-language studies have reported that mindfulness practices improved emotional self-regulation in Spanish university students (Fuente-Arias, Franco-Justo, & Mañas-Mañas, 2010), and conferred multiple benefits in the academic performance of South American immigrants in Spain (Franco, Soriano, & Justo, 2010). In Colombia, the “RESPIRA” (2013) program aims to implement mindfulness among students from schools affected by violence in order to promote social-emotional learning and increased teacher/student well-being. Earlier work with university populations in Colombia tested attention deficit reduction through mindfulness (Barragán, Lewis, & Palacio, 2007). Subsequently, Sánchez-Quijano (2016) designed a program titled, “Consciencia Plena del Sentido en la Vida” program with university students, validating it with mixed methods research. For their part, Mazorco and Cuenca (2020) designed a contextual program based on the eight-week Kabat-Zinn stress reduction program according to the Stahl and Goldstein (2010) workbook, as well as various educational programs, to work with teachers and

university students. They reported qualitative results indicating enhancements in well-being, awareness, gratitude, and relationships.

Although these research results represent significant progress in validating the benefits of mindfulness and holotropic breathwork, information on these treatments’ effectiveness with Colombian samples continues to be limited—providing incentive for the study that follows.

Study

This study aimed to compare the effects of mindfulness and holotropic breathwork therapies in adolescents in the process of rehabilitation due to use of psychoactive substances (PAS). Research was conducted at the Fundación Grupo de Apoyo, affiliated with the Colombian Family Welfare Institute (ICBF, for its Spanish acronym).

Method

This study used an exploratory mixed methods research design. Its quantitative phase involved a quasi-experimental inter-group comparison study with pretest and posttest measurements (Hernández, Fernández, & Baptista, 2014), while qualitative information was processed using the grounded theory approach (Corbin & Strauss, 2008; Bryant & Charmaz, 2010), with specific use of thematic analysis.

Participants

Participants were selected through purposive sampling. Selection criteria were as follows: (a) aged 13–18, (b) female, (c) individuals who used psychoactive substances, (d) who had been inpatients for two months or less at the Fundación Grupo de Apoyo for rehabilitation due to psychoactive substance use, and (e) had no experience in meditation techniques and no prior medical or psychiatric history.

Measures

Participants completed a demographic questionnaire and a measure to determine risk of psychoactive substance use. In addition, heart rate data and qualitative reports were collected from participants; record was also made of Fundación staff members’ perceptions of each adolescent’s process, from experimental groups and the control group.

Demographic Questionnaire

A demographic questionnaire collected participant age, sex, years of school, time spent at the institution, and drug use.

Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST)

The ASSIST is an 8-item measure developed by the World Health Organization (2010) to be a culturally neutral assessment tool for use in primary health care settings to screen for use of tobacco, alcohol, cannabis, cocaine, amphetamines, sedatives, hallucinogens, inhalants, opioids, and other psychoactive drugs.

Polar F7 Heart Rate Sensor

Heart rate measurements were collected using a Polar F7 HR sensor attached around the chest of each participant and controlled from the wrist. The investigators conducted pre-training with participants, who learned to initiate heart rate measurement by pressing a button on the pulsometer when instructed, while in a supine position. Data was transmitted from the device to a computer via Bluetooth. Heart rate measurements were collected at pre-test one hour prior to the start of the first session, and at post-test one hour after the end of the last session.

Documentation of Participant Experiences

Written records were collected documenting participants' informal reports of their experiences in both the mindfulness and the holotropic breathwork sessions.

Staff Observations

Fundación staff members who worked with participants were asked about their perception of each adolescent's process, and these observations were recorded.

Procedures

The study proceeded in three phases. In the first phase, over the course of three sessions before treatment began, researchers and research assistants used play interactions to facilitate an environment of trust and openness, collect demographic data, and apply baseline measures using the ASSIST and Polar F7 HR sensor.

