

Research Article

Effects of Medical Cannabis use on Military Veterans Suffering from Tinnitus

MD Mandy Liedeman, MD Stefan Konasiewicz, Chanile Vines, and Justin Whitehall*

Department of Research, Avail Medical Clinic, Canada

***Corresponding author**

Justin Whitehall, Department of Research, Avail Medical Clinic, Toronto, Canada

Submitted: 23 February 2024

Accepted: 13 March 2024

Published: 19 March 2024

ISSN: 2475-9473

Copyright

© 2024 Konasiewicz S, et al.

OPEN ACCESS**Keywords**

• Tinnitus; Sleep; Quality of Life; Medical Cannabis; Veteran; Cannabinoid Therapy

Abstract

The aim of this research was to investigate the impact of a comprehensive cannabis intervention on tinnitus symptoms and associated outcomes among military veteran personnel. Utilizing a range of measures, including the Tinnitus Statement, headache severity, quality of life, and sleep quality, the study assessed changes in participants' experiences at baseline and follow-up.

Results indicated a consistent and statistically significant reduction in the perceived severity of tinnitus, with improvements extending to associated symptoms such as headache severity and sleep quality. The intervention demonstrated a positive effect on participants' well-being, emphasizing the interconnected nature of tinnitus symptoms with broader aspects of health.

While these findings present promising insights into the potential efficacy of the intervention, the study highlights the importance of future research with larger sample sizes and control groups to validate and generalize the observed effects. This holistic approach to symptom management provides a foundation for enhancing the overall well-being of military personnel affected by tinnitus.

INTRODUCTION

Military personnel, due to their constant exposure to high levels of noise, face various health challenges, with tinnitus emerging as the most prevalent condition among Canadian Armed Forces (CAF). As evidenced by G, 5G1 favorable medical claims between 2021-22, tinnitus not only poses physical challenges but also contributes to psychological distress, including anxiety, depression, and an overall decline in quality of life [1]. As a response to this prevalent condition, medical cannabis has gained attention, particularly with an increasing number of CAF veterans receiving prescriptions for medical cannabis, specifically for tinnitus; through Veterans Affairs Canada (VAC) [1]. Recognizing the potential therapeutic properties of cannabis against auditory damage prompted our investigation into this complex medical condition.

Our research aims to delve into the intricacies of tinnitus among military personnel by employing comprehensive assessments at baseline and follow-up. We utilized a single-item sleep quality scale, questions from the PEN G249e (Veterans Affairs Medical Questionnaire for Hearing Loss/Tinnitus), a self-perceived survey on headache severity and duration, and a singular item addressing overall quality of life. In our follow-up assessments, we incorporate the Patient Global Impression of Change and a survey addressing concomitant medications and therapies. This approach allowed us to explore the direct effects

of tinnitus and also the potential influences of other factors, including additional medications or therapies, on symptom improvement.

While research on civilians has explored pharmacological treatments for tinnitus, such as antiepileptic drugs like lamotrigine and gabapentin, our study seeks to contribute to the existing knowledge by specifically investigating the efficacy of medical cannabis in managing tinnitus symptoms among military personnel. Acknowledging the limitations of treatments, such as antiepileptic drugs, our research adopts a holistic approach, considering the broader context of symptomatology and potential external influences on treatment outcomes. We aim to assess the effectiveness of cannabis as an intervention for tinnitus within the military context, providing valuable insights for improved healthcare practices and enhanced well-being among military personnel.

Literature Review

Tinnitus, characterized by the perception of noise in the absence of an external source, poses a significant challenge to physical and mental well-being. Conventional treatments often fall short of providing substantial relief, prompting the exploration of alternative therapeutic approaches [2]. Among these, Cannabidiol (CBD), a non-psychoactive component of the cannabis plant, has gained attention for its potential

neuroprotective and anti-inflammatory properties. This literature review critically examines existing research on the use of CBD in managing tinnitus, considering its efficacy, safety, and underlying mechanisms. CBD's neuroprotective attributes have been studied extensively, demonstrating its potential to mitigate oxidative stress, neuroinflammation, and excitotoxicity—all implicated in tinnitus pathology [3,4]. The anti-inflammatory properties of CBD may contribute to its ability to modulate neuronal activity and alleviate symptoms associated with tinnitus [5,6]. Promising results from preliminary trials suggest that CBD may offer meaningful relief for individuals grappling with tinnitus-related distress [7,8]. While CBD is generally considered safe, concerns persist regarding its potential side effects, interactions with medications, and long-term consequences [9]. As research continues to evolve, a nuanced understanding of CBD's role in alleviating tinnitus symptoms may pave the way for innovative and elective interventions, ultimately enhancing the quality of life for individuals affected by this debilitating condition.

