A preliminary study on the application of Behavioral Activation in the treatment of smoking in women

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ABSTRACT: The present study evaluated the effectiveness of Behavioral Activation (BA) on women smokers with depression and anxiety symptoms who received multi-component treatment for smoking cessation. Forty-nine women were randomly assigned to two groups. 1) experimental: BA and varenicline and 2) control, cognitive behavioral therapy for smoking cessation and varenicline. Both treatments were applied in 10 twice-weekly. The Beck Depression Inventory II, the Beck Anxiety Inventory, the Fagström Test, Smokerlyzer® piCO monitor for carbon monoxide breath tests, and the Behavioral Activation Scale for Depression were used. Project-by-Project Analysis (PPA) was carried out with bivariate logistic regression, including only those who had completed the treatment and follow-ups. In the second, Intention-to-Treat Analysis (ITA) used the Kaplan-Meier non-parametric method and the Log Rank Test for all those initially randomized. The results showed that the abstinence rate with the BA treatment was higher than for the cognitive behavioral treatment for smoking cessation. Furthermore, BA loss was lower than with the standard treatment. We therefore conclude that BA + varenicline was effective from the end of the smoking cessation treatment to the six-month follow-up.

Keywords: multicomponent intervention; varenicline, behavioral activation; smoking, comorbidity.

Un estudio preliminar sobre la aplicación de la activación conductual en el tratamiento del tabaquismo en mujeres.

RESUMEN: El presente estudio evaluó la efectividad de la activación conductual (AC) sobre el consumo de tabaco en mujeres con síntomas de depresión y ansiedad que recibieron tratamiento multi-componente para dejar de fumar. Participaron 49 mujeres asignadas aleatoriamente a dos grupos: 1) experimental, tratamiento de AC y vareniclina y 2) control, tratamiento cognitivo conductual para dejar de fumar y vareniclina. Ambos tratamientos se aplicaron durante 10 sesiones. Se usó el Inventario de Depresión de Beck-II, Inventario de Ansiedad de Beck, el Test de Fagström, el dispositivo marca Smokerlyzer, modelo piCO simple para medir cooximetría exhalada, y la Escala de Activación Conductual para la Depresión. Se analizaron los datos a través de dos métodos. En el primero se utilizó el Análisis Por Proyecto (APP) a través de la Regresión Logística Bivariada, incluyendo solamente a quienes habían culminado el tratamiento y los seguimientos a seis meses. En el segundo método, se usó el Análisis por Intención a Tratar (AIT) utilizando el procedimiento no paramétrico de Kaplan Meier y el Test de Log Rank con todos los que se aleatorizaron inicialmente para el estudio. Los resultados arrojaron que la proporción de abstinencia del tratamiento de AC es superior al tratamiento cognitivo conductual para dejar de fumar. Finalmente, la pérdida de participantes en el grupo de AC fue menor en comparación al tratamiento estándar. Por lo que se concluyó que el grupo que recibió AC y vareniclina, mostró ser efectivo desde el final del tratamiento para dejar de fumar hasta el seguimiento a seis meses.

Palabras clave: intervención multicomponente, vareniclina, activación conductual, tabaquismo, comorbilidad.

Introduction

According to the World Health Organization (WHO, 2019), tobacco use and exposure to smoke are major worldwide public health problems, and one of the main modifiable risks associated with the principal causes of preventable deaths. The Encuesta Nacional de Consumo de Drogas, Alcohol y Tabaco [National Survey of Drugs, Alcohol and Tobacco Use] (ENCODAT, 2016-2017) carried out in Mexico in the population aged 18 to 65, showed that there was a current prevalence of 20.1 million smokers (population about 14 million), of whom 9.8% were women (3,602,000) and 31.3% were men (10,206,000), which is a considerable figure considering the total population. But, in addition, when passive smokers are added to this, the consequences increase alarmingly (Villatoro-Velázquez et al., 2017).

