

Cognitive Behavioral Therapy for Tinnitus in Adults: A Review of Efficacy in Quality-of-Life Enhancement

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Abstract

Background: Tinnitus, characterized by the perception of sounds without an external source, significantly affects quality of life. Cognitive Behavioral Therapy (CBT) has emerged as a promising approach for managing tinnitus-related distress and enhancing psychological well-being. **Objectives:** This review aims to analyze the effectiveness of CBT in tinnitus management, focusing on alleviating distress, enhancing coping mechanisms, and improving overall well-being. **Methods:** PubMed and World of Science databases were systematically searched using keywords related to tinnitus, CBT, and quality of life. English, peer-reviewed studies focusing on adult populations were included. Studies involving pediatric populations or not meeting inclusion criteria were excluded. Data extraction was performed using PRISMA guidelines, with a narrative synthesis approach for analysis. Methodological quality and risk of bias were assessed using appropriate tools. The search engine initially identified 155 studies that met the inclusion criteria for the systematic review. However, upon further evaluation, 140 of these studies were excluded due to their non-randomized design. Of the remaining 15 studies, 11 were found to be partially accessible but ultimately excluded from the review as they did not meet the full accessibility criteria. Therefore, only four studies remained in the review, deemed suitable for inclusion based on their randomized design and full accessibility. **Results:** Studies by Beukes *et al.* [1]-[3] and Simoes *et al.* [4] evaluated CBT's effectiveness. With internet-based CBT, Beukes *et al.* demonstrated reductions in tinnitus distress, negative cognitions, and comorbidities. Simoes *et al.* proposed combination treatments for tinnitus management. The review outcome suggests that CBT is an effective treatment for tinnitus, as it can help reduce tinnitus distress and improve quality of life. However, limitations in sample sizes and follow-up durations highlight the need for further research to establish CBT's long-term efficacy and optimal parameters.

Integrating internet-based CBT into comprehensive care strategies can enhance the well-being of individuals affected by tinnitus.

Keywords

Tinnitus, CBT, Quality of Life, Cognitive Behavioral Therapy

1. Introduction

Tinnitus, a prevalent condition characterized by the perception of ringing, buzzing, or other sounds without an external source, significantly impacts an individual's quality of life, giving rise to distress, sleep disturbances, and difficulties in concentration [5]. The intricate nature of tinnitus's underlying mechanisms notwithstanding, empirical evidence suggests that psychological factors play a pivotal role in its perception and management [6].

Various theories have been formulated to elucidate the underlying mechanisms of tinnitus. Some posit that damage to the inner ear triggers tinnitus, while others propose alterations in the brain's auditory signal processing. Cochlear models of tinnitus assert that it originates in the inner ear, particularly the cochlea, due to damage or dysfunction of hair cells or the auditory nerve. Conversely, non-cochlear models suggest tinnitus stems from the brain, specifically the auditory cortex or other regions like the limbic system, which governs emotions and memory.

Cochlear models encompass the "hair cell" theory, attributing tinnitus to hair cell loss or damage in the cochlea, disrupting auditory system function. Another cochlear model, the "synaptic" theory, posits that tinnitus arises from synaptic changes between hair cells and the auditory nerve.

Non-cochlear models propose that tinnitus isn't solely linked to the auditory system but involves the brain's interpretation of auditory signals. The "central" theory suggests tinnitus emerges in the brain's auditory cortex, influenced by attentional and cognitive factors. The "limbic" theory suggests tinnitus relates to emotional processing and memory systems, affected by stress, anxiety, and depression.

Tinnitus profoundly influences a patient's overall quality of life, precipitating adverse emotional and psychological repercussions. The continued presence of ringing, buzzing, or other auditory sensations in the ears can instigate heightened anxiety, stress, and insomnia levels, impeding relaxation, concentration, and sleep onset. The enduring persistence of tinnitus may also evoke sensations of frustration, anger, and despair, amplifying the detrimental impact on mental well-being. Moreover, the continual distraction and discomfort stemming from tinnitus can precipitate social withdrawal, prompting individuals to eschew social interactions or experience feelings of embarrassment regarding their condition. Furthermore, the resultant sleep disturbances and chronic stress associated with tinnitus can precipitate various physical health complications, including fatigue, headaches,

and muscular tension, further compounding the burden on the individual's physical well-being.

