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Effects of auriculotherapy on anxiety, stress and insomnia in female smokers and non-smokers

Efeitos da auriculoterapia sobre ansiedade, estresse e insônia em mulheres tabagistas e não tabagistas

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ABSTRACT
To investigate the effects of an auriculotherapy protocol on anxiety, stress, and insomnia in female smokers and nonsmokers. This is a quasi-experimental, open-label, two-arm, pre- and post-test study carried out in a city in the interior of the Brazilian Midwest, from June to August 2022. The study included interviews and 12 sessions of auriculotherapy with mustard seeds with participants in the experimental and control groups. The definition of the points followed the standard National Acupuncture Detoxifucation Association (NADA) protocol. Five instruments were used: a structured script, BAI, ISSL, Pittsburgh Scale, and Fagerstrom test. Auriculotherapy contributed to the reduction of anxiety, stress, and sleep quality in both groups. In the experimental group, for anxiety ($p = 0.024$) and stress ($p = 0.027$), it was significant in the eighth session and sleep in the twelfth ($p = 0.046$). The possibility of using auriculotherapy with the NADA protocol was verified with female smokers and non-smokers in significantly improving levels of anxiety, stress and insomnia.

Keywords: Complementary Therapies. Mental Health. Tobacco Use Disorder.

RESUMO
Investigar os efeitos de um protocolo de auriculoterapia sobre a ansiedade, estresse e insônia em mulheres tabagistas e não tabagistas. Estudo quase experimental, aberto, com dois braços, pré e pós-teste, realizado em município no interior do Centro-Oeste brasileiro, no período de junho a agosto de 2022. O estudo possuiu entrevista e realização de 12 sessões de auriculoterapia com sementes de mostarda junto às participantes dos grupos experimental e controle. A definição dos pontos, seguiu-se o protocolo padrão *National Acupuncture Detoxifucation Association* (NADA). Utilizou-se cinco instrumentos, roteiro estruturado, BAI, ISSL, Escala de Pittsburgh e teste de Fagerstrom. A auriculoterapia contribuiu para a redução da ansiedade, estresse e qualidade de sono em ambos os grupos. No grupo experimental, para ansiedade ($p=0,024$) e estresse ($p=0,027$) sendo significativo na oitava sessão e o sono na décima segunda ($p=0,046$). Verificou-se a possibilidade de utilização da auriculoterapia com o protocolo NADA junto a mulheres tabagistas e não tabagistas na melhora significativa dos níveis de ansiedade, estresse e insônia.

Palavras-Chave: Terapias Complementares. Saúde Mental. Tabagismo.

INTRODUCTION

Smoking is an avoidable chronic disease that causes severe and progressive harm to health. There are approximately 1.1 billion smokers in the world, a habit which causes 8 million deaths per year[2]. In Brazil, from 2006 to 2019, 9.8% of the adult population were smokers[3].

In the last few years, a growing number of people has been searching for treatments for smoking cessation, especially women[4]. One of the reasons for this is the damage and repercussions of smoking in their lives. These include factors such as judgment, marginalization, violence, and loss, and is closely related to other personal characteristics, such as having other dependences[5], being single, the provider, the only responsible for child and home care[6], and sedentary behavior[7]. There are also cultural specificities regarding health care, since women search and attend health services more often than men and, thus, have more knowledge about risks and diseases associated with the use of tobacco[8].

Women also have a large probability of having mood disorders, which, coupled with their life contexts, can lead them to smoking, if this habit is understood as a way to relieve anxiety, stress, and other personal demands[9]. Tobacco is often a type of self-medication for daily problems, especially emotional ones[10]. However, tobacco can increase the intensity of these disturbances and negative feelings[11].

Many campaigns aim to minimize the use and the effects of smoking — using, for example, actions related to the 31st of May, considered to be the World No Tobacco Day by the World Health Organization (WHO) since 1987, year in which the Framework Convention on Tobacco Control (FCTC/WHO), formed by 181 countries, was conducted. Its goals were to monitor and enhance policies for prevention, and support against smoking; to increase taxation over tobacco; and surveil and regulate advertisements of this type of product[2].

In Brazil, since 1986, the National Program for the Control of Smoking (PNCT) has supported and fostered new social behavior regarding smoking, while providing resources to help smokers quit this habit. Nonetheless, not all Brazilian municipalities carry out a decentralized version of these activities[12], and thus, some participants abandon the treatment[13].