Despite decades of research on the relationship between tobacco, depression and anxiety, knowing that the presence of one increases the probability of the other, abstinence rates continue to be systematically lower for smokers with depression and/or anxiety than for smokers in the general population, highlighting the need to integrate components that address these problems (Mathew et al., 2017).

Therefore, since emotional comorbidity with tobacco impedes successful treatment, psychological interventions would have to be developed that enable the symptomatology to be approached simultaneously, thereby increasing the likelihood of abstinence (Martínez-Vispo et al., 2018).

The main elements dealing with comorbidity were incorporated by proposing effective, cost-efficient strategies which adapt to the needs of the Mexican healthcare system. Behavioral Activation (BA) is one of the most promising of these psychological intervention strategies (Jacobson et al., 1996; Kanter et al., 2010; MacPherson et al., 2010). In addition to being short and parsimonious, BA has a transdiagnostic vision which can focus on the dimensional elements in common in comorbidity instead of categories. This provides a common framework of intervention for smoking, depression and anxiety, which can be a promising complement to the standard abstinence strategies for smokers without depressive and anxiety symptoms (Aldi et al., 2018).

Studies have suggested that women tend to have less favorable long-term treatment results than men, and this has generally been attributed to negative emotional aspects (Chávez-Ayala et al., 2013; Godoy et al., 2016). One of the hypotheses that are consistent with this perspective is that people use tobacco as self-medication for managing negative symptoms of depression and anxiety (Moreno-Coutiño et al., 2015).

Even though men generally smoke more than women (Villatoro-Velázquez et al., 2017), the risk of not quitting is higher among women when these negative emotional states are present, and that would be justification for treatment of women to include emotional aspects.

In this regard, Cooper et al. (2016) carried out a prospective study of 6811 smokers to find out whether depression predicted smoking cessation and whether it was influenced by gender. They concluded that, among women, depressive symptoms ($OR = 0.63$; 95% $CI = 0.49 - 0.81$) and diagnosis of depression ($OR = 0.46$; 95% $CI = 0.34 - 0.63$) negatively predicted abstinence, but not in men. These results were similar to Nakajima, & Al'absi (2012) in women with depression ($OR = 1.05$; 95% $CI = 1.01 - 1.10$) and anxiety ($OR = 1.12$; 95% $CI = 1.02 - 1.22$); to Peiper, & Rodu (2013) ($OR = 1.05$; 95% $CI = 1.02 - 1.34$), in female smokers and depression; and Weinberger, & McKee (2012). demonstrated gender differences in the relationship between negative affect and smoking behavior ($t = 2.26$; $p = .032$; $d = .68$).

Although this is well known, there is little in the literature on treatments addressing comorbid symptoms in smokers (Davoudi et al., 2017).

Behavioral Activation (BA) could contribute to the transdiagnostic approach of depression, anxiety and smoking. In the context of some studies, although oriented toward other mental health-related conditions, and albeit few, BA has been applied to smoking, and there is evidence of its contribution in this context to comorbid symptoms (Ekers et al., 2014; González-Roz et al., 2018; MacPherson et al., 2010; MacPherson et al., 2017; Martínez-Vispo et al., 2019).

Although much of the literature proceeds from high-income countries, experiences in Latin America are even scarcer, so evaluating the effectiveness of BA in the Mexican population would provide new data. BA is a treatment approach that can be applied to groups, and although there is not yet enough evidence that group therapy has better results than with individuals (Stead et al., 2017), it enables more people to be treated, which has many advantages.

In view of the above and in response to suggestions for further research in this regard, the objective of this study was to evaluate the effectiveness of BA on smoking in a group of women with depressive and anxiety symptoms receiving multicomponent treatment to quit smoking.

Method

Participants

The sample included 49 women who attended the National Institute of Respiratory Diseases (INER) Smoking Cessation Clinic in Mexico, 25 in the standard cognitive behavioral treatment and 24 in the BA group.

