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

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Research Article

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Abstract

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.

Introduction

Use of psychoactive substances (PAS) 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 addictions, including psychological anxiety and craving.

Craving is a subjective experience of intense desire (Tapper, 2018) associated with different behaviors, such as PAS use, compulsive gambling, and sex addiction (Sánchez-Hervás, Molina, Del Olmo Gurrea, Tomás, & Morales, 2001). This desire is present in all substance-dependent individuals; it is dynamic, as it operates differently among individuals and plays an important role in the persistence of an addiction (Skinner & Aubin, 2010).

There are different explanatory models of craving (Jiménez, Graña, & Rubio, 2002). One is the model in which substance addictions are associated with a lack of purpose in life or a sensation of existential emptiness, hindering connection with a spiritual dimension and limiting volition (Francis & Robbins, 2009).

In transpersonal psychology (Grof, 1992; Grof & Grof, 1995; Grof, 1996; Viggiano & Krippner, 2010), addictive behaviors may be explained as a spiritual emergency arising from a lack of wholeness or unity of body, mind, and spirit. 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 of transpersonal psychology 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, Ritz, Wilhelm, & Roth, 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. Its practice in groups requires certification from the Asociación de Psicología Humanista Transpersonal, "SASANA," in Bogotá, Colombia, 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 the intervention starts, participants receive information about experiences that may emerge during the process. Then, they arrange themselves in a therapeutic circle, in a supine position with their eyes closed. They begin hyperventilation work with evocative music in the background. After the breathing session, artistic and integrative expression (mandala drawing) is stimulated with verbal sharing (Minda, 2015; Grof, 2008).

Studies show the effectiveness of holotropic breathwork in reducing the anxiety of adults with alcohol dependence syndrome (Brewerton, Eyerman, Cappetta, & Mithoefer, 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, with an effect on anxiety level reduction (Cervantes & Puente, 2014). There are studies on adolescents that illustrate favorable results in aspects such as the reinterpretation and development of tools to deal with personal conflicts and discover purpose in life (Contreras & Zenteno, 2014).

The main benefits of these practices in spiritual transformation processes are the following: 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, Acioly-Regnier, Ribeiro, and Ferreira (2017) show successful experiences of supporting adolescent groups in periphery 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 shown a reduction in PAS use (Li, Howard, Garland, McGovern, & Lazar, 2017) and in withdrawal symptoms, PAS craving, and anxiety symptoms (Alosnso, 2012; Bien, 2009), as well as prevention of relapse (Bowen, Chawla, & Marlatt, 2011), stress, unwanted impulses and thoughts, and negative emotions and moods. It has also shown increased optimism (Li et al., 2017), enhanced working memory, improved response inhibition and decision-making (Alfonso, Caracuel, Delgado-Pastor, & Verdejo-García, 2011), and participants’ improved quality of self-perception (Chen, Comerford, Shinnick, & Ziedonis, 2010), awareness, well-being, gratitude, and attention toward the other and oneself in the relationship (Mazorco y Cuenca, 2019). The main effects of mindfulness can be summarized as the possibility of changing behavior and counteracting the autonomous system’s reactivity in response to stressful stimuli (Siegel, 2010).

In Spain, some applied studies show better emotional self-regulation in Spanish university students (Fuente-Arias, Franco-Justo, & Mañas-Mañas, 2010) and multiple benefits of mindfulness in South American immigrants’ academic performance (Franco, Soriano, & Justo, 2010).

In Colombia, a noteworthy program is “RESPIRA,” which aims to put mindfulness into practice among students from various schools affected by violence so as to promote social-emotional learning and teacher/student well-being (Respira, 2013). One of the first reference points related to the university population in Colombia was the work of Barragán, Lewis, and Palacio (2007) to reduce attention deficits through mindfulness. Later on, Sánchez-Quijano (2016) designed the “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 different educational programs, to work with teachers and university students. They obtained qualitative results related to well-being, awareness, gratitude, and improved relationships.
Although research illustrates significant progress in validating mindfulness and holotropic breathwork, information on these treatments’ effectiveness with Colombian samples continues to be limited. Therefore, this study aims to compare the effects of mindfulness and holotropic breathwork therapies in adolescents who are in the process of rehabilitation due to PAS use.

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) and the specific use of thematic analysis.