Thus, due to a lack of interest/willingness in starting the treatments available in health services to stop or reduce smoking, or even due to lack of knowledge about the PNCT, the population seldom searches for this type of care[14]. In this regard, integrative and complementary health practices (PICS) have been gaining space, since, in addition to enhancing conventional mental health treatment[15], they go to the individual in the context of their own lives, holistically generating the balance they need to reorganize their roles[16]. One of these PICS is auriculotherapy, the practice of using specific stimuli in the auricle to minimize pathological conditions related with tobacco consumption[17] by treating physical and mental disorders[18].

Some national and international studies demonstrated that auriculotherapy had a positive impact on anxiety and stress in adults and older people[19] and in prison guards[20]; on insomnia in women with chronic pathologies[21] and in Hispanic immigrants[22]. However, no literature has been produced that shows whether auriculotherapy, as an exclusive protocol of treatment for nicotine dependence in women, has any beneficial effects on anxiety, stress, and insomnia. As a result, this study aimed to investigate the effects of an auriculotherapy protocol on the anxiety, stress, and insomnia of female smokers and non-smokers.

METHODOLOGY

This is an open quasi-experimental study, with two branches: a pre- and a post-test. It was conducted in a small municipality in the Brazilian Midwest, from June to August 2022. This town was chosen as it does not have specialized mental health services, nor does it have, *in loco*, a complete psychosocial network. This study followed the guidelines of the Standards for Reporting Interventions in Clinical Trials of Acupuncture (STRICTA).

The control group (CG) included: women from 18 to 59 years old, with a score of 0 in the Fagerström Test (no nicotine dependence). Were excluded from the CG women from the

same family (first to third degree); who use psychotropic medication (anxiolytics, antipsychotics, antidepressants, mood stabilizers, anticonvulsants, antiparkinsonians, and antidementia drugs) or used them in the last 12 months; women with any type of ear deformation (edema, malformation, or a history of injuries to the auricle); and women who were in abstinence from tobacco (regardless of the period/time of cessation).

The experimental group (EG) included women from 18 to 59 years old; who had been smoking for at least five years; smoked more than 10 cigarettes/day[22]; and scored ≥ 5 on the Fagerström Test (medium or greater dependence). Were excluded from the EG women from the same family (first to third degree); who used psychotropic medication (anxiolytics, antipsychotics, antidepressants, mood stabilizers, anticonvulsants, antiparkinsonians, and antidementia drugs) or had used it in the last 12 months; women with some type of ear deformation (edema, malformation, or a history of injury to the auricle); as well as those who, at some point, had undergone any form of anti-smoking treatment.

Participants were recruited from the only Central Health Unit in town, a Family Health Strategy (ESF) unit that was the reference for all therapeutic groups there. The main researcher, in touch with the nurse who was responsible for the unit, gathered data about women who searched the health service to participate in groups or educational activities provided there, in the field of mental health or not, in the 30 days before their contact. The list had names, addresses, and telephone numbers of 35 women. Census sampling was used, with a sample size calculated according to the total number of participants who were recommended for groups to treat smoking in the Single Health System (15 smokers per group at most)[23]. The main researcher got in touch with all women and, after checking for inclusion and exclusion criteria, 19 were invited, and distributed in a CG (n=11) and an EG (n=8). The study included interviews and auriculotherapy in both groups. The interviews and auriculotherapy sessions took place in the office of a physical therapy clinic, ensuring participants' comfort, privacy, and confidentiality.

Five instruments were used. The first was a structured script, elaborated by study researchers with closed questions that addressed sociodemographic, clinical, and lifestyle aspects. This script was tested one month before the study started, with a similar population which was not part of the study sample. The second instrument was Beck's Anxiety Inventory (BAI), created by Aaron Beck et al., and adapted and validated in Brazil by Cunha. The BAI has 21 questions to ascertain how the patient felt in the previous week. The scoring system gives 0 points for "not at all - did not bother me", 1 point for "mildly - did not bother me much", 1 for "moderate - it bothered me, but I could endure it", and 3 points for "severe - I almost could not bear it". At the end, anxiety levels can be classified as minimal (0 to 10), mild (11 to 19), moderate (20 to 30), or severe (31 to 63).