The selection was made by convenience sampling. Inclusion criteria were women ≥ 18 years old, a depression score over 10 on the Beck Depression Inventory II (González et al., 2015), an anxiety score over 12 on the Beck Anxiety Inventory and signing the informed consent for voluntary participation. Exclusion criteria were a diagnosis of psychiatric disorders other than depression, anxiety or tobacco dependence according to the DSM-IV (Rodríguez et al., 2014), any medical impediment for regular session attendance, currently or in the last three months on medication and/or in psychological therapy to quit smoking, or for depression and/or anxiety management, and current consumption of illegal drugs.

Sample Size calculation

The sample size was calculated using the mean difference formula to compare two groups over time:

$$N = \frac{2 (z\alpha + z\beta)^2 (1 + (n - 1) \rho)}{n [(\mu_1 - \mu_2)/\sigma]^2}$$

N = Total sample size.

$Z\alpha = .05$ (1.96)

$Z\beta = .842$ (statistical power .8)

$\mu_1 - \mu_2/\sigma = .50$ (effect size)

n = minimum number of measurements over time (2)

$\rho = .6$ (repeated measures correlation)

Instruments

The dependent variables were depression, anxiety, abstinence from use and behavioral activation, and were measured in pretreatment, posttreatment and face-to-face monitoring at one, three and six months with the following instruments:

Beck-II Depression Inventory (BDI-II)

The version adapted to the Mexican population by González et al. (2015) was used. Total scores range from 0-63 with the following cutoff points: 0-9, minimal depression; 10-16, mild; 17-28, moderate; and 29-63, severe. The scale has an internal consistency of $\alpha .87$ and a convergent and divergent validity ($rs > .70$).

Beck Anxiety Inventory (BAI)

The version for the Mexican population by Robles, Varela, Jurado, & Páez (2001) was used. The scale has an internal consistency of $\alpha .84$ and $\alpha .83$ and the test-retest reliability coefficient was $r = .75$. Total scores range from 0-63 with the following cutoff points: 0-5, minimum; 6-15, mild; 16-30, moderate; and 31-63, severe.

Behavioral Activation Scale for Depression (BADSD)

The Mexican version by Sánchez, Barraca, Mora, & Reyes (2018) was used. The scale has an internal consistency of $\alpha .89$ and for each of the subscales: activation (7 items; $\alpha = .84$), avoidance/rumination (8 items; $\alpha = .84$), work/school deterioration (5 items; $\alpha = .77$) and social deterioration (5 items; $\alpha = .85$).

Fasgeström test.

The short Mexican version by Moreno-Coutiño, & Villalobos-Gallegos (2017) was used. The scale has an internal consistency of .57 to .66. Levels set are low (0 to 3), moderate (4 to 6) and severe (> 6).

CO exhaled

A score of 6 or less on the Smokerlyzer® piCO monitor was considered current abstinence.

Procedure

The protocol was approved by the Comité Evaluador de Psicología de la Universidad Nacional Autónoma de México [Psychology Evaluation Committee of the National Autonomous University of Mexico], and by the Comité de Ética del Instituto Nacional de Enfermedades Respiratorias [Ethics Committee of the National Institute of Respiratory Diseases] (INER) in 2017 (C55-17). All participants signed their informed consent.

When the protocol had been approved by the Institute's ethics committee, the therapists collaborating in the project were trained, and the project was publicized to recruit patients. Each intervention group was assigned a therapist who had a Ph.D. and was trained in BA for the experimental group and in AIT for the standard group. The participants thus recruited were randomized into two groups by a researcher not involved in the study, using the WinPepi statistics program version 9. The control group received the standard intervention to stop smoking, consisting of cognitive behavioral therapy with emphasis on modifying thoughts to change behavior, in 10 twice-weekly 90-minute sessions + varenicline (see Table 1).