In the second phase participants were arbitrarily divided into groups and interventions were applied. All groups received treatment as

usual (TAU) from the Fundación, consisting of four phases of treatment over 8 months: detoxification, rehabilitation, promotion of healthy lifestyle, and relapse prevention. Daily activities included auxiliary trainers who led physical discipline activities combined with lectures, films, and other formative or recreational activities. These daily practices were supplemented with pedagogical, nursing, and psychological support, external psychiatric consultation, and where possible inclusion of families in the treatment process. Participants were divided into a TAU plus mindfulness group (Group 1), a TAU plus holotropic breathwork group (Group 2), and a control group (Group 3) that received only treatment as usual. Informal qualitative reports of participant experiences were collected during this phase.

In the third phase post-test heart rate data was collected, and the Fundación Grupo de Apoyo's staff workers were interviewed to record their perceptions of each adolescent's process. The health professionals such as the nurse, the social worker, the psychologist, and the assistant leaders or trainers, who reported their qualitative perceptions of the evolution of the adolescent girls in the control and experimental groups after the end of the intervention, did so on the same date. These individuals were aware that a study was being conducted, but with the exception of the psychologist, they did not know which individuals from the institution's population had been selected for the study, nor were they aware of the different groups to which the participants had been assigned, so they were mostly blind to the conditions of the study.

There was a final activity to conclude the study and express appreciation to the participants and staff that involved sharing a cake and exchanging impressions with the adolescents and workers.

Intervention

The mindfulness intervention was taken from the "Consciencia Plena del Sentido en la Vida" program (Sánchez-Quijano, 2016), which, in turn, was inspired by a mindfulness course offered by the Fundación FORO from Buenos Aires and the Psychology PhD program of the Universidad de Flores, Argentina. As for the holotropic breathwork technique, it was taken from a course offered by the

Asociación de Psicología Humanista Transpersonal, "SASANA," in Bogotá, Colombia. This technique is related to the theoretical and methodological developments published by Grof and Grof (2010). The main materials used during the interventions were mats, bells, blindfolds, blankets, poster boards, markers, colored pencils, crayons, music, and audio devices.

Four mindfulness sessions and three holotropic breathwork sessions were conducted. The mindfulness sessions took place once a week, while the holotropic breathwork sessions were held every 15 days.

In the first session, playful activities were used to recognize and interact with the adolescents.

The sociodemographic data questionnaire and ASSIST were applied in the second session. In the third session, each participant's height and weight was recorded to enter this data into the heart rate monitors. Resting heart rate (pre-test) was measured. Subsequently, treatment with groups 1 and 2 began. Four mindfulness sessions were conducted (see Table 1), lasting between 60 and 90 minutes. Three holotropic breathwork sessions, which used an age-adapted technique for adolescents and included support from three caregivers from the research team, were conducted with an average duration of two hours (see Table 2).

The mindfulness sessions were held in groups and lasted one hour. In the first session,

Table 1. Distribution of Mindfulness Technique Sessions

Session Focus	Objective	Activities
1. Mindfulness meditation	Learn to relax the mind and body	Introduction to types of breathing and their connections with positive emotions Duration: 1 h
2. Mindfulness meditation: Formal movement and sitting meditation	Learn formal meditation techniques to develop full awareness of the present moment	Attention to breathing, implementation of body exploration or scanning, sitting meditation, and yoga poses Duration: 1.5 h
3. Mindfulness meditation: Informal meditation	Practice meditation (full awareness) in various situations that arise in daily life.	Attention to breathing, informal meditation practice (mindfully walking, working, and eating) Duration: 1.5 h
4. Mindfulness meditation: Observation of thoughts and emotions	Identify situations that lead to psychoactive substance use to attain a full awareness that favors self-regulation.	Attention to breathing, implementing the observation and acknowledgment of thoughts, emotions, and sensations associated with PAS use, without resisting these private events, to put emotional self-regulation into practice Duration: 1.5 h

Description of the four mindfulness sessions conducted with the mindfulness intervention group, including the topical focus of the session, the session's objective, and the activities engaged in with participants.