The third instrument used was the Pittsburgh Sleep Quality Index (PSQI), created by Buysse et al. to evaluate the quality of sleep in the previous month and translated and validated in Brazil by Bertolazi et al. This instrument has 19 questions, with a score that varies from 0 to 21. A score higher than 5 suggests a bad sleep quality pattern.

The fourth test used was Fagerström 's Test. Created by Karl Fagerström, this instrument analyzes the degree to which one is dependent on nicotine. The instrument has only six questions, with Likert-type responses. The first and fourth questions can receive scores from 0 to 3; questions 2, 3, 5, and 6 can score 0 or 1. The result can be very low (0 to 2), low (3 to 4), medium (5), high (6 to 7), or very high (8 to 10).

The fifth instrument used was the Lipp Adult Stress Symptom Inventory, standardized by Lipp and Guevara. It comprises 37 somatic items and 19 psychological ones, with three frames referring to four stages of stress (alertness, resistance, near exhaustion, and exhaustion). The first block includes 12 physical symptoms and 3 psychological ones, which refer to the first stage of stress (alertness). The respondent is requiring to sign any symptom they experienced in the last 24 hours. The second block includes 10 physical symptoms and 5 psychological ones, which should be marked if experienced during the previous week. This is used to evaluate phases II

and III of stress. The third block includes 12 physical symptoms and 11 psychological ones. Respondents indicate whether they experienced these symptoms during the previous month, so the third phase of stress can be evaluated. After all answers are given and calculated, the stress levels of the patient can be ascertained.

Regarding the interventions, 12 auriculotherapy sessions were applied for each participant from both groups, one every seven days. The instruments and the auriculotherapy sessions were both applied by the main researcher, which is a professional specialized in auricular acupuncture, which is based on Traditional Chinese Medicine (TCM). At the beginning of the procedure, participants were guided about the potential discomfort at the time of application and during the week. The auricle was sanitized using alcohol 70%, and the points were located manually, using a stainless-steel touch probe. The acupuncture points were determined according to the standard protocol of the National Acupuncture Detoxification Association (NADA), which recommends using the following: *Shenmen*, Sympathetic Kidney, Liver, and Upper and Lower Lung. The study protocol started with an application in the right auricle, alternating in each session. Materials used included mustard seeds with adhesives. Patients were advised to stimulate the point three times a day; not to use friction when drying the auricle with a towel after bathing, but drying with a cotton swab, preferably, and not on top of the points. These recommendations were repeated every session.

Seeds were removed every session, only by the researcher responsible for carrying out the auriculotherapy. If any seed were to fall off between sessions or there were cases of intense pain and/or uncontrollable itching, the participant should immediately let the researcher know (via WhatsApp or telephone call, in the same day and at the time this was noticed), so the researcher could go to the place where the participant is, evaluate the auricle, and replace the seed. However, this did not happen throughout the study.

As Figure 1 shows, after every four auriculotherapy sessions, four instruments were applied to the EG (BAI, ISSL, Pittsburgh Scale, and Fagerström Test), while three were applied to the CG (Bai, ISSL, and Pittsburgh Scale). The sessions in which the instruments were not applied lasted for approximately 15 minutes, while the others lasted for about 50 minutes. If a participant from any group did not go to a pre-scheduled session and did not answer two attempts of contact via telephone call, her participation would be discontinued.

Data was inserted and organized in Microsoft Excel 2013 spreadsheets via double input. Then, the results were compared, and the database was verified. After this stage, data was imported into the software SPSS version 20.0. Shapiro-Wilk's test was applied to numerical variables, showing that data had a non-parametric distribution. To compare the mean found in each of the four interventions (EG and CG), we used Wilcoxon's test, adopting a significance level below 0.05.

This study respected all ethical aspects of research with human beings, according with resolution 466/2012 from the National Council of Health (CNS). It was approved by the Research Ethics Committee for Research with Human Beings (CEP), at the Universidade do Estado de Mato Grosso, under CAAE: 28214720.9.0000.5166 and opinion 3.903.714. All participants read, accepted, and signed the Informed Consent Form.