Table 1*Standard Cognitive Behavioral Therapy for Smoking Cessation*

<i>Session</i>	<i>Name</i>	<i>Points worked on</i>
1	Introduction	Smoking addiction theory, mechanisms of action of nicotine, types of dependency and pharmacological treatment.
2	Analysis of reasons for smoking	Analysis of reasons for smoking.
3	Abstinence	Begin pharmacological treatment to quit smoking. symptom withdrawal log passed out for homework.
4	Risk situations Relaxation technique	Analysis of risk situations, strategies for better coping and a relaxation technique.
5	How smoking is harmful to health and benefits of quitting	Scientific information on how smoking is harmful to health.
6	Cognitive restructuring	Thoughts, emotions and behaviors related to abstinence.
7	Training in problems solving and advertising	Training in problem-solving.
8	Nutrition and tobacco	Scientific information on the metabolic changes associated with abstinence and different choices in eating.
9	Relapse prevention	Relapse and related situations.
10	Preparation for maintenance. Closing	Analysis of progress made in the treatment and the strategies learned.

The experimental group received BA intervention, consisting of 10 twice-weekly 90-minute sessions, emphasizing planning and monitoring activities incompatible with smoking which serve as reinforcement and are valuable in the person's life + varenicline (see Table 2).

Table 2*Behavioral Activation Treatment for smoking*

<i>Session</i>	<i>Name</i>	<i>Aspect to work</i>
1	Introduction	Functional analysis of behavior, according to the Behavioral Activation Model by Martell et al. (2010).
2	Smoking and emotions	Analysis of the relationship between smoking and emotions. Preparation for withdrawal.
3	Situations of risk and behavioral activation	Analysis of risk situations and programming of activities incompatible with smoking.
4	Behavioral activation as an action plan	Monitoring of scheduled activities and planning new activities.
5	Behavioral activation as an action plan	Monitoring of scheduled activities and planning new activities.
6	Behavioral activation as an action plan	Monitoring of scheduled activities and planning new activities.
7	Behavioral activation as an action plan	Monitoring of scheduled activities and planning new activities.
8	Behavioral activation as an action plan	Monitoring of scheduled activities and planning new activities.

9	Behavioral activation as an action plan	Monitoring of scheduled activities and planning new activities.
10	Relapse prevention and end of therapy.	Future risk situations Action plans.

The treatment was applied by therapists with a Ph.D. trained in each approach using the Sansores et al, (1998) for the standard treatment, and the BA intervention adapted to smoking by Sánchez, Barraca, Mora, & Reyes (2020).

During the admission assessment, in a semi-structured interview, participants were given information related to smoking, and completed depression, anxiety and behavioral activation measures. After about a one-month waiting period, the participants began the smoking cessation program according to the group assigned to them.

The varenicline dose in both groups was one .5 mg tablet in the morning for three days, from the fourth to the seventh day, one .5-mg tablet twice a day (morning and night), and from the eighth day to three months, 1 mg twice a day (morning and night), supervised by a clinician who did not participate in the study, and the participant selection process was from August 2017 to December 2018 (see Figure 1).

Figure 1

Participant selection process

Data Analysis

For primary analyses, the group abstinence prevalence rates were compared using two types of analyses. The first was a Project-by-Project Analysis (PBP) with a Bivariate Logistic Regression

Model to predict abstinence based on the type of treatment, with P -value less than .05 ($p < .05$), using the WinPepi statistics program version 9. Only those who completed the intervention and attended the follow-up at one, three or six months were included. The second was Intention-to-Treat Analysis (ITT), which included all the patients who were initially assigned to the groups. For the ITT, the Kaplan-Meier non-parametric method was used to assess the probability of withdrawal and compare by treatment. Log Rank was used to verify whether the change in withdrawal was due to the type of treatment, with significance level less than .05 ($p < .05$), using the Statistical Package for Social Sciences, version 25.

For the secondary analyses, the Student's t -test for independent samples was used to compare the BAI, BDI and BADS pretreatment averages between the treatment groups.