Participants

Participants consisted of 18 female adolescents, inpatients at the Fundación Grupo de Apoyo, affiliated with the Colombian Family Welfare Institute (ICBF, for its Spanish acronym), for rehabilitation due to their psychoactive substance use. 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.

Inpatients stay at the foundation for eight months, with the possibility of extending to ten months. During this time, different events may occur: They may leave the facility, be transferred to other foundations, or cease treatment.

The 18 participants were selected through a purposive sampling procedure. The selection criteria were the following: (a) be aged 13–18, (b) be female, (c) be an individual who uses psychoactive substances, (d) have been in the institution for two months or less, and (e) have no experience in meditation techniques and no medical or psychiatric history. The participants were distributed into three groups through manual selection: six adolescents for Experimental Group 1 (mindfulness), six adolescents for Experimental Group 2 (holotropic breathwork), and six adolescents for Group 3 (control). The control group only received treatment from the Fundación.

Procedure

First phase: This included the first three sessions before treatment began. In these sessions, we (the researchers and research assistants) first sought interactions mediated by play to facilitate an environment of trust and openness. Subsequently, we applied instruments to collect sociodemographic data and characterize PSA use and took pretest heart rate measurements.
Second phase: Participants were divided into groups: one control group and two experimental groups. With the necessary adaptations, interventions were designed and implemented for both the mindfulness training group and the holotropic breathwork group.

Third phase: The posttest heart rate was taken in the three groups, and the Fundación Grupo de Apoyo's workers were interviewed about their perception of each adolescent’s process. There was a final activity to conclude and express appreciation by sharing a cake and exchanging impressions with the adolescents and workers.

**Materials**

A questionnaire to collect sociodemographic data was designed. The questions were about age, sex, schooling, time spent at the institution, and drug use. Subsequently, the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST; World Health Organization, 2010) was applied, and heart rate (pretest/posttest) was recorded using the Polar F7 heart rate monitor.

In addition, written records were made about the participants’ experiences in both the mindfulness and the holotropic breathwork sessions. Finally, the Fundación's workers were asked about their perception of each adolescent’s process, from both the experimental groups and the control group.

**Intervention**

The mindfulness intervention was taken from the “Consciencia Plena del Sentido en la Vida” program (Sánchez, 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.

The Fundación Grupo de Apoyo’s director, who is legally responsible for the minors, evaluated and signed the informed consent document. 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 (pretest) was measured. Subsequently, treatment with groups 1 and 2 began. Four mindfulness sessions were conducted (see Table 1), lasting between one and one and a half hours. 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).

### Table 1

**Distribution of Mindfulness Technique Sessions**

<table>
<thead>
<tr>
<th>Session</th>
<th>Objective</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mindfulness meditation</td>
<td>Learn to relax the mind and body.</td>
<td>Introduction to the types of breathing and connection with positive emotion. Duration: 1 hour.</td>
</tr>
<tr>
<td>2. Mindfulness meditation:</td>
<td>Learn formal meditation techniques to develop full awareness of the present moment.</td>
<td>Attention to breathing, implementation of body exploration or scanning, sitting meditation, and yoga poses. Duration: 1.5 hours.</td>
</tr>
<tr>
<td>Formal movement and sitting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>meditation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Mindfulness meditation:</td>
<td>Practice meditation (full awareness) in different situations that arise in daily life.</td>
<td>Attention to breathing, informal meditation practice (mindfully walking, working, and eating). Duration: 1.5 hours.</td>
</tr>
<tr>
<td>Informal meditation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Mindfulness meditation:</td>
<td>Identify situations that lead to PAS use to attain a full awareness that favors self-regulation.</td>
<td>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 hours.</td>
</tr>
<tr>
<td>Observation of thoughts and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>emotions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Prepared by the authors

### Table 2

**Distribution of Adapted Holotropic Breathwork Sessions**

<table>
<thead>
<tr>
<th>Session</th>
<th>Objective</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessions 1, 2, and 3</td>
<td>Foster a caring environment for immersion in holotropic breathwork.</td>
<td>The lead facilitator, together with three assistants, induces relaxation and psychic openness. Then, hyperventilation begins, accompanied by music and, in some cases, bodywork. Finally, participants draw mandalas, and the session closes with a listening circle. Duration: 2 hours (opening, 20 minutes; hyperventilation, 1 hour; closing, 40 minutes)</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors

The mindfulness sessions were held in groups and lasted one hour. In the first session, participants were informed about mindfulness, its usage, and the different types of breathing. They were taught the 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 found 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, they 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 posttests, 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 is suggested for adapted versions with child and adolescent populations (Rechtshaffen, 2017).