Cognitive Behavior Therapy (CBT), a psychotherapeutic approach designed to assist individuals in identifying and modifying negative thought patterns and behaviors [7], has demonstrated efficacy in treating various mental health conditions, including depression, anxiety, and post-traumatic stress disorder (PTSD). Recent investigations have explored the potential benefits of integrating CBT into tinnitus management, recognizing its holistic influence on psychological well-being [8]. In addition to addressing tinnitus-related distress and augmenting the overall quality of life [9], CBT may provide individuals coping with tinnitus with enhanced tools for managing associated anxiety and depression [10]. While recognizing that CBT may not act as a curative measure for tinnitus, it emerges as a valuable instrument for the comprehensive management of the condition and elevating the overall well-being of those impacted by it [3].

Internet-based cognitive behavioral therapy (ICBT), a contemporary form of therapy merging traditional CBT with online accessibility, has proven effective in treating various mental health conditions, including tinnitus. ICBT for tinnitus typically involves online sessions and exercises to educate individuals about tinnitus, teach relaxation techniques, and restructure cognitive perceptions. Interactive tools like virtual reality exposure therapy assist in desensitizing individuals to perceived sounds. Real-time therapist support is also provided, enhancing the effectiveness of the intervention.

This review thoroughly examines the current evidence regarding the efficacy of CBT for managing tinnitus. It aims to uncover the potential benefits of this approach in reducing tinnitus-related distress, enhancing coping strategies, and promoting overall psychological well-being among individuals facing this auditory issue. The review aims to provide valuable insights for integrating psychological interventions, notably CBT, into comprehensive care plans for those with tinnitus.

2. Tinnitus Etiology

The etiology of tinnitus is intricate and encompasses many factors that can influence its onset and severity [9]. Among the foremost underlying causes of tinnitus lies damage to the inner ear, which may arise from age-related hearing impairment, exposure to loud noises, or other forms of trauma [5]. Such damage disrupts the normal functioning of the auditory system, thereby precipitating the perception of phantom auditory sensations [11]. Additionally, tinnitus may stem from various other sources, including the accumulation of earwax, ear infections, and certain medications recognized as ototoxic, such as specific antibiotics, chemotherapy agents, and high doses of aspirin [5].

Moreover, tinnitus can manifest as a symptom of underlying medical conditions like Meniere's disease, otosclerosis, and acoustic neuroma. Meniere's disease, characterized by inner ear dysfunction, manifests with symptoms including

vertigo, tinnitus, and hearing loss [6] [12] [13]. Otosclerosis entails abnormal bone growth in the middle ear, culminating in tinnitus and hearing impairment [14]. Meanwhile, acoustic neuroma, a benign tumor arising along the nerve linking the inner ear to the brain, presents symptoms including tinnitus, hearing loss, and balance disturbances [15].

Various neurophysiological models have been posited to elucidate the underlying mechanisms of tinnitus. Foremost among these is the “neuronal hyperactivity” model, which postulates that heightened neuronal activity within the brain’s auditory cortex, precipitated by factors like hearing loss, ear trauma, or neurochemical signaling, underpins tinnitus generation [8] [16]. Conversely, the “synaptic plasticity” model proposes that tinnitus arises from alterations in synaptic connectivity among neurons within the auditory system, influenced by factors such as hearing impairment, ear injury, or shifts in neurochemical signaling [17].