Finally, the Bivariate Repeated Measures Analysis was used to assess the change from pretreatment to follow-up at six months, in the BDI, BAI, and BADS scores in the group that received BA. The Bonferroni adjustment was used to find any differences between measurements.

Results

Baseline clinical characteristics

Of the 49 participants who started, only 40 (81.6%) accepted varenicline as a smoking cessation drug. Of these 40, 17 were in the BA group and 23 in the standard treatment group. Those who started pharmacological treatment completed three months on varenicline. This was verified during each follow-up session.

Secondly, a Student's t -test for independent samples was used and the homogeneity between groups was determined in pretreatment (see Table 3).

Table 3

Difference in the mean at baseline and clinical characteristics between the BA and standard treatment groups

	Minimum	Maximum	StD Group ($n = 25$) $\bar{x}$ (SD)	BC Group ($n = 24$) $\bar{x}$ (SD)	Student's t	df	p	d
Age	29	69	47.92 (10.39)	51.58 (11.59)	-1.116	47	.250	.39
Dependence	0	10	4.76 (2.78)	5.71 (2.49)	-1.253	47	.216	.35
Years Smoking	1	50	28.32 (11.06)	33.71 (11.36)	-1.681	47	.099	.48
Cigarettes per day	5	40	13.64 (7.67)	12 (7.48)	.757	47	.453	.21
Attempts to quit smoking	.00	6.00	1.16 (.65)	1.29 (.72)	-.429	47	.670	.18
Exhaled CO pretreatment	4	50	17.12 (11.45)	15.96 (6.98)	.426	47	.672	.12
BDI	9	33	19.20 (6.38)	19.96 (5.20)	-.455	47	.651	.13
BAI	3	54	21.76 (7.99)	23.75 (12.92)	-.651	47	.518	.18
BADS	16	155	84.04 (24.65)	82.13 (25.09)	.269	47	.789	.07

Note: StD = Standard Treatment; BA = Behavioral Activation; $\bar{x}$ = mean; SD = Standard deviation

Estimation of the group abstinence rate by ITT and PBP

The relationship between the type of treatment and the occurrence of abstinence was calculated by Log Rank Chi-square. Of the 49 participants, 59.2% were abstinent at the six-month follow-up, the majority of whom were in the group that received BA treatment (66.7%), while most of those who were still smoking at the six-month follow-up were those who had received the standard treatment (52%).

The Log Rank test showed that treatment type influenced the occurrence of withdrawal ($\chi^2 = 5.300$; $p = .021$), which lasted longer in the behavioral activation group ($\bar{x} = 180$) than in the standard treatment group ($\bar{x} = 152$), effect size ($r = .67$).

Results of the PBP showed that in the post-treatment measurement, the group that received BA had a higher probability of abstinence than the standard treatment group (OR of 16 [95% CI 4.1-63, $p < .001$]). The same occurred at one month (OR of 26 [95% CI 6-118, $p < .001$]) and at three months of follow-up (OR of 7 [95% CI 1.4-34, $p = .018$]). However, the effect at six months lost statistical value (OR 4.3 [95% CI 0.32-57, $p = .27$]).

When the effect of treatment was measured with covariates such as age, depression and anxiety history, and nicotine dependence level, the same effect was observed for the BA group at the end of treatment (OR of 21 [95% CI 6.3 -68, $p < .001$]), at one-month (OR 34 [95% CI 9-133, $p < .001$]) and three-month follow-up (OR 9.6 [95% CI 2-45, $p = .004$]), but at six months, the OR also lost statistical significance (OR 5.4 [95% CI 0.45-66, $p = .18$]).

Secondary variables

The Student's t -test for independent samples was used to evaluate the between-group differences in the BDI, BAI and BADS scores from the pretreatment to the six-month follow-up, showing that there was only a difference in the BDI scores at six months ($t = 3.60$; $p = .003$; $d = 1.64$) and in the BADS at three months ($t = -2.418$; $p = .025$; $d = .42$), but not in the rest of the measurements. The averages indicated that the standard group had higher BDI scores ($\bar{x} = 14.25$) and lower BADS scores at six months ($\bar{x} = 81.83$), than the BA group, ($\bar{x} = 7.42$) and ($\bar{x} = 99.75$), respectively.