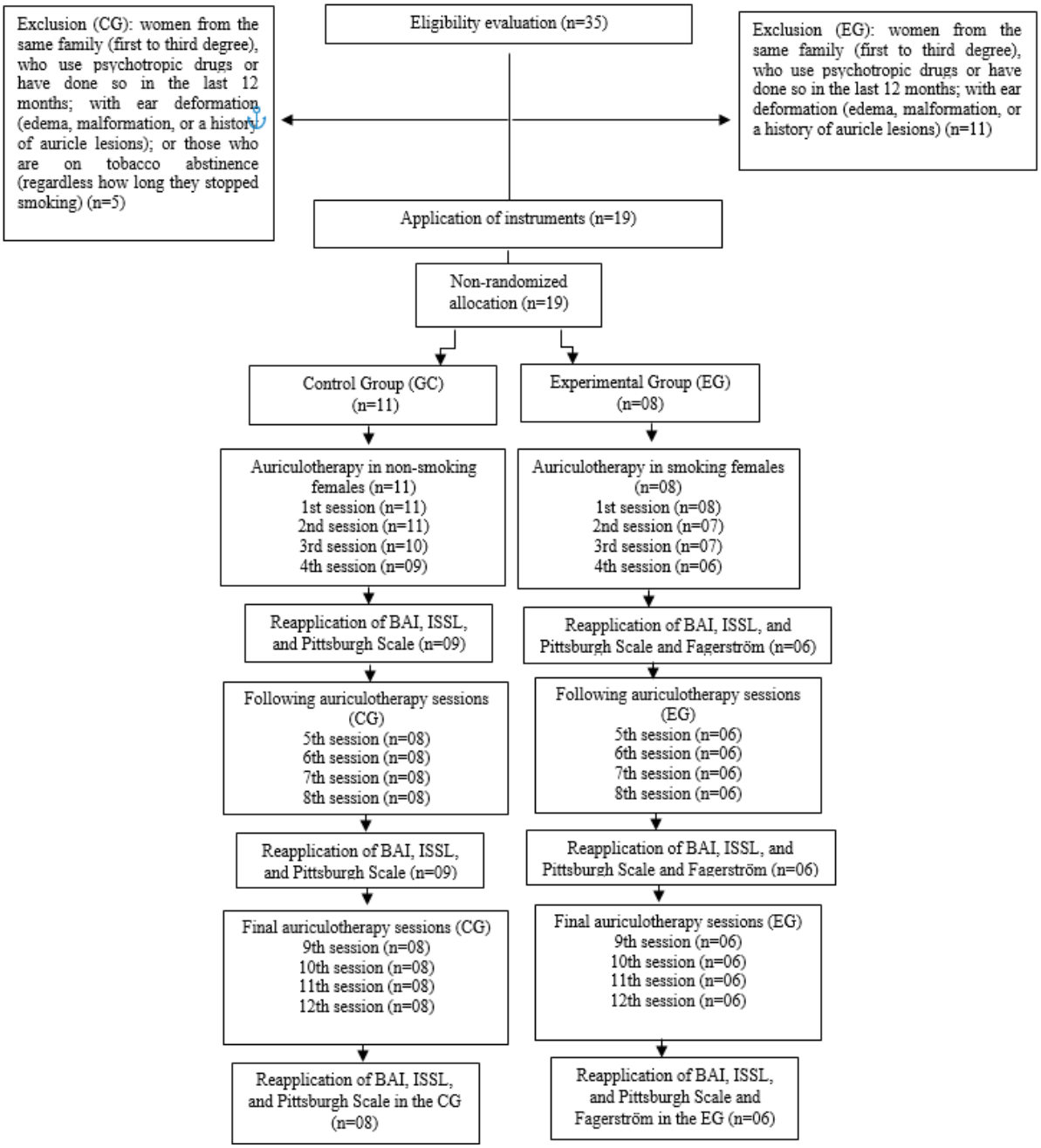

Figure 1. Flowchart of the participants involved in the study, according to the CONSORT. Mato Grosso, Brazil, 2022.

RESULTS

Regarding the sociodemographic characteristics of the participants, most were from 41 to 55 years old (71.4%), self-declared as non-white (64.3%), had higher education (50.0%), were married/in a stable union (57.1%), had a family income from one to three minimum wages (50.0%), and had a religion (92.9%). Regarding aspects of their lives, most were women who took part in leisure activities (57.1%), did physical activities in their routine (50.0%), slept from four to eight hours a day (71.4%), and reported having insomnia in the last week (50.0%). 78.6% have a family history of using tobacco and/or its derivatives.

Table 1. Characterization of study participants. Mato Grosso, Brazil.