2.1. Tinnitus Types

Tinnitus manifests in two primary forms: subjective and objective. Subjective tinnitus, the more prevalent type, is characterized by internal perception of sounds, such as ringing, buzzing, or hissing, which vary in intensity and frequency [18]. This condition is often attributed to inner ear or auditory pathway alterations, potentially stemming from hair cell damage or neural changes [19]. In contrast, objective tinnitus entails sound the affected individual and others can hear, commonly described as clicking, tapping, or pulsing, sometimes synchronized with the person’s heartbeat [18]. While less frequent than subjective tinnitus, objective tinnitus is typically linked to specific medical conditions like tumors, aneurysms, or vascular irregularities [18]. Recognizing that both subjective and objective tinnitus can significantly impact one’s daily life is crucial, emphasizing the importance of seeking medical advice when symptoms persist [18] [19].

2.2. The prevalence of Tinnitus

Tinnitus is a prevalent worldwide condition [20]. Approximately 13% of adults in the United Kingdom endure prolonged tinnitus, roughly 7.1 million individuals [21]. This condition rises with age and affects both genders equally [20]. Shifting the focus to Australia, estimates indicate that approximately one in three individuals grapple with ongoing tinnitus daily, with a higher prevalence among males than females and an increased occurrence with advancing age [22]. In the United States, tinnitus affects about 8 to 25.3% of people, and exposure to noise in occupational and recreational settings serves as a significant, potentially alterable risk factor [23]. These figures underscore the widespread prevalence of tinnitus and the necessity of comprehending its risk elements and impact on quality of life across diverse demographic groups. Additionally, approximately 0.5% of individuals reported tinnitus severely affecting their life [21]-[23].

2.3. The Impact of Tinnitus on Quality-of-Life

Tinnitus significantly affects an individual's auditory perception and overall quality of life [24]. The constant ringing, buzzing, or other auditory sensations in the ears can interrupt concentration during daily tasks such as work, reading, and social interactions [25]. The severity of tinnitus varies from minor inconvenience to severe distress and limitations in daily functioning.

In addition to its auditory impact, tinnitus can negatively affect mental health and well-being [26] [27]. The persistent noise may trigger feelings of anxiety, stress, and frustration, potentially leading to depression [28]. Disruptions in sleep patterns, including insomnia, can also occur [29].

Furthermore, tinnitus can interfere with social activities and relationships [30]. The ongoing auditory disturbances may make it challenging to participate in social gatherings or enjoy hobbies, leading to feelings of isolation and loneliness [25] [26]. These social consequences can further worsen the individual's mental health and overall sense of well-being.

2.4. Tinnitus Intervention Options

Various treatment paradigms exist for tinnitus management, each tailored with distinct methodologies and objectives [31]. Tinnitus Retraining Therapy (TRT) represents a sound-based intervention designed to facilitate the brain's acclimatization to tinnitus signals, thereby diminishing their perceived loudness and disruptive effects on daily functioning [16] [32].

The Stepped Care model adopts a hierarchical strategy, initially employing minimally invasive interventions such as sound therapy and counseling and escalating to more intensive measures like Cognitive Behavioral Therapy (CBT) if required [8].

Utilizing hearing aids presents another viable option, particularly beneficial for individuals with concomitant hearing impairment [10]. They enhance communication abilities and concurrently alleviate tinnitus symptoms.

Meditation therapy emerges as an effective adjunct, proven to mitigate tinnitus-related distress and bolster overall quality of life [33]. Notably, Cognitive Behavioral Therapy (CBT) stands out as a highly productive intervention [33]-[35]. It centers on identifying and modifying maladaptive cognitive patterns and behaviors linked with tinnitus, consequently fostering significant improvements in patient's quality of life [35]. By systematically addressing the psychological and emotional ramifications of tinnitus, CBT equips individuals with effective coping mechanisms, empowering them to regain mastery over their condition and restore a sense of control in their lives [36].

2.5. Internet-based Cognitive Behavioral Therapy (ICBT)

Internet-based cognitive behavioral therapy (ICBT) is a contemporary method of mental health intervention that merges the advantages of traditional cognitive behavioral therapy (CBT) with the accessibility and convenience of online platforms [1]. It has been demonstrated to effectively address various mental health issues,

including tinnitus, which entails perceiving ringing or similar sounds in the ears without an external source. ICBT presents a promising avenue for managing this condition [3].