The Student's t -test for independent samples was used to find out whether there was a difference in these scores between those who achieved abstinence at six months (59.2%) and those who did not (40.8%). The data indicated a difference only in BDI scores at six months ($t = -2.89$; $p = .012$; $d = .58$), in BAI at six months ($t = -3.25$; $p = .006$; $d = .41$), and on the BADS at three months ($t = 2.10$; $p = .048$, $d = .61$), but not in the rest of the measurements. In addition, those who achieved abstinence had lower scores on the BDI ($\bar{x} = 5.75$) and BAI at six months ($\bar{x} = 6.25$), and higher on the BADS ($\bar{x} = 102.77$), than those who did not stop smoking, whose average was ($\bar{x} = 12.50$), ($\bar{x} = 19$) and ($\bar{x} = 83.44$) respectively.

Since the BA group had lower BDI scores and higher BADS scores at six months, the change in these variables from pretreatment to six months was evaluated, using the Linear Model of Repeated Measures. All the variables fulfilled the assumption of homogeneity of variance ($p > .05$). The Fisher value indicated the difference and reduction in BDI averages from pretreatment to the six-month follow-up ($F = 10.126$; $p = .005$). According to the Eta², 85.6% of BDI scores depended on treatment.

The Bonferroni Test (BSD) found differences between pretreatment and posttreatment (BSD = 8.364; $p = .034$), pretreatment and follow-up at one month (BSD = -10.273; $p = .012$), pretreatment

and the third month of follow-up ($BSD = -7.63$; $p = .032$), and pretreatment and follow-up at six months ($BSD = -11.091$; $p = .000$). The decreasing trend in BDI scores was linear ($F = 30.16$; $p = .000$) with reduction in averages.

The BAI average scores indicate a reduction and a difference between measurements ($F = 6.606$; $p = .016$). As in the BDI, the η^2 shows that 79.1% of the response of the variable depends on treatment. The only difference found was between the pretreatment and the one-month follow-up ($BSD = 13.455$; $p = .039$) and the trend shows a linear reduction in scores ($F = 8.93$; $p = .014$).

Finally, no significant differences in the BADS means ($F = 3.83$; $p = .059$) were observed from the beginning of treatment to the six-month follow-up, although there was a trend of linear increase in the scores ($F = 5.763$; $p = .037$).

Summarizing, the data show that BA therapy is effective for the treatment of women who attend smoking cessation treatment and is even comparable to standard treatment and has a higher abstinence rate and lower percentage of loss at six months, compared to the standard group. As secondary results, it was observed that those who stopped smoking showed lower scores on the BDI and BAI, and higher on the BADS than those who did not quit smoking. Those who received the BA treatment showed the best results.

Discussion

The objective of this study was to evaluate the effectiveness of behavioral activation on smoking in a group of women smokers with depressive and anxiety symptoms receiving multicomponent treatment to stop smoking. The four main findings were: First, BA with varenicline was more effective in terms of withdrawal outcomes up to six months than standard treatment with varenicline, according to the ITT, and comparable according to the PBP. Second, the presence of depressive symptoms decreased significantly up to the six-month follow-up in the BA group. Third, participants who achieved the most days of continuous withdrawal at each measurement time, had fewer depressive symptoms than those with fewer days of continuous withdrawal at that point, and fourth, BDI-II scores decreased at six months, while BADS scores increased, and this change was greater among those who had quit smoking.

In general, the findings of this study indicate that either BA as a single strategy or as a component of standard treatment could be useful for treating women with depression and anxiety for smoking in Mexico, because it resulted in higher probability of abstinence from point prevalence, lower dropout and more days of continuous abstinence from smoking at six-month follow-up.