Study Objectives

The primary objective of this research study is to assess and understand the multifaceted impact of tinnitus among military personnel. Specifically, we aim to achieve the following objectives:

Baseline Assessment:

- Utilize a single-item sleep quality scale to gauge the sleep patterns of participants.
- Incorporate relevant items from the PEN G249e, a specialized Veterans Affairs Medical Questionnaire designed for assessing hearing loss and tinnitus.
- Administer a self-perceived survey on headache severity and duration to capture participants' subjective experiences.
- Include a single-item question on the overall quality of life to measure the broader impact of tinnitus on participants' well-being.

Follow-up Assessment:

- Retain all baseline assessments, including the single-item sleep quality scale, PEN G249e items, and the self-perceived headache severity/duration survey.
- Introduce the Patient Global Impression of Change to evaluate participants' perspectives on the overall changes in their condition.

By implementing these comprehensive assessments at both baseline and follow-up stages, we aim to gain an understanding of the tinnitus experience among military personnel. Additionally, including follow-up measures allows us to explore not only any impact from cannabis treatment and the direct effects of tinnitus but also potential influences from external factors, such as changes in overall health and concurrent treatments. This

study objective aligns with our overarching goal of contributing valuable insights to enhance the management and well-being of military personnel affected by tinnitus.

Participants

The research team investigated Canadian veterans aged 25+, with a diagnosis of tinnitus who have been provided with medical authorization for cannabis by a licensed healthcare practitioner, are registered as Clients with a licensed producer, and use medical cannabis (in any format) to treat symptoms for at least six months. Any patient with cardiovascular disease (angina, peripheral vascular disease, cerebrovascular disease, arrhythmias), respiratory or oral disease, or any other serious systemic disorders; pregnancy/planning to become pregnant or breastfeeding; history of schizophrenia, psychosis, bipolar disease, borderline personality disorder, dissociative personality disorder, delirium or dementia; and previous enrollment in a cannabis-related study were excluded. Data was collected and performed in accordance with the Declaration of Helsinki. Ethical approval was granted by the Centre of IRB Intelligence for Protocol 00048415.

METHODS

Study Design

This research employs a prospective, observational study design with a sample size of approximately 47 participants. The study duration spans three to four months, and the study site is the Avail Cannabis Clinic. Potential participants, referred from other clinics and organizations for medical cannabis authorization under the Cannabis Regulations, were identified before medical consultation. All participants were solely using cannabis as a form of treatment for Tinnitus since being prescribed medical cannabis. Data collection included baseline measures obtained through Lime Survey, follow-up visits at approximately 45 days, and end-of-study surveys to diarize cannabis's overall impact.

Survey

The study incorporated a range of validated measures to assess various aspects of participants' well-being. At baseline and follow-up, we utilized the single-item sleep quality scale, items from the PEN G249 e (Veterans Affairs Medical Questionnaire for Hearing Loss/Tinnitus), a self-perceived headache severity/duration survey, and a single-item quality of life question. At follow-up, we utilized all of the former and added in The Patient Global Impression of Change and a concomitant medications/therapies survey, which helped us identify if other medications or therapies were possibly playing a role in their symptom improvement. This multi-faceted approach allowed for a thorough examination of the participants' experiences and treatment outcomes throughout the study duration.

RESULTS

Demographics

A total of 47 participants completed an assessment in the

study. Not all participants completed both the initial and follow-up. The survey respondents ranged from 30 to 87 years old, with an average age of 60.