ICBT for tinnitus typically encompasses a series of online sessions and exercises tailored to aid individuals in comprehending and coping with their tinnitus-related distress. These sessions may involve educating participants about tinnitus, teaching relaxation techniques, and conducting cognitive restructuring exercises to help individuals alter their perceptions and beliefs regarding their tinnitus [2]. Moreover, ICBT may incorporate interactive elements such as virtual reality exposure therapy, facilitating gradual desensitization to perceived sounds. Additionally, real-time guidance and support from trained therapists are often integrated into ICBT programs, providing individuals with assistance as they navigate the intervention [3].

2.6. Tinnitus Assessments

Developing standardized assessment techniques for subjective tinnitus is challenging due to its subjective nature [37]; however, the Department of Health recommended standard procedures for assessment [38]. Audiological evaluations are crucial in assessing and managing tinnitus, involving a comprehensive patient history, otoscopic examination, and various tests such as pure tone air and bone conduction. Special precautions should be taken during specific assessments to avoid discomfort in patients with hyperacusis [37].

Self-reporting questionnaires like the Tinnitus Handicap Inventory (THI) and the Tinnitus Functional Index (TFI) effectively evaluate tinnitus's impact on quality of life. However, they may not accurately capture changes in severity [39].

Psychological evaluations are also essential as patients with tinnitus often experience concentration difficulties, anxiety, and depression, which can significantly affect their well-being. Various screening tools like the Patient Health Questionnaire for Depression (PHQ-9), the Beck Depression Inventory, and the Hospital Anxiety and Depression Scale are recommended for assessing psychological issues associated with tinnitus, with referral to mental health professionals if necessary [40].

On the other hand, objective tinnitus involves sounds that both the affected individual and others can hear, often associated with specific medical conditions such as tumors or vascular irregularities, highlighting the importance of seeking medical advice for persistent symptoms [41].

3. Study Hypothesis

This review aims to meticulously analyze the extant evidence about the effectiveness of CBT in tinnitus management. Beyond exploring existing studies, the objective is to elucidate the potential advantages of internet-based CBT in alleviating tinnitus-related distress, augmenting coping mechanisms, and fostering a broader positive impact on the psychological well-being of individuals grappling with this

auditory challenge. The outcomes of this review aspire to contribute substantively to the ongoing initiative of integrating psychological interventions, particularly CBT, into comprehensive care and management strategies tailored for individuals contending with tinnitus.

4. Method

This research review's methodological approach involves a systematic and comprehensive exploration of the existing literature to investigate the effectiveness of Cognitive Behavioral Therapy (CBT) in managing tinnitus.

PubMed and World of Science were the primary databases selected for the literature search. These databases were chosen for their extensive medical and psychological research coverage, ensuring a thorough exploration of the relevant literature about tinnitus and cognitive behavioral therapy.

The review process will adhere to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [42]. The keywords employed in the literature search were "tinnitus," "CBT," "quality of life," and "cognitive behavioral therapy."

4.1. Inclusion and Exclusion Criteria

The inclusion criteria were established to ensure the relevance and reliability of the selected studies [43]. The criteria encompassed studies published in English, peer-reviewed articles, and those focusing on adult populations. This targeted approach aimed to enhance the quality and consistency of the included literature. Studies not meeting the inclusion criteria, including those not published in English, non-peer-reviewed articles, and those involving pediatric populations, were excluded from the review. These criteria were applied rigorously to maintain the integrity of the selected studies (refer to **Figure 1**).