Table 2. Distribution of Adapted Holotropic Breathwork Sessions

Session	Objective	Activities
Sessions 1, 2, and 3	Foster a caring environment for immersion in holotropic breathwork	The lead facilitator, together with three assistants, induced relaxation and psychic openness, followed by hyperventilation practice accompanied by music and, in some cases, bodywork. After the breathing activity, participants draw mandalas, and the session closes with a listening circle. Duration: 2 h (opening, 20 mins; hyperventilation, 1 h; closing, 40 mins)

Description of the three holotropic breathwork sessions conducted with the holotropic breathing intervention group, including the session's objective and the activities engaged in with participants.

participants were provided with information about mindfulness, its applications, and various types of breathing practices. They were taught a body exploration exercise, with the option of concluding the session by connecting with a pleasant emotion. Subsequently, they were informed that they must continue practicing the exercise every day of the week. In the second session, they began analyzing the challenges they encountered during the weekly practice, as well as the benefits. The practice continued, and participants learned about “formal movement meditation,” or hatha yoga, and formal sitting meditation. The third session introduced the attitudes of mindfulness. The participants did an informal meditation together with a domestic cleaning activity, and they were invited to adopt these attitudes in other activities during the week. In the fourth session participants learned to bring their full attention to thoughts and emotions, particularly those associated with situations that trigger substance use, similar to those expressed by Bowen et al. (2011).

The last session—the closing session—included the heart rate post-tests, an evaluation of the experience, and a cake to express appreciation. Although most standardized mindfulness programs are eight weeks long, due to the difficulty of maintaining the sample due to increased dropping out, a decision was made to conclude the intervention at this point, with the hope that the expected results had been achieved. The participants had been taught all the techniques that are commonly used in standardized programs such as Mindfulness-Based Stress Reduction (MBSR), although with shorter practice times and fewer sessions, as suggested for adapted versions with child and adolescent populations (Rechtshaffen, 2017).

Regarding the holotropic breathwork intervention, some basic ideas and elements of the techniques were incorporated into an initial talk its purpose, the procedure, and possible positive and negative experiences. Inclusion of a deep theoretical discussion was ruled out for this adapted version due to the participants’ age, interest, and level of schooling. After the initial talk, the intervention’s opening phases began with a therapeutic circle, mind-body relaxation, musical accompaniment

appropriate for the breathing phases (tribal, heroic, music expressing emotion and integration, and emotional reconciliation melodies), bodywork according to individual needs, mandala drawing, and talking circles. The researchers documented the discourse and the relationship with mandala drawing. Using these protocols, the participants breathed simultaneously, in a controlled manner, and in a safe space for their physical and emotional protection. The support of a sitter among the adolescents was not taken into account—first, considering the participants’ emotional vulnerability and their own poor resources to care for and support another person, and second, due to the time restrictions that the institution protecting the participants allowed for this type of process.

Each session lasted approximately two hours, with the time divided into an opening group conversation circle (15–20 minutes), a moment for each breather to relax and adjust their mat (15 minutes), the hyperventilation process (30–60 minutes), individual bodywork according to personal physical preparation with the facilitator’s support (15–20 minutes), mandala drawing (15–20 minutes), and a final round of group conversation (15–20 minutes). After the intervention, the participants had general psychological support as an institutional service. This way of organizing the time was the result of the institution’s restrictions, participants’ resources, and the systematic organization of the process after the entire intervention.

This time, the intervention was organized according to five factors: (1) the lack of participants’ previous experience with a transpersonal process or technique; (2) the lack of a caring and safe environment in the institution’s day-to-day life for the integration of a full and deep holotropic experience; (3) the facilitators’ observations about the physical and emotional manifestation of the individual and collective rhythm; (4) the collective synchrony in the experience; and (5) the institution’s time restrictions that affected the strict application of holotropic breathwork protocols.

After finalizing the application of mindfulness and holotropic breathwork, the heart rate of the two experimental groups and the control group was recorded. After the intervention was finished, the

workers were asked for their outside perception of the therapeutic process with the adolescents from both the experimental groups and the control group.