The results expand the evidence from previous studies of BA treatment in smokers with depressive symptoms in comorbidity with anxiety symptoms (Hopko et al., 2016; Leventhal, y Zvolensky, 2015; Reynolds et al., 2011; Soleimani et al., 2015). Even though BA was not developed for smoking treatment per se, it can be a critical addition to treatment planning for cigarette smokers with concomitant depressive and anxiety symptoms.

It even agrees with Martínez-Vispo et al. (2018), who found that the results of their systematic review suggested that BA can help improve substance use abstinence and depressive symptoms, but that further research is needed to support its effectiveness.

This study also agrees with the systematic review carried out by Patnode et al. (2015), in which behavioral interventions combined with medication to stop smoking improved tobacco cessation rates in the general adult population up to 82% compared to minimal intervention or the usual intervention ($RR, 1, 82$ [IC, 1.66 to 2.00]). In addition, Stead et al. (2016) conducted a systematic review to assess the effect of combining behavioral support and medication to aid smoking cessation, compared to a minimal intervention or usual care, and to identify whether there are different effects

depending on characteristics of the treatment setting, intervention, population treated, or take-up of treatment, and concluded that combine pharmacotherapy and behavioral support increase smoking cessation (RR , 3.88, 95% [CI 3.35 to 4.50]), results similar to Rovina et al. (2009) (OR = 0.573, 95%, CI = 0.221 - 1.487).

In agreement with the results of this research, some studies have also concluded that BA significantly reduces comorbid symptoms between smoking and emotional symptoms (MacPherson et al., 2017), while on the contrary, other studies, such as Busch et al. (2017) and González-Roz et al. (2018), found no significant difference between BA and the standard treatment for smoking cessation. It even appeared that BA had better results for substance use than for depression compared to a control condition, so withdrawal after treatment or during the follow-up period may have an impact on depression symptoms and not be due to the treatment itself (Iudicello et al., 2010; Mathew et al., 2013).

This contradiction in results may be due to the difference in tobacco dependence and depression severity levels. While in previous studies it was moderate to severe, in this study, although dependence was moderate to severe, symptomatology was mild to severe.

Despite the differences in the results of research on BA, and although more research is required to expand the evidence on the effect of BA in the treatment of women for smoking addiction, the findings of this study suggest that it could benefit women who have concomitant depressive and anxiety symptoms. However, this is an initial approach that requires further evidence of its scope, and to generalize these results, the effect of BA on sustained abstinence would have to be evaluated without the use of smoking cessation medication, since varenicline could have affected the results.

According to Secades-Villa et al. (2015), depressive symptoms can increase the probability of a tenacious smoking habit and decrease the smoking cessation rate due to various mechanisms. The participants with depressive symptoms may be smoking to alleviate negative mood symptoms, and although it is possible that this may be happening given the preliminary research data, it is a point that would still have to be confirmed in this research.

Therefore, as BA makes it possible to address the variables that harm the success of a smoking cessation treatment, such as depression and anxiety symptoms, it may have a positive effect in the treatment, and be more advantageous than standard treatments, which would indirectly prevent relapse.

Limitations

Based on the preliminary results, the limitations of the study should be taken into account. The sample size is small and may not have sufficient statistical power. Different therapists should also be able to participate in both group conditions, so that the therapeutic style is not a variable influencing the results. Men with anxiety/depressive symptoms should be included in the sample as well to see if the results differ by sex. Furthermore, it is important for other clinical symptom verification measures to be used and not just self-report questionnaires. And finally, it should be possible to observe the effect of the intervention on participants who did not take any type of medication for smoking cessation or concomitant symptoms during the study.

Conclusions

Although more research is needed to support the effectiveness of BA in treating smoking and concomitant depressive and anxious symptoms, these findings showed promising data. Future studies are required to investigate the mechanisms of BA action that could not be elucidated here, as well as any possible moderating variables that may have an impact on the results of depression and anxiety.

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