Survey Results

Descriptive statistics were computed to examine the central tendency and variability of tinnitus statement scores at baseline and follow-up assessments. The mean tinnitus statement score at baseline was 4.21 (SD = 0.98), indicating a high level of perceived severity on average among participants (Mdn = 4.00). In the follow-up assessment, the mean tinnitus statement score decreased to 3.70 (SD = 1.05), suggesting a reduction in perceived severity over time (Mdn = 4.00). The minimum and maximum scores at baseline were 2.00 and 5.00, respectively, while at follow-up, they ranged from 1.00 to 5.00. These findings are based on data from 31 participants with complete responses. Overall, the results suggest a notable change in tinnitus statement scores from baseline to follow-up, reflecting a potential improvement in participants' subjective tinnitus experiences [Table 1].

Nonparametric Tests-Related-Samples Wilcoxon Signed Rank Test

The Wilcoxon signed rank test was employed to examine the differences between tinnitus statement scores at baseline and follow-up assessments in a sample of 31 participants. The test yielded a statistically significant result ($Z = -3.13$, $p = .002$), indicating a significant decrease in tinnitus statement scores from baseline (Mdn = 4.21) to follow-up (Mdn = 3.70). The negative sign of the standardized test statistic suggests that the median score at baseline was higher than the median score at follow-up. These findings suggest a significant change in tinnitus statement scores over the course of the study, providing evidence of an intervention effect [Table 2].

A paired-sample t-test was conducted to compare the mean scores of participants on the tinnitus statement between baseline (M = 4.35, SD = 0.95) and follow-up (M = 3.68, SD = 1.08). Results revealed a statistically significant difference between the two conditions, $t(30) = 3.503$, $p = 0.001$. The mean tinnitus statement score significantly decreased from baseline to follow-up, indicating a reduction in tinnitus symptoms over the course of

Table 1: Descriptive Statistics of presence of Tinnitus at Baseline and Follow up

	Mean	Std. Deviation
Tinnitus Statement Baseline	4.2051	0.97817
Tinnitus Statement Follow-up	3.7027	1.05053

Table 2: Wilcoxon Signed Rank Test to examine the differences Between Tinnitus Statement

	Mean
Total N	31
Test Statistics	13.000
Standard Error	20.248
Standardized Test Statistics	-3.136
Asymptotic Sig (2-Sided test)	0.002

the study. The p-value of < 0.001 (both one-sided and two-sided) further supports the evidence of a significant difference [Table 3].

Analysis 2

Headache Severity: Descriptive statistics for tinnitus headache scores at baseline (M = 2.10, SD = 1.46) and follow-up (M = 1.54, SD = 1.50) indicated a mean reduction in headache severity over time. The range of scores at baseline varied from 0 to 4, with a minimum of 0 and a maximum of 4. Similarly, at follow-up, the range was from 0 to 4. A valid dataset with 31 observations was used for this analysis [Table 4].

The related-samples Wilcoxon signed rank test revealed a statistically significant difference in tinnitus headache scores between baseline and follow-up conditions, $W = 15.00$, $SE = 20.73$, $Z = -2.967$, $p = .003$. This suggests a significant change in headache severity from baseline to follow-up. The analysis was based on a total sample size of 31 participants [Table 5].

Analysis 3

How does Tinnitus affect Quality of Life Analysis [Table 6]: Descriptive statistics for "Tinnitus Quality of Life" scores were completed on Scale of 1-5: Not at all -1, Very Little- 2, Somewhat

Table 3: Paired-Samples t-Test of Mean Scores on the Tinnitus Statement between Baseline and Follow Up

	Mean	SD	T(31)	One-sided p	Two-sided p
Tinnitus Statement Baseline	4.3548	0.95038			
Tinnitus Statement Follow-up	3.6774	1.07663			
Pair 1 Tinnitus Statement					
Baseline-Tinnitus Statement	0.67742	1.07663	3.503	<0.001	0.001
Follow up					

Table 4: Descriptive Statistics of Tinnitus headaches Scores at Baseline and Follow-Up

	N	Mean	SD
Tinnitus Headache Baseline	40	2.1000	1.46410
Tinnitus Headache Follow-up	37	1.5405	1.50175

Table 5: Related-Samples Wilcoxon Signed Rank Test for Tinnitus Headache Scores at Baseline and Follow-Up

	Total N	31
Test Statistics		15.000
Standard Error		20.730
Standardized Test Statistics		-2.967
Asymptotic Sig (2-Sided Test)		0.003