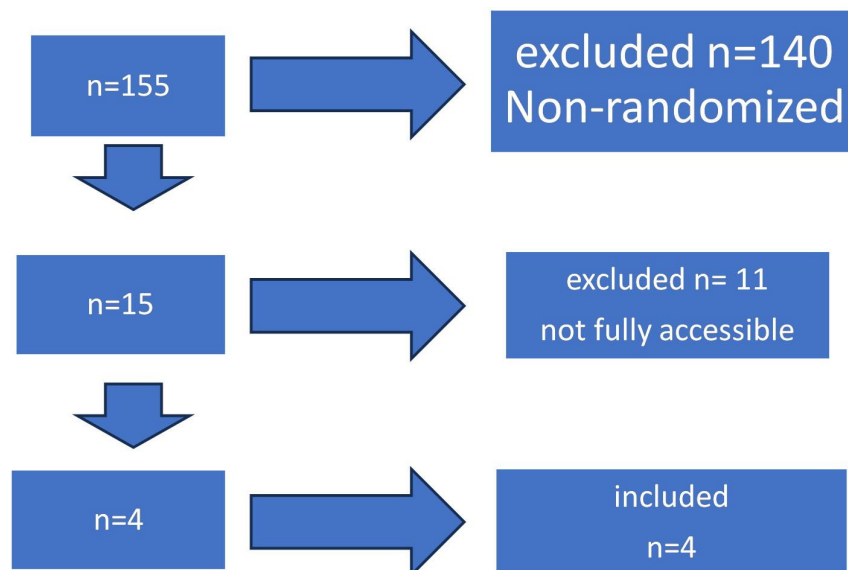


Figure 1. Inclusion and exclusion flowchart.

4.2. Data Extraction

Data extraction was systematically carried out utilizing the PRISMA-2020 data extraction form, facilitating the organized collection of pertinent information from the chosen studies. Extracted data encompassed various elements, including study characteristics (authors, publication year, and study design), participant details (sample size, age, and gender), methodology, assessment tools employed, and treatment interventions and outcomes specifics. This process involved meticulous extraction and recording of information in a standardized form to guarantee precision and uniformity across all included studies. The compiled data offered a comprehensive overview of the findings in the selected studies, enabling a thorough analysis and synthesis of results [42]. The researcher conducted the initial searches and screening of titles and abstracts. Full-text articles meeting the inclusion criteria were then assessed, and any discrepancies in study selection were resolved through discussion and consensus.

4.3. Data Analysis

The data analysis process will employ a narrative synthesis approach, which enables a comprehensive and reiterative assessment of the extracted data [44]. This method allows for a detailed summarization of the findings from the included studies, highlighting key findings, trends, and discrepancies [44] [45]. Through this approach, we will synthesize the data into a cohesive narrative that provides a comprehensive overview of the existing literature on the effectiveness of cognitive behavioral therapy for treating tinnitus. The narrative synthesis will facilitate a deeper understanding of the existing evidence and identify gaps in the current research, which will inform the development of future studies in this area [43].

4.4. Quality Assessment

The included studies' methodological quality and risk of bias will be evaluated using a suitable tool, such as the Cochrane Risk of Bias tool for randomized controlled trials [46]. This assessment is crucial in determining the overall strength of the evidence presented in the review, as it helps to identify potential biases and limitations in the studies that may impact the validity and reliability of their findings. By examining the methodological quality and risk of bias of the studies, we can better understand the existing literature and identify areas where further research is needed to strengthen the evidence base [46]. This assessment will also inform the development of future studies, enabling researchers to design and implement more rigorous and practical studies that can provide robust evidence for the effectiveness of cognitive behavioral therapy for treating tinnitus.

5. Objective of the Study

The main goal of this study is to examine how effective cognitive behavioral therapy (CBT) is in alleviating symptoms and enhancing the quality of life for adult individuals dealing with tinnitus. Specifically, our research aims to evaluate CBT's

impact on reducing tinnitus intensity, improving mental well-being, and enhancing the overall life satisfaction of tinnitus patients. Additionally, we seek to investigate the potential mechanisms through which CBT brings about therapeutic benefits, including changes in cognitive and behavioral factors. Furthermore, the study will explore the long-term sustainability of the treatment's effects. By offering evidence-based insights into the use of CBT for managing tinnitus, this research strives to enhance clinical care and improve the overall quality of life of individuals affected by this prevalent and distressing condition.