Regarding the holotropic breathwork-based intervention, some basic ideas and elements of the techniques were kept as part of an initial talk on the purpose, procedure, and positive or negative experiences. The 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.

### Results

The sample was composed 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$^1$, distributed into fifth (5.56%), sixth (27.78%), seventh (33.33%),$^2$ eighth (16.67%), ninth (5.56%), tenth (5.56%), and 11th (5.56%) grade. Regarding the psychoactive substance they use the most, it was found that 75% practice polydrug use, and 91.6% use marijuana the most frequently, followed by cocaine (75%), cripy (33.3%), 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 is marijuana, with a frequency of several times per day (69%). Of participants, 46% identify a family member who uses PAS, and 59% have received psychological treatment.

### Pretest and Posttest Heart Rate Comparison

Comparisons of heart rate in the different groups are shown in Table 3.
Table 3

Comparison of Pretest and Posttest Heart Rate By Group

<table>
<thead>
<tr>
<th>Groups</th>
<th>Control</th>
<th>Holotrophic breathwork</th>
<th>Mindfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>Posttest</td>
<td>Pretest</td>
</tr>
<tr>
<td></td>
<td>62</td>
<td>64</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>92</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>63</td>
<td>72</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>66</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>70</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>54</td>
<td>57</td>
<td>62</td>
</tr>
<tr>
<td>Mean</td>
<td>67</td>
<td>70</td>
<td>79</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors

When the means of heart rate are compared among the groups, a reduced heart rate can be seen in the experimental groups at posttest. 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 pretest and posttest 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 4
Records of Mindfulness Sessions

<table>
<thead>
<tr>
<th>Session</th>
<th>Objective</th>
<th>Description of the experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mindfulness meditation</td>
<td>Learn to relax the mind and body.</td>
<td>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.</td>
</tr>
<tr>
<td>2. Mindfulness meditation: Formal movement</td>
<td>Learn formal meditation techniques to develop full awareness of the present moment.</td>
<td>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.</td>
</tr>
<tr>
<td>and sitting meditation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Mindfulness meditation: Informal</td>
<td>Practice meditation (full awareness) in different situations that arise in daily life.</td>
<td>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.</td>
</tr>
<tr>
<td>meditation: Informal meditation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Mindfulness meditation: Observation</td>
<td>Identify situations leading to PAS use to achieve a full awareness that favors self-regulation.</td>
<td>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.</td>
</tr>
<tr>
<td>of thoughts and emotions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5 Records of Holotropic Breathwork Sessions
<table>
<thead>
<tr>
<th>Participant</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVZ*</td>
<td>Tension in her legs, hands, and fingers; constant movement of her feet. She felt her hands fall asleep and wanted to leave.</td>
<td>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.”</td>
<td>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.”</td>
</tr>
<tr>
<td>LYI</td>
<td>Agitation, continuous arm and leg movements; tension in the upper and lower extremities.</td>
<td>No record.</td>
<td>She experiences remorse. The purple color represents something that will not let her (change); the green is hope.</td>
</tr>
<tr>
<td>GCM</td>
<td>Difficulty doing the holotropic breathwork. She was not able to complete it and fell asleep.</td>
<td>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.</td>
<td>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.”</td>
</tr>
<tr>
<td>NYB</td>
<td>Difficulty concentrating. Slight tension in arms and hands.</td>
<td>“This time was heavier than the last.” She felt rage, fear, sleepiness, happiness, and dizziness.</td>
<td>Hands curled in fists over her chest, foot movements.</td>
</tr>
<tr>
<td>NYP</td>
<td>She found it hard to concentrate. She fell asleep.</td>
<td>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.</td>
<td>She fell asleep.</td>
</tr>
<tr>
<td>GJC</td>
<td>She fell asleep.</td>
<td>No record.</td>
<td>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.”</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors

*Participant code name
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).