Treatment of Data

The quantitative data analysis was conducted with the Statistical Package for Social Sciences (SPSS) program, obtaining percentages of sociodemographic data. Rates and ratios were used to analyze the characteristics of substance use. To compare the means of pre- and post-treatment heart rates, the Student's *t*-test was selected for related samples, with a 95% confidence interval. To establish the mean of the treatments, Cohen's *d* was used.

For the qualitative data, a thematic analysis was conducted of the written records from the intervention sessions for both experimental groups and of the interviews with the institution's workers about each participant's process, including that of the adolescents from the control group.

Ethics

According to Article 16 of Law 1098 of 2006—the Childhood and Adolescence Code issued by the Congress of the Republic of Colombia—individuals or legal entities that work at the ICBF are authorized to exercise the protection of adolescents, subject to State supervision. For this research, the Fundación Grupo de Apoyo complied with the law on adolescent protection, and so Jesús Usuaza, the foundation's director, evaluated and signed the informed consent document. In addition, practice of the holotropic breathwork intervention in groups requires certification from the Asociación de Psicología Humanista Transpersonal, "SASANA," in Bogotá, Colombia, which was obtained.

Results

The sample was comprised of 18 female adolescents, whose age ranged from 15 to 18 years (*SD* = 1.62). Their level of schooling was between fifth and 11th grade, distributed into fifth (5.56%), sixth (27.78%), seventh (33.33%), eighth (16.67%), ninth (5.56%), tenth (5.56%), and 11th (5.56%) grade.¹ Regarding the psychoactive substance they used the most, it was found that 75% practiced polydrug use, and 91.6% used marijuana the most frequently, followed by cocaine (75%), *cripy* (33.3%),² inhalants (25%), cocaine paste (25%), and amphetamines (16.6%).

Of the study participants, 31% began using psychoactive substances out of curiosity. The most-used substance was marijuana, with a frequency of several times per day (69%). Of participants, 46% identified a family member who used PAS, and 59% had received psychological treatment.

Pretest and Posttest Heart Rate Comparison

When the means of heart rate are compared among the groups, a reduced heart rate can be seen in the experimental groups at post-test (Table 3). Upon applying the Student's *t*-test, there is evidence of a statistically significant difference between the control group's heart rate and the mindfulness group's heart rate (*t* = 1.38; *p* = 0.04). However, when comparing the control group and the holotropic breathwork group, there are no statistically significant differences in heart rate (*t* = 1.70; *p* = 0.22).

When the effect size was estimated with a 95% confidence interval, taking heart rate as pre-test and post-test values, *d* = 0.64 was obtained for the holotropic breathwork treatment, indicating a medium effect size, while the mindfulness treatment resulted in *d* = 0.85, showing a large effect size.

In addition, the experimental treatments were systematized by describing the participants' experiences in the context of each session. In the case of the mindfulness group, their experiences are compiled generally, not individually, due to the difficulties they had in completing self-records. See Table 4. In the case of the holotropic breathwork group, the experience was described individually according to the records of the breathwork facilitators or caregivers. See Table 5.

Table 3.
Comparison of Pretest and Posttest Heart Rate by Group

Groups	Control		Holotropic Breathwork		Mindfulness	
	62	64	75	67	70	61
	89	92	80	53	103	64
	63	72	56	81	77	84
	55	66	109	78	67	67
	77	70	90	74	71	70
	54	57	62	66	69	59
Mean	67	70	79	70	76	67

In addition, the participants' internal perspective of holotropic breathwork is illustrated by two cases in which their mandala drawings are related to their narratives (see Table 6). Similarly, the institution's workers provided their perceptions of the process experienced by the adolescents who took part in the research. All this information was processed through the QDA Miner Lite qualitative data analysis software, identifying the most relevant categories. See Table 8.

Considering the significance by frequency and percentages of references by codes, we observed that in the control group, which only received treatment as usual from the Foundation, there were three cases with improved mood and decreased stress and anxiety. In the other cases, there was no therapeutic progress. In the experimental mindfulness group, in addition to finding more references to decreased anxiety and stress, there was evidence of better coping, better communication, greater treatment adherence, and greater emotional regulation, with better communication standing out prominently. In the case of the experimental holotropic breathwork group, there were references to the same categories as in the previous group, but better coping and emotional self-regulation were the most significant.