6. Critical Appraisal

Beukes *et al.* [3] conducted a 2-arm randomized clinical trial to evaluate the effectiveness of internet-based cognitive behavioral therapy (CBT) in reducing tinnitus distress compared to weekly monitoring. The study included 158 participants and found that internet-based CBT reduced tinnitus distress, negative tinnitus cognition, and insomnia compared to weekly monitoring. The results remained stable over a 2-month follow-up period. However, the study had some limitations, including low compliance rates for questionnaire completion and withdrawal of 16% of participants. Despite these limitations, the study provides encouraging results and suggests that internet-based CBT may be a viable option for managing tinnitus distress in a US population. Beukes *et al.* [2] investigated the effectiveness of internet-based CBT in reducing tinnitus distress and tinnitus-related comorbidities and improving quality of life in a randomized controlled trial. The study included 102 participants and found that internet-based CBT was effective in reducing tinnitus distress, tinnitus cognitions, insomnia, anxiety, and depression. The results remained stable over a 2-month follow-up period. However, the study had some limitations, including low compliance rates for questionnaire completion and withdrawal of 16% of participants. Despite these limitations, the study provides encouraging results. It suggests that internet-based CBT may be a viable option for managing tinnitus distress in a US population, and further work is needed to improve compliance and attract more Spanish speakers. Beukes *et al.* [1] compared the effectiveness of internet-based CBT with face-to-face clinical care in reducing tinnitus distress and related difficulties in a randomized controlled trial. The study included 92 participants and found that both interventions were equally effective in reducing tinnitus distress and most tinnitus-related difficulties, except insomnia, which favored iCBT. The study concluded that iCBT is a non-inferior alternative to face-to-face care for tinnitus management and may offer a more accessible and convenient option for individuals with tinnitus. Simoes *et al.* [4] described the Unification of Treatments and Interventions for Tinnitus Patients (UNITI) project, which aims to compare the effectiveness of single treatments and combined treatments on tinnitus distress through a multicenter, randomized clinical trial (UNITI-RCT). The trial will evaluate the effectiveness of cognitive behavioral therapy, sound therapy, structured counseling, hearing aids, and combinations of these treatments in reducing tinnitus distress. The study will

involve five tinnitus centers across Europe, four treatment arms with a single treatment, and six with a combinational treatment. The results of the UNITI-RCT trial will provide important evidence on the effectiveness of combination treatments for managing chronic tinnitus patients.

These studies suggest that internet-based CBT and CBT may be viable for managing tinnitus distress in the US population. Combining treatments may be more effective than single treatments in reducing tinnitus distress. However, further work is needed to improve compliance, attract more Spanish speakers, and evaluate the long-term effectiveness of these interventions.

7. Inclusion and Exclusion Criteria

The four studies conducted by Beukes *et al.* [1]-[3] and by Simoes *et al.* [4] exemplify the commitment to rigorous research practices by clearly outlining the criteria for including and excluding participants in their research papers [43] (refer to **Table 1**). This meticulous approach contributes to the overall credibility and robustness of the studies, facilitating a better understanding of the research context and promoting the advancement of knowledge in their respective fields [47].

By clearly defining who is included and excluded, these studies minimize the potential for confounding variables [48]. This precision enhances the internal validity of the research, allowing for more confident conclusions about the relationships between variables [49].

Table 1. Characteristics of the included studies.