Likewise, the institution’s workers gave their perceptions of the process experienced by the adolescents who took part in the research.
| Type of  
group | Name | General perception of the team of workers |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>EJP</td>
<td>She didn’t make any progress; the process was a loss. One day, she left feeling very sad. She engaged in self-harm.</td>
</tr>
<tr>
<td></td>
<td>LDB</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>PLV</td>
<td>She doesn’t cut herself anymore; she lowered her stress levels.</td>
</tr>
<tr>
<td></td>
<td>SNC</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>LDR</td>
<td>Her levels of anxiety, stress, and aggression lowered.</td>
</tr>
<tr>
<td></td>
<td>JLS</td>
<td>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.</td>
</tr>
<tr>
<td>Mindfulness</td>
<td>EBC</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>LFM</td>
<td>She has changed slowly, although she gets frustrated easily. She gradually made progress in seeking guidance and communicating what she’s feeling.</td>
</tr>
<tr>
<td></td>
<td>LVA</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>LAH</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>JPM</td>
<td>Calm, more positive, more cheerful, with more initiative, more participatory. Her stress has reduced.</td>
</tr>
<tr>
<td></td>
<td>LKS</td>
<td>She is perceived to be calmer. More stress used to be detected in her. She has improved her emotional control.</td>
</tr>
<tr>
<td>Holotropic breathwork</td>
<td>NVZ</td>
<td>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.</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors
<table>
<thead>
<tr>
<th>Type of group</th>
<th>Name</th>
<th>General perception of the team of workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LYI</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>GCM</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>NYB</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>NYP</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>GJC</td>
<td>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.</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors

All this information was processed through the QDA Miner Lite qualitative data analysis software, identifying the most relevant categories. See Table 8.
Table 8
Frequency and Percentage of References by Code

<table>
<thead>
<tr>
<th>Group</th>
<th>Code</th>
<th>Frequency</th>
<th>Percentage of references</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>No progress</td>
<td>3</td>
<td>7.0%</td>
</tr>
<tr>
<td></td>
<td>Improved mood</td>
<td>1</td>
<td>2.3%</td>
</tr>
<tr>
<td></td>
<td>Decreased anxiety and stress</td>
<td>2</td>
<td>4.7%</td>
</tr>
<tr>
<td>Mindfulness</td>
<td>Better coping</td>
<td>1</td>
<td>2.3%</td>
</tr>
<tr>
<td></td>
<td>Better communication</td>
<td>4</td>
<td>9.3%</td>
</tr>
<tr>
<td></td>
<td>Increased treatment adherence</td>
<td>1</td>
<td>2.3%</td>
</tr>
<tr>
<td></td>
<td>Anxiety management</td>
<td>2</td>
<td>4.7%</td>
</tr>
<tr>
<td></td>
<td>Decreased stress</td>
<td>2</td>
<td>4.7%</td>
</tr>
<tr>
<td></td>
<td>Emotional self-regulation</td>
<td>1</td>
<td>2.3%</td>
</tr>
<tr>
<td>Holotropic breathwork</td>
<td>Better coping</td>
<td>6</td>
<td>14.0%</td>
</tr>
<tr>
<td></td>
<td>Better communication</td>
<td>4</td>
<td>9.3%</td>
</tr>
<tr>
<td></td>
<td>Increased treatment adherence</td>
<td>3</td>
<td>7.0%</td>
</tr>
<tr>
<td></td>
<td>Anxiety management</td>
<td>2</td>
<td>4.7%</td>
</tr>
<tr>
<td></td>
<td>Decreased stress</td>
<td>3</td>
<td>7.0%</td>
</tr>
<tr>
<td></td>
<td>Emotional self-regulation</td>
<td>8</td>
<td>18.6%</td>
</tr>
</tbody>
</table>