In the mindfulness group's first two sessions, the adolescents referred to experiencing states of relaxation, peace, freedom, and humor. In the third session, they expressed appreciation for the technique as a way to escape the routine of being confined in the institution. In the last session, the participants re-experienced anxiety-producing personal events associated with psychoactive substance use, but they managed to cope with them by using the technique. Some of the adolescents were also able to identify situations prior to their use, such as a family conflict or being offered a substance by a colleague or friend.

In the holotropic breathwork group, participants' perspectives on their experience were documented through their reports, and reflected in their mandala drawings. Two brief case summaries can serve to illustrate typical participant processes: (1) Subject LYI manifested states of subjective well-being, such as happiness, freedom, peace, security, and the presence of God. At the same time, she referred to positive values such as love and hope. Finally, she expresses self-awareness around personal elements that constrain her change as a person. (2) Subject NVZ remembered how she used to be, took perspective of herself, and focused on beautiful memories from her life story, but she

Session Focus	Description of the Experience
1. Mindfulness meditation	Although one of the participants began expressing resistance to the work, later all of them demonstrated their willingness. Finally, they expressed feeling good and being relaxed with the breathing techniques.
2. Mindfulness meditation: Formal movement and sitting meditation	In this session, the adolescents reported feeling free and laughing at the workers because the workers worried that the adolescents might run away when they were in an outdoor space of the facility situated on a hilltop, which would allow them to jump the fence.
3. Mindfulness meditation: Informal meditation	Although most of the adolescents were still shy, some of them said they liked the activity because they could escape the routine of being confined in the institution. One of them said she had to take advantage of these techniques because she did not have support from anyone else and had to get by on her own
4. Mindfulness meditation: Observation of thoughts and emotions	This exercise produced anxiety by triggering the desire to use—and withdrawal because they could not—so they breathed with greater intention as a means of calming down. Some of the adolescents were also able to identify pre-use situations, such as a family conflict or a partner's offer to use.
Participant experiences are compiled generally rather than presented specifically due to participant challenges with completing self-records,	

Table 5. Records of Holotropic Breathwork Session Experiences			
Participant Code Name	Session 1	Session 2	Session 3
NVZ	Tension in her legs, hands, and fingers; constant movement of her feet. She felt her hands fall asleep and wanted to leave.	Trembling hands; leg movements. "The grey is like how I used to be. I focused on my happy memories and became blue"; "easier, good, more relaxed."	Movements in her hands, fingers, and feet; tetany in all extremities; emotional expressions, crying, confusion. "I relived all the bad stuff. I felt embarrassed to be seen. I didn't realize it and sat down to cry."
LYI	Agitation, continuous arm and leg movements; tension in the upper and lower extremities.	No record.	She experiences remorse. The purple color represents something that will not let her (change); the green is hope.
GCM	Difficulty doing the holotropic breathwork. She was not able to complete it and fell asleep.	First, hand and feet movements, then leg movements, hand numbness, crying, expression of grief, catharsis. Pressure or emptiness in her chest associated with darkness, then it disappeared, and she visualized a better life.	Many movements in her hands, fingers, and legs; upper extremities, hands curled in fists. She ended up laughing. "I felt better; I was hurt and began healing. I couldn't pull away; I felt tied back, and then I could rise into the sky."
NYB	Difficulty concentrating. Slight tension in arms and hands.	"This time was heavier than the last." She felt rage, fear, sleepiness, happiness, and dizziness.	Hands curled in fists over her chest, foot movements.
NYP	She found it hard to concentrate. She fell asleep.	Leg movements, pain in her hands. "I was in heaven, and I told my mother I love her." She felt as if death was haunting her, and then heard the mother of God saying she loved her. She saw herself going home.	She fell asleep.
GJC	She fell asleep.	No record.	Constant movements of her hands, feet, and legs. Anxiety. She says that her mother (who died when she was a year old) places difficulties in her path that she feels she can overcome. "There's hope; I'm a warrior."
Observations of participant experiences as recorded by session facilitators or caregivers			