Table 6: Descriptive Statistics of Tinnitus Quality of Life Scores at Baseline and Follow-Up

	N	Mean	SD	Min	Max
Tinnitus Headache Baseline	39	3.7436	1.09347	1.00	5.00
Tinnitus Headache Follow-up	37	3.5135	1.04407	2.00	5.00

-3, Much -4, Very much- 5. Tests revealed that at baseline, participants reported a mean quality of life score of 3.743G (SD = 1.09347). At follow-up, the mean score slightly decreased to 3.5135 (SD = 1.04407). These findings suggest a moderate level of variability in perceived quality of life related to tinnitus among participants, both initially and after the intervention [Table 7].

“Tinnitus Quality of Life” indicated that participants reported a mean quality of life score of 3.8000 (SD= 1.1569) the average quality of life score from baseline to follow-up, suggesting that participants perceived a decrease in tinnitus severity (peG9) at Baseline and 3.4000 (SD = 1.03724) at follow-up. The standard error of the mean provides an estimate of the precision of the sample mean. The results indicate a reduced impact of tinnitus on their overall quality of life throughout the duration of the study.

At baseline, participants reported a mean score of 3.2439 (SD = 2.09500) on the “Tinnitus Sleep” variable, with scores ranging from 0.00 to 7.00. After follow-up, the mean score increased to 5.470G (SD= 2.50134), ranging from 1.00 to 10.00. The decrease in valid n (from 41 to 34) indicates missing data in the follow-up assessment. These findings suggest a positive and notable change in participants’ reported sleep experiences with participants reporting better sleep outcomes. We see in the frequency table [Appendix Figure 2] that at baseline, seven participants reported a terrible sleep pattern and only one ‘Good’. In the follow-up no participant reported their sleep as ‘Terrible’ and 11 participants reported their sleep as either Good to Excellent [Table 8].

DISCUSSION

Analysis 1: Tinnitus Statement Presence

The results of the analysis on the presence of tinnitus, as measured by the tinnitus statement, demonstrate a significant change in participants’ perceptions over the study period. Both descriptive statistics and nonparametric tests indicate a consistent trend of decreased severity. The reduction in the mean tinnitus statement score from 4.21 at baseline to 3.70 at follow-up suggests an improvement in participants’ subjective tinnitus experiences. The Wilcoxon signed rank test and paired-samples t-test further confirm a statistically significant decrease in scores, substantiating the efficacy of the intervention. This supports the

Table 7: Paired Sample Test of Tinnitus Quality of Life Scores at Baseline and Follow-Up

	Mean	SD
Tinnitus Quality of Life Baseline	3.800	1.15669
Tinnitus Quality of Life Follow-Up	3.4000	1.03724

Table 8: Descriptive Statistics of Tinnitus Sleep Quality Scores at Baseline and Follow-Up

	N	Mean	SD	Min	Max
Tinnitus Sleep Baseline	41	3.2439	2.09500	1.00	5.00
Tinnitus Sleep Follow-up	34	5.4706	2.50134	2.00	5.00

notion that the treatment had a positive impact on alleviating tinnitus symptoms among the participants.

Analysis 2: Headache Severity

Descriptive statistics for headache severity scores also indicate a positive trend. The mean reduction in headache severity from baseline (M = 2.10) to follow-up (M = 1.54) suggests a potential positive effect of the intervention on this symptom. The related samples Wilcoxon signed rank test further supports these findings, revealing a statistically significant difference in headache severity between baseline and follow-up. This implies that the intervention not only influenced tinnitus symptoms but also had a positive secondary effect on associated symptoms, such as headaches.

Analysis 3: Quality of Life

The analysis of the impact of tinnitus on quality of life, as measured on a scale of 1-5, indicates a moderate level of variability both at baseline and follow-up. Although there was a slight decrease in mean scores from 3.743G to 3.5135, the changes may not be clinically significant. The “Tinnitus Quality of Life” variable also shows a decrease from 3.8 at baseline to 3.40 at follow-up. While these changes might indicate a potential decrease in the impact of tinnitus on the perceived quality of life, further investigation is necessary to understand the clinical significance of these variations.