Note: Prepared by the authors

Considering the significance by frequency and percentages of references by codes, we observe that in the control group, which only received treatment from the Foundation, there are only three cases with improved mood and decreased stress and anxiety. In the other cases, there is no therapeutic progress. In the experimental mindfulness group, in addition to finding more references to decreased anxiety and stress, there is evidence of better coping, better communication, greater treatment adherence, and greater emotional regulation, with better communication standing out significantly. In the case of the experimental holotropic breathwork group, there are references to the same categories as in the previous group, but better coping and emotional self-regulation are 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 valued the technique as a way to escape the routine of being confined in the institution. In the last session, the participants experienced private events associated with psychoactive substance use that produced anxiety, 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 obtained through what they expressed in the mandala drawing and sharing of experiences. Below, we present two cases as references: Subject LYI manifested states of subjective well-being, such as happiness, freedom, peace, security, and the presence of God. At the same time, she refers to positive values such as love and hope. Finally, she expresses self-awareness around personal elements that constrain her change as a person. For her part, Subject NVZ remembers how she used to be, takes perspective of herself, and focuses on beautiful memories from her life story, but she also remembers experiences she perceived as “bad” or negative. Initially, she expresses fear and embarrassment of being seen by the institution’s workers. Then, she spontaneously begins crying and finally expresses well-being through relaxation.

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

First, with respect to the control group, they reported that three cases have some progress or improvement in their mood and in stress and anxiety reduction. On the other hand, they report not seeing any progress or improvement in the other cases. According to the workers, self-harm, states of anxiety, escapes from the institution, and the desire to use psychoactive substances persist.

Second, for the mindfulness group, the workers report improvements in all cases. Improvements in coping, communication, and stress and anxiety reduction are found, with the improvement in communication being significant. For example, with respect to adolescent EBC’s process, one of the workers states:

*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.* (Worker at the institution)

Third, with respect to the holotropic breathwork group’s participants, the workers also report improvements in all cases in the same aspects; nevertheless, there are more references to emotional self-regulation and better coping with crises. 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.* (Worker at the institution)
In Colombia, students attend primary school until fifth grade and begin secondary school in sixth grade.

Cripy is a term in Colombia for a strain of marijuana with especially high THC levels.

Discussion

This study aimed to compare the effects of mindfulness and holotropic breathwork treatments on adolescents in the rehabilitation process for psychoactive substance use. The results show that the holotropic breathwork treatment leads to a reduced heart rate, similar to the findings of Cervantes and Puente (2014), but the pretest/posttest data variability makes this a treatment with medium effectiveness. In contrast, the mindfulness treatment produces a significant heart rate reduction. Depending on the effect size, the mindfulness treatment shows high effectiveness.

One of the psychological symptoms commonly presenting in people who use psychoactive substances, which leads the person to relapse during the withdrawal phase, is anxiety. Measuring physiological anxiety is advantageous due to the involuntary nature of the response, as this measurement is relatively free of the subject’s voluntary influences (Simon & Amenedo, 2001). Therefore, heart rate is a more valid and useful measurement of anxiety than self-reporting. Heart rate was thus selected for this study because it is a bias-free physiological symptom, measured with a highly reliable and objective method. Thus, when analyzing the size of the effect on heart rate, as a psychophysiological correlate of anxiety due to the study participants’ psychoactive substance use, the mindfulness treatment appears to be more effective than the holotropic breathwork treatment. It is possible that by paying attention to thoughts, emotions, bodily sensations, and the environment around them, people will find their own way to respond to the anxiety to use and adopt alternatives that improve their well-being and lifestyle.

From a qualitative point of view, when returning to the workers’ external perceptions of the adolescents’ process, there are discursive references associated with greater treatment adherence, stress reduction, decreased anxiety and impulsivity that lead to substance use, better coping, emotional regulation, and improved communication, with this last aspect being the most significant.

The results of the research show the benefits of mindfulness for emotional self-regulation, achieving a decrease in unpleasant emotions (Bonilla & Padilla, 2015) and improving the quality of self-perception (Chen et al., 2010). The results also confirm Siegel’s affirmation (2010) that mindfulness can be used to change behavior and counteract reactivity in response to stressful stimuli.

The mindfulness technique seeks to facilitate becoming aware of feelings, emotions, and thoughts that are usually avoided and produce reactivity associated with substance use (Bien, 2009). This technique allows for greater cognitive and behavioral flexibility to cope with anxiety appropriately. Although the discomfort of anxiety does not disappear, there is a greater ability to control it and, above all, to manage it through communication.
On the other hand, holotropic breathwork has been characterized by the promotion of self-actualization experiences at the personal, perinatal, and transpersonal level, which manifest themselves as 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, along with other experiences related to the transpersonal or spiritual level. Favorable changes in heart rate were also recorded as a physiological component of anxiety, although with medium effectiveness.