Table 6. Expressions Resulting from Two Adolescents' Experience with Holotropic Breathwork

Participant Session	Mandala	Participant Description
LYI Session 1		<p>Peace Free Safe</p>
LYI Session 2		<p>Love Free Happiness Peace</p>
LYI Session 3		<p>God is with me Hope "I experienced remorse. The color purple represents something that still doesn't leave me [change]; green is hope"</p>
NVZ Session 1		<p>She felt her hands fall asleep and wanted to leave.</p>
NVZ Session 2		<p>"The grey is like how I used to be. I focused on my happy memories and became blue"; "easier, good, more relaxed."</p>
NVZ Session 3		<p>"I relived all the bad stuff. I felt embarrassed to be seen. I didn't realize it and sat down to cry"</p>

Table 7. General Perception of Institutional Staff Members After Intervention Period

Group	Code Name	Observations by Institutional Staff
Control	EJP	She didn't make any progress; the process was a loss. One day, she left feeling very sad. She engaged in self-harm.
	LDB	She didn't move forward or backward. Although she doesn't have problems with adapting or with authority, she doesn't seek help or talk about her substance use. She demonstrates anxiety with food.
	PLV	She doesn't cut herself anymore; she lowered her stress levels.
	SNC	She escaped ten times and was taken to another institute for substance use. Up until the day she left, she was very anxious and wanted to use again.
	LDR	Her levels of anxiety, stress, and aggression lowered.
	JLS	Her mood improved, and she is calmer. She no longer engages in self-harm nor suicidal ideation. She expresses herself more and shares with the other girls.
Mindfulness	EBC	Although she has no family, since she lived on the street, and never had any visitors, her progress is notable. She strengthened her impulse management when she felt anxious to use and improved her communication with both the staff of professionals and the other girls, whom she gave advice to when they also went into crisis.
	LFM	She has changed slowly, although she gets frustrated easily. She gradually made progress in seeking guidance and communicating what she's feeling.
	LVA	She has behaved well and mindfully engaged in the process. Although she improved her communication, she expresses her emotions. She interacts more with the other girls and increased her confidence. She lacks self-regulation.
	LAH	She has been better, despite not having her family's support. She has had a more positive, proactive attitude. She increased her communication skills, relates better with the other girls, and tries to cope with problems. She copes with family situations, and her anxiety has reduced.
	JPM	Calm, more positive, more cheerful, with more initiative, more participatory. Her stress has reduced.
	LKS	She is perceived to be calmer. More stress used to be detected in her. She has improved her emotional control.
Holotropic Breathwork	NVZ	She doesn't show aggression, nor anxiety. She didn't used to interact, is very quiet, and has no support network. She changed positively and controls her emotions better. Before, she had an attitude of rejection. She seems calmer and more friendly. She was able to outwardly express a situation that was holding her back.
	LYI	She has improved her impulse control and anxiety. She was very aggressive and used to isolate herself and engage in self-harm. Changes have been detected; she's calmer. She has managed to cope with problematic situations and adhere to treatment.
	GCM	She has seen improvements in her grieving process and her problem-solving ability. She gained peace of mind and greater security, and she seeks more help.
	NYB	Very cheerful. Her grandmother and mother set her off. Now, she has less stress, tolerates frustration, acknowledges when she makes a mistake, and has less anxiety.
	NYP	She has improved. She used to repress her feelings, and now she expresses what's going on. The change is notable. She's made a lot of progress. She experienced several crises: wanting to be alone, to leave the institution, and to cut herself. Now, she wants to finish her process, do the work for her family. She is making plans for herself. She learned to communicate, manage stress and emotions.
	GJC	She has made progress in communication. She became more open to the therapeutic process and has greater self-control. Her tolerance of frustration and grief still need work. She was able to express a traumatic situation outwardly.

also remembered experiences she perceived as “bad” or negative. Initially, she expressed fear and embarrassment of being seen by the institution’s workers. Then, she spontaneously began crying and finally expressed well-being through relaxation.