Analysis 4: Tinnitus Sleep Quality

The analysis of sleep quality in relation to tinnitus reveals noteworthy improvements. Participants reported a substantial increase in mean scores from 3.2439 at baseline to 5.470G at follow-up, with a notable shift in frequency distribution toward better sleep outcomes. The decrease in participants reporting terrible sleep and the increase in those reporting good to excellent sleep further support the positive impact of the intervention on sleep quality.

In conclusion, the findings suggest that the intervention not only positively influenced tinnitus symptoms but also had potential secondary effects on associated symptoms and aspects of participants’ overall well-being, such as headache severity and sleep quality. However, it’s important to interpret the results cautiously and consider the clinical significance of observed changes. Future research with larger sample sizes and control groups could provide more robust insights into the effectiveness of the intervention.

CONCLUSION

This study investigated the impact of a comprehensive intervention on tinnitus symptoms and associated outcomes among military personnel. The findings consistently indicate a positive effect of the intervention on participants’ experiences of tinnitus, suggesting improvements in perceived severity and associated symptoms. The significant reductions in tinnitus statement scores, headache severity, and improvements in sleep

quality collectively point to the potential effectiveness of the intervention.

The observed improvements in tinnitus symptoms align with the broader goal of enhancing the well-being of military personnel, particularly concerning prevalent conditions like tinnitus. While the study provides promising insights, it's crucial to acknowledge the need for further research with larger sample sizes and control groups to validate the observed effects. Additionally, assessing the clinical significance of changes in quality of life is essential for a comprehensive understanding of the intervention's impact.

These findings contribute valuable knowledge to the field, emphasizing the interconnectedness of tinnitus symptoms with other aspects of participants' well-being. This holistic approach to symptom management offers a promising avenue for future interventions and underscores the importance of addressing associated symptoms to improve overall quality of life among military personnel.

AUTHOR CONTRIBUTION STATEMENT

The authors confirm contribution to the paper as follows: study conception and design: Stefan Konasiewicz RCPSC, Mandy Liedeman M.D., Chanile Vines M.SC, Justin Whitehall; data collection: Stefan Konasiewicz RCPSC, Mandy Liedeman M.D., Chanile Vines M.SC, Justin Whitehall; analysis and interpretation of results: Stefan Konasiewicz RCPSC, Mandy Liedeman M.D., Chanile Vines M.SC, Justin Whitehall; draft manuscript

preparation: Stefan Konasiewicz RCPSC, Mandy Liedeman M.D., Chanile Vines M.SC, Justin Whitehall. All authors reviewed the results and approved the final version of the manuscript.

REFERENCES

1. 4.0 Disability Benefits, table 4.1, Canada, 2022.
2. Makar SK, Mukundan G, Gore G. Treatment of tinnitus: a scoping review. *Int Tinnitus J*. 2017; 21: 144-156.
3. Jones NA, Hill AJ, Smith I, Bevan SA, Williams CM, Whalley BJ, et al. Cannabidiol displays antiepileptiform and antiseizure properties in vitro and in vivo. *J Pharmacol Exp Ther*. 2010; 351: 300-308.
4. Campos AC, Fogaca MV, Sonogo AB, Guimaraes FS. Cannabidiol, neuroprotection, and neuropsychiatric disorders. *Pharmacol Res*. 2016; 112: 119-127.
5. Iffland K, Grotenhermen F. An update on safety and side effects of cannabidiol: A review of clinical data and relevant animal studies. *Cannabis Cannabinoid Res*. 2017; 2: 139-154.
6. Zou S, Kumar U. Cannabinoid receptors and the endocannabinoid system: Signaling and function in the central nervous system. *I J Mol Sci*. 2018; 19: 833.
7. Dawson D. Exploring the therapeutic potential of cannabidiol for tinnitus. *J Neurological Res*. 2019; 41: 211-220.
8. Martin-Sanchez E, Furukawa TA, Taylor J, Martin JL. Systematic review and meta-analysis of cannabis treatment for chronic pain. *Pain Med*. 2020; 21: 2124-2138.
9. Iseger TA, Bossong MG. A systematic review of the antipsychotic properties of cannabidiol in humans. *Schizophr Res*. 2015; 162: 153-161.