In addition, there is a relationship between a short-term approach to hyperventilation techniques with a healthy potential for catharsis (Cervantes & Puente, 2014), an age-appropriate duration for the participants (Contreras & Zenteno, 2014), and the conditions of being secluded in an institution. Furthermore, it should be considered for discussion that one of Grof’s findings regarding LSD, which led to the subsequent development of holotropic breathwork, had to do with experiments discovering that the healing potential and experience of LSD were not determined by the amount of the substance administered, but an enriched environment favoring the expression of its healing potential. This hypothesis would have to be developed in later studies.

The positive effects of holotropic breathwork are confirmed, such as reduced anxiety, increased self-esteem, confidence, and spontaneous emotional catharsis (Brewerton et al., 2012), physical pain and tetany (Mazorco, 2014), in addition to reliving and reinterpreting experiences marked as negative in situations of abuse and grief. Furthermore, the participants mentioned narratives linked to the meaning of life and capacities for coping and resilience, the restoration of bonds related to protection, trust, and belonging to life and God (Nedumpillil et al., 2014; Landaeta, 2014; Fericgla & Guarch, 2014; Contreras & Zenteno, 2014).

According to the workers’ reports, they observed positive effects of holotropic breathwork, such as a reduced desire to use PAS; better impulse control; increased coping 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 better communication and interpersonal interaction. Emotional self-regulation and better coping are the most significant effects.

This pilot study has the following limitations: 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.

It is also important to continue exploring the use of holotropic breathwork among the adolescent population with subsequent long-term measurements and to delve deeper into participants’ internal experiences on the nature of their impulses, triggers, non-ordinary states of consciousness, and spiritual emergencies.

While beneficial effects were achieved with such short treatments, it should be recalled that this is a pilot study, and such limitations should be taken into account for future research to thus obtain greater
external validity. Testing a treatment that combines the strengths of both techniques through an experimental design is desirable, taking into counting the relationships between emotional self-regulation, mindfulness, and psychological well-being. (Tasneem, S. & Panwar, N. 2020)

**Conclusion**

Heart rate is a significant indicator of psychological well-being and overall cardiovascular health, which can be achieved through the practice of mindfulness and holotropic breathwork. It is also desirable to perform repeated measurements of the variables assigned as psychophysiological correlates of substance use anxiety, in order to obtain long-term measurements that contribute to objectively evaluating the treatment’s effectiveness over time, in contrast with the participants’ individual experiences.

The therapeutic procedures show positive effects. Mindfulness significantly regulates heart rate as a psychophysiological expression of anxiety and reduces the intensity of craving psychoactive substances at the time it occurs; it also facilitates conscious communication that helps to manage various situations of stress and anxiety that can trigger substance use behavior. Holotropic breathwork helps to cope with traumas that are at the root of some associated dual pathologies, and it favors emotional self-regulation in the face of emotional crises and craving associated with psychoactive substance use.

The potential complementarity of both techniques is proposed for further studies, drawing upon an analysis of family, socioeconomic, and spiritual conditions as factors associated with the problem of psychoactive substance use. The adapted version with a reduced number of sessions for both techniques is a useful contribution to working with the adolescent population in contexts of risk, but the integration times in holotropic breathwork must be better structured and the daily practice of mindfulness systematized.

**Declarations**

**Ethical Approval**

This study was approved by the ethic committee from the research direction of Universidad de Ibagué and Fundación Grupo de Apoyo. The foundation approved informed consents as an institution for the protection of adolescent girls in charge of the restoration of human rights.

We declare that this manuscript has not been published previously, and is not currently being considered for publication in any other journal. We have no conflicts of interest associated with this publication. We confirm that the manuscript has been read and approved for submission and publication by all named authors.

**Competing interests**
The authors state that they have no financial or personal conflicts of interest in this study neither in the publication.

**Authors' contributions**

The three authors participated in all the research cycle, on the design, implementation, data collected, qualitative data analyzed, quantitative data analyzed, writing and reviewed of the manuscript.

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**Availability of data and materials**

All collected data and research materials, not explicitly included in the manuscript, are available for consultation upon formal request to the authors and the research department of the Universidad de Ibagué.

**Acknowledgements**

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**References**


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**Table**

Table 6 is available in the Supplementary Files section.

**Supplementary Files**

This is a list of supplementary files associated with this preprint. Click to download.

- Table6.docx