Based on their perspectives, the workers—including the institution’s health personnel and peer counselors—provided the following reports regarding the three groups:

For the control group, the institutional staff observed some progress or improvement in mood and stress and anxiety levels in three cases. No progress or improvement was seen in the remaining cases. Staff reported continuation of self-harm, states of anxiety, escapes from the institution, and the desire to use psychoactive substances.

The institution's staff reported improvements in all cases assigned to the mindfulness group, reflected in increases in coping and communication, and reductions in stress and anxiety; improvement in communication was the most visible change. For example, with respect to adolescent participant EBC's process, one of the workers stated:

Although she has no family, since she lived on the street, and never had any visitors, her progress is notable. She strengthened her impulse management when she felt anxious to use and improved her communication with

both the staff of professionals and the other girls, whom she gave advice to when they also went into crisis. (Institutional staff member)

Institutional staff reported similar improvements in all cases assigned to the holotropic breathwork group, but with more references to emotional self-regulation and enhanced crisis-coping skills. For example, in the case of adolescent NYP, another worker reports that

She has improved. She used to repress her feelings, and now she expresses what is going on. The change is notable. She has made a lot of progress. She experienced several crises, [such as] wanting to be alone, to leave the institution, and to cut [herself]. Now, she wants to finish the process, do the work for her family. She is making plans for herself. She learned to communicate, to manage stress and emotions. (Institutional staff member)

Discussion

This study measured the effects of mindfulness and holotropic breathwork interventions with adolescents in residential rehabilitation for psychoactive substance use, as compared with each other and a control group receiving treatment as usual. Heart rate is a significant indicator of psychological well-being and overall cardiovascular health, and

Table 8. Frequency of Selected Codes in Institutional Staff Notes

Code	Frequency			Percentage of References		
	Control	Mindfulness	Holotropic Breathwork	Control	Mindfulness	Holotropic Breathwork
<i>no progress</i>	3	0	0	7%	-	-
<i>decreased mood symptoms or enhanced mood regulation</i>	3	4	5	7%	9.4%	11.7%
<i>better coping</i>	0	1	6	-	2.3%	14%
<i>better communication</i>	0	4	4	-	9.3%	9.3%
<i>increased treatment adherence</i>	0	1	3	-	2.3%	9.3%
<i>emotional self-regulation</i>	0	1	8	-	2.3%	18.6%

Staff observation notes on participants were analyzed using QDA Miner Lite qualitative analysis software, and categories most relevant to participant progress were identified. The code, "decreased mood symptoms or enhanced mood regulation" was compiled by combining "decreased anxiety and stress" with "anxiety management" and "decreased stress."

both experimental groups showed greater reductions in heart rate than the control group. In addition, increased heart rate can be used as a marker of a physiological response to anxiety, the latter being a common psychological symptom in psychoactive substance users that is associated with relapse during withdrawal. Since heart rate is an involuntary response, and thus relatively free from participants' influence (Simon & Amenedo, 2001), it was deemed preferable to self-report measures of anxiety.

Both the mindfulness and holotropic breathwork groups showed decreases in mean heart rate to a similar extent, in contrast with control participants receiving treatment as usual, who demonstrated an increase in mean heart rate. Heart rate reductions associated with the holotropic breathwork intervention, and likely reflecting reductions in anxiety, were similar to the findings of Cervantes and Puente (2014), but due to pre-test/post-test data variability, our study showed only a medium effect size. This variability was likely due to the fact that some participants fell asleep during portions of the holotropic breathing sessions. Despite these instances of partial participation in the hyperventilation practices, positive therapeutic results were achieved.

Holotropic breathwork has been characterized as promoting self-actualizing experiences at the personal, perinatal, and transpersonal levels, in the form of physical, emotional, and spiritual experiences (Grof & Grof, 2010). As participants delve into voluntary hyperventilation with evocative music, physical and emotional experiences emerge on a personal or biographical level, as well as experiences consistent with transpersonal or spiritual qualities. Hyperventilation techniques also provide an opportunity for evoking catharsis (Cervantes & Puente, 2014), which should be managed to maintain an age-appropriate duration for participants (cf. Contreras & Zenteno, 2014).