Variables	Total	Smokers (*n*=6)	Non-smokers (*n*=8)
Age	**N(%)**	**N(%)**	**N(%)**
26 to 40 years old	4 (28.6)	-	4 (50.0)
41 to 55 years old	10 (71.4)	6 (100.0)	4 (50.0)
Skin color			
White	5 (35.7)	1 (16.7)	4 (50.0)
Non-white	9 (64.3)	5 (83.3)	4 (50.0)
Marital status			
Single	5 (35.7)	3 (50.0)	2 (25.0)
Married/stable union	8 (57.1)	2 (33.3)	6 (75.0)
Separated or divorced	1 (7.1)	1 (16.7)	-
Monthly family income			
< 1 minimum wage	5 (35.7)	3 (50.0)	2 (25.0)
1 to 3 minimum wages	7 (50.0)	2 (33.3)	5 (62.5)
> 3 minimum wages	2 (14.3)	1 (16.7)	1 (12.5)
Educational level (complete and incomplete)			
Illiterate	1 (7.1)	1 (16.7)	-
Elementary school	1 (7.1)	1 (16.7)	-
High school	5 (35.7)	1 (16.7)	4 (50.0)
Higher education	7 (50.0)	3 (50.0)	4 (50.0)
Follows a religion			
Yes	13 (92.9)	5 (83.3)	8 (100.0)
No	1 (7.1)	1 (16.7)	-
Hours of sleep per day			
2-4h	2 (14.3)	-	2 (25.0)
4-8h	10 (71.4)	4 (66.7)	6 (75.0)
8-12h	2 (14.3)	2 (33.3)	-
Insomnia			
Yes	7 (50.0)	4 (66.7)	3 (37.5)
No	7 (50.0)	2 (33.3)	5 (62.5)
Leisure activities			
Yes	8 (57.1)	4 (66.7)	4 (50.0)
No	6 (42.9)	2 (33.3)	4 (50.0)
Physical activities			
Yes	7 (50.0)	2 (33.3)	5 (62.5)
No	7 (50.0)	4 (66.7)	3 (37.5)
Family history of tobacco use			
Yes	11 (78.6)	6 (100.0)	5 (62.5)
No	3 (21.4)	-	3 (37.5)

In this study, the auriculotherapy was applied to female smokers and non-smokers. There were no reports of adverse effects. Non-smokers presented a higher mean anxiety score (27.63) than smokers (20.67) (Table 2).

Table 2. Data on anxiety, stress, noneffective sleep, and nicotine dependence among participants. Mato Grosso, Brazil.

Variable	Smoker			NON-SMOKERS		
	Mean ± SD	Time	*p-value*	Mean ± SD	Time	*p-value*
Anxiety						
T0 (1st session)	20.67 (8.733)			27.63 (13.575)		
T1 (4th session)	19.00 (8.832)	T0 x T1	0.063	20.63 (13.938)	T0 x T1	0.018
T2 (8th session)	16.67 (8.618)	T0 x T2	0.024	17.50 (13.342)	T0 x T2	0.011
T3 (12th session)	13.83 (7.731)	T0 x T3	0.026	15.00 (12.490)	T0 x T3	0.011
Stress						
T0 (1st session)	5.67 (2.251)			7.75 (3.655)		
T1 (4th session)	4.83 (3.061)	T0 x T1	0.343	5.38 (2.560)	T0 x T1	0.016
T2 (8th session)	1.83 (2.994)	T0 x T2	0.027	2.75 (2.315)	T0 x T2	0.018
T3 (12th session)	0.67 (1.633)	T0 x T3	0.026	1.13 (2.100)	T0 x T3	0.018
Noneffective sleep						
T0 (1st session)	9.17 (4.535)			8.63 (4.534)		
T1 (4th session)	8.67 (2.160)	T0 x T1	0.498	7.13 (2.642)	T0 x T1	0.066
T2 (8th session)	6.50 (2.588)	T0 x T2	0.072	5.50 (2.138)	T0 x T2	0.018
T3 (12th session)	4.33 (1.033)	T0 x T3	0.046	4.50 (1.604)	T0 x T3	0.018
Nicotine dependence						
T0 (1st session)	7.33 (1.211)					
T1 (4th session)	6.33 (1.211)	T0 x T1	0.034	---	---	---
T2 (8th session)	5.67 (0.816)	T0 x T2	0.023	---	---	---
T3 (12th session)	4.50 (0.548)	T0 x T3	0.026	---	---	---

The auriculotherapy contributed to reducing anxiety in both groups. Non-smokers had a significant increase in anxiety symptoms in the fourth intervention session (p=0.018), while smokers' anxiety only decreased in the eighth session (p=0.024). Auriculotherapy showed better results in smokers as sessions advanced. Non-smokers saw an improvement in their anxiety since the beginning of the program.