Positive impacts of holotropic breathwork consistent with reports in the literature were observed, such as reduced anxiety, increased self-esteem, confidence, and spontaneous emotional catharsis (Brewerton et al., 2012), alongside short-term adverse effects such as physical pain and tetany (Mazorco, 2014), and transformative processes

in which past experiences of abuse, grief, or other negative qualities were relived and reinterpreted. In addition, some participants reported creation of narratives linked to life meaning and restoration of bonds related to protection, trust, and belonging to life and God, accompanied by increased capacities for coping and resilience (cf. Nedumpillil et al., 2014; Landaeta, 2014; Fericgla & Guarch, 2014; Contreras & Zenteno, 2014).

The institution's staff members observed positive effects in the holotropic breathwork group such as a reduced desire to use psychoactive substances; improved impulse control; increased coping skills and emotional self-regulation in stressful or crisis situations; enhanced expression and emotional control; an increase in positive emotions such as peace of mind, trust, and joy; and greater positivity in communication and interpersonal interactions. Of these, increases in emotional self-regulation and better coping were deemed the most important effects.

Of note here are the Grofs' (1995, 2010) findings from therapeutic work with LSD—to which holotropic breathwork was a successor modality when LSD possession and use was criminalized: they reported that the expression of LSD's healing potentials correlated more reliably with the richness of the therapeutic environment than with the dosage level of the drug. For this reason, these positive outcomes from the intervention should not be considered in isolation from the context created for its application.

With the group participating in the mindfulness intervention, similar heart rate reductions were accompanied by a large effect size. The mindfulness techniques used were designed to facilitate increased awareness of feelings, emotions, and thoughts that would otherwise be avoided or produce reactivity associated with initiation of substance use (Bien, 2009). These techniques aim at developing greater cognitive and behavioral flexibility to cope with anxiety appropriately. Although the discomfort of anxiety does not disappear, there is evidence of greater ability to manage the discomfort through communication and to exercise control over behavioral responses to the anxiety.

The results of the research demonstrated the value of mindfulness for emotional self-regulation, for decreasing unpleasant emotions (cf. Bonilla & Padilla, 2015), and for improving the quality of self-perception (cf. Chen et al., 2010). Results were also in line with Siegel's claim (2010) that mindfulness can be used to change behavior and counteract reactivity in response to stressful stimuli. It may be that the emphasis on attention to thoughts, emotions, bodily sensations, and the environment fostered the discovery of alternate ways to respond to anxiety.

Institutional staff reported greater treatment adherence in the mindfulness group, improved stress reduction, decreases in the anxiety and impulsivity associated with substance use, enhanced coping, and emotional regulation and communication—with this last aspect highlighted as the most impactful.

Limitations

This pilot study was limited by the variability of institutional conditions for sample control, the reduced number of sessions for both experimental treatments, and the low number of participants in the sample.

Conclusion

Both holotropic breathwork and mindfulness interventions showed positive effects in an adolescent population at risk for abuse of psychoactive substances, despite the logistical and size limitations of this pilot study. Future research should include repeated application of objective measures and follow-up assessments to evaluate treatment response and durability. This should be accompanied by closer attention to participants' subjective experiences of their impulses, triggers, non-ordinary states of consciousness, and spiritually-toned emergencies.

Holotropic breathwork and mindless interventions may well be complementary, suggesting that future studies should test an intervention that integrates both, with a reduced number of sessions of each process. Such an intervention should be designed in the context of an analysis of family, socioeconomic, and spiritual conditions that may factor in abuse of psychoactive substances. In addition, there is need for intentional inclusion of increased integration times for holotropic

breathwork, and a structured daily practice of mindfulness needs to be implemented within the intervention design.

Conflict of Interests

The authors state that they have no conflicts of interest in this study.

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Notes

1. In Colombia, students attend primary school until fifth grade and begin secondary school in sixth grade.
2. *Cripy* is a term in Colombia for a strain of marijuana with especially high THC levels.

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