Regarding stress, the intervention applied helped reduce the symptoms in both groups. Among non-smokers, a reduction in the level of this symptom was observed after the 4th session (p=0.016). Among smokers, similarly to what happened regarding anxiety, more sessions were necessary to reduce stress levels, which was only achieved in the eighth auriculotherapy session (p=0.027).

Participants in both groups reported improved sleep, especially T2 for the CG and in (p=0.018) T3 for the EG (p=0.046), when compared to the initial stage. The intervention showed even more beneficial results throughout the program, showing that the higher the number of sessions, the better the results in both smokers and non-smokers (T3: EG: p=0.046, CG: p=0.018). The auriculotherapy intervention program also had an impact in reducing nicotine dependence in the fourth session (p=0.034). The reduction increased significantly as the number of sessions advanced, which can be noticed when T0 is compared to T3 (p=0.026).

DISCUSSION

This study evaluated the effects of auriculotherapy on the anxiety, stress, and insomnia of female smokers or non-smokers. Anxiety, as well known, is a quite common disorder in adults, especially women[24], and even more in female smokers[25]. They are part of the

group who seeks this type of care the least[26], but after they start treatment for smoking, they see other perspectives of life and health, as this harmful habit is replaced[8].

Non-smoking women saw improvements in their anxiety levels before smokers did, reflecting, among other elements, the abstinence caused by a reduction in the use of tobacco, a feeling that potentiates anxiety[27]. Therefore, women with no tobacco dependence can receive the benefits of this therapeutic practice faster, as their gaseous exchanges and peripheral oxygen saturation levels are better[28]. They also have lower levels of exhaled carbon monoxide (COex) and cabooxyhemoglobin[29], two conditions that have a positive connection with the reduction and control of anxiety with auriculotherapy[30].

A bibliographic review of studies from Brazil, Iran, Spain, Germany, and the United States, mostly involving nursing students or professionals, applied auriculotherapy for anxiety disorders using protocols that were similar to ours (10 to 12 sessions). They used the points *Shenmen*, Kidney, and Liver, seeing a gradual improvement of symptoms. Results, on average, were felt from the eighth session on[31]. Other studies about anxiety control using auriculotherapy used at least one of the acupuncture points of the NADA protocol (used in the present study). The most common was *Shenmnen*[32], Upper and Lower Lung[33], Sympathetic[34] Kidney and Liver[35].

On the other hand, non-chronic anxiety conditions, such as feelings before procedures or interventions, do not require several auriculotherapy sessions. Pressure in acupuncture points in the minutes before clinical interventions are enough for this type of control[36], which is not true for the common anxiety disorder in smokers.

Smokers often suffer with high blood pressure, which is strictly related with anxiety[37]. Thus, auriculotherapy protocols that seek to reduce anxiety should also consider predisposing factors and how they interfere in treatment time and in the advice that must be passed forward, since extending treatment (number of sessions) without clarifying its goals not only causes people to abandon the treatment and question its therapeutic efficacy, but can, in some cases, act as a force against anxiety reduction[38].

Stress showed a similar result to that of anxiety symptoms regarding the number of auriculotherapy sessions needed to show positive effects in both groups. Evidence suggests that most smokers, in addition to the emotional stress that causes physical reactions in them, are affected by the oxidative stress caused by smoking, which leads to imbalance in the defense systems of the body[39]. This characteristic, in the female gender, shows some specificities regarding smoking treatment, with stress being an important factor that makes cessation and its continuation more challenging[40].

A research carried out in São Paulo, using auriculotherapy with middle-aged women (20 to 50 years old) found a reduction in stress levels starting in the fourth auriculotherapy session, which was confirmed in the eighth session ($p<0,05$). This was achieved using only three points (*Shenmen*, Kidney, and Brain Stem)[41]. On the other hand, interventions with health professionals from both sexes during the COVID-19 pandemic, in Spain, found that stress has been reduced in six sessions — despite the fact they combined auriculotherapy and acupuncture[42]. This number of sessions and the new therapeutic association can be related to the intensity of the sources of stress and other psychic conditions experienced during the pandemic, a situation different from this study.

It is worth noting that untreated stress can both recruit smoking and be a mechanism that decreases the self-esteem of the smoker, harming their self-image, for example, as they neglect their oral health[43], generating stains and halitosis and evolving into more serious cases, such as mouth cancer[44]. In Colombia, most female smokers had lost teeth, cavities, or dental traumas that caused them stress, often associated to low self-esteem[45]. Nevertheless, a Canadian study found that stress, although it may bring harm, can be used in treatments, as its ability to activate smoking mechanisms can also be used to reduce consumption[46]. However, this therapeutic resource opposes the auriculotherapy mechanism in these cases.

Regarding sleeping patterns, they have a strong relationship with smoking, since nicotine

is a substance that directly affects the sleep/wake cycle. This sleep disturbance can also increase the use of cigarettes and other drugs[47], leading to changes in the emotional behavior of a person[48]. Additionally, smoking can cause health issues in one's throat, such as chronic tonsillitis. This can also harm the quality of health, which, in a Cuban study, was significantly minimized using auriculotherapy (points C1, C2, C3, C4, E) as opposed to conventional treatments (benzathine penicillin, multivitamin, and antihistamine)[49].

Regarding the NADA protocol used in this study, it may not be the best therapeutic option to treat sleep disorders, since it requires more auriculotherapy sessions in both groups (CG and EG). An investigation with nursing professionals that used some points in common with this study (*Shenmen* and Kidney) found that, after six sessions, trouble sleeping decreased ($p<0.0001$), with improvements in sleep quality ($p=0.012$) and less sleep disorders ($p=0.025$)[50].

Before the pandemic, researchers from Sichuan Province, China, investigated the safety of applying auriculotherapy results, showing how effective it was to treat insomnia[51]. According to the findings of the present study, it can be a good therapeutic strategy, even after the pandemic. In this regard, despite the lack of scientific evidence that shows, on the medium-to-long term, the extension of the effects of the pandemic in women, smokers or not, auriculotherapy treatment for sleep can reduce the use of anxiolytic drugs, which is prevalent in this group, avoiding potential interactions between these drugs and the substances in cigarettes[52].

The possibility of incorporating this therapeutic practice goes against the principles of health promotion when it comes to seeking balance in body functions and a better performance in the relationship between men and nature, as it seeks to reduce the damage caused by tobacco, ensuring sustainability, and creating a care strategy that broadly reaches health needs. Furthermore, considering that the use of psychotropic substances is increasingly common in youth[53,54], often starting and being potentiated by the influence of peers and family, it is important to intervene with their bonds of care (mothers, aunts, godmothers, and grandmothers) and observe changes in their lifestyle, which can transform them into agents of health promotion, becoming references for the cessation of smoking or the search for a treatment. On the other hand, for the professionals involved in auriculotherapy, this activity, as a daily fixture of patient care, be in health education actions or in the procedure as a whole, can mobilize resources for the promotion of self-care, seen as these workers often neglect their own health[55].

The use of this protocol was beneficial to channel the frequent emotional demands from health services, suggesting that professionals should invest in training in this integrative practice, taking ownership of it in their daily health care practice. Since this is a safe, non-invasive, and low-cost practice, its implementation can be faster, with a greater adherence from the community — especially in women with nicotine dependence, a public that is less present in therapeutic groups for smokers.

CONCLUSION

This study showed that the NADA protocol had significant results in reducing stress, anxiety, and insomnia for female smokers and non-smokers, according with a paired statistical test carried out in each group, before and after 4, 8, and 12 sessions. The group of smokers took longer to see a significant decrease in anxiety, stress, and insomnia levels. Regarding insomnia, the protocol only had an effect after 12 days, suggesting that other points could be associated to this protocol, or replaced.

Limitations of this study include its sample size, although it is still in line with INCA recommendations. Other limitations include the fact it was carried out in a single territory and the lack of intergroup analysis to observe whether there would be a statistical difference between both intervention groups. Measuring vital signs and hemodynamic levels during auriculotherapy sessions could also allow extra analyses. This study was the first in the world to find other therapeutic possibilities of using the NADA protocol. However, further research is necessary, so its effects on other populations and health care contexts can be ascertained.

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