Study	Design	Number of participants	Finding
Beukes <i>et al.</i> (2018)	A randomized, multicenter, 2-arm parallel-group	92	Similar results for Feasibility of iCBT vs. face-to-face for managing tinnitus
Beukes <i>et al.</i> (2021)	Single Group pilot study	27	Supported the feasibility of iCBT and CBT for managing tinnitus
Beukes <i>et al.</i> (2022)	A randomized control trial/2-arm	146	iCBT and CBT reduces tinnitus distress
Simoes <i>et al.</i> (2023)	A Randomized control trial	500	A combination of treatments has a significant outcome

7.1. Demographic Information

The studies conducted by Beukes *et al.* [1]-[3], as well as by Simoes *et al.* [4], demonstrated a comprehensive approach to participant inclusion by encompassing diverse demographics [50]. These investigations intentionally included individuals of various genders, ages, and ethnicities. This inclusive sampling strategy ensures a more representative and nuanced understanding of the phenomena under investigation. By incorporating a broad spectrum of participants, these studies contribute to the generalizability of their findings and acknowledge and account for potential variations across different demographic groups. This commitment

to diversity in the study populations enhances the external validity of the research, allowing for a more inclusive and holistic interpretation of the results.

7.2. Study Design

The four studies described in the question employ different study designs, each with its advantages and limitations. Beukes *et al.* [2] utilized a single-group pre-test-posttest design, which allows for the evaluation of the feasibility and safety of the intervention in a small-scale study but lacks a control group, which limits the ability to conclude the effectiveness of the intervention [43]. Beukes *et al.* [1] employed a randomized, multicenter, 2-arm parallel-group, noninferiority trial, which allows for the comparison of the intervention's effectiveness to a standard treatment or control group but may be more resource-intensive and complex to implement than a single-group design [51] [52]. Beukes *et al.* [3] used a prospective 2-arm delayed intervention efficacy trial, which allows for evaluating the intervention's effectiveness in a controlled trial but may be subject to bias due to the delayed intervention in the control group [53]. Simoes *et al.* [4] utilized a randomized clinical trial, which allows for the management of many patients from different sites located in several countries and provides evidence for the effectiveness of the intervention compared to a control group but may be more resource-intensive and complex to implement than a single-group design [43].

7.3. Quality of Life

The quality-of-life outcome was assessed in four trials using different questionnaires. Beukes *et al.* [1] used the Satisfaction with Life Scales (SWLS) to evaluate the participants' satisfaction with their life in general. In the same study, Beukes *et al.* [1] also used the Tinnitus Functional Index (TFI) to assess the impact of tinnitus on the participants' daily life. Beukes *et al.* [2] used the Tinnitus Handicap Inventory (THI) to evaluate the impact of tinnitus on the participants' daily life, and Beukes *et al.* [3] used the THI-Tinnitus Handicap Inventory. Simoes *et al.* [4] also used the THI to assess the impact of tinnitus on the participants' daily life.

7.4. Sample Size

The sample sizes of the four studies mentioned vary considerably. Beukes *et al.* [1] had a sample size of 92 participants, Beukes *et al.* [2] had a sample size of 27 participants, Beukes *et al.* [3] had a sample size of 146 participants, and Simoes *et al.* [4] had a sample size of 500 participants.

The sample size of Beukes *et al.* [1] is relatively small compared to the other studies [54]. With a sample size of 92 participants, the study may have limited statistical power to detect significant differences between the groups. Additionally, the small sample size may increase the risk of bias and limit the generalizability of the results. In contrast, the sample size of Beukes *et al.* [2] is even smaller, with only 27 participants [55] [56]. This small sample size may limit the study's ability to detect significant differences between the studied groups and may increase the

risk of bias and limitation of the results. The sample size of Beukes *et al.* [3] is larger than the previous two studies, with 146 participants. This sample size provides more statistical power to detect significant differences between the studied groups and may represent the population of interest more. The sample size of Simoes *et al.* [4] is the largest of the four studies, with 500 participants (Faber & Fonseca, 2014; Tongco, 2007). This large sample size provides a high statistical power to detect significant differences between the studied groups and may represent the population of interest more. Simoes *et al.* [4] sample size provides more reliable and generalizable results. However, collecting data from a large sample can be challenging, resource-intensive, and biased [57].

7.5. Follow-Up Period

Beukes *et al.* [1] had a short follow-up period of 2 months, which may not be sufficient to capture the long-term effects of the CBT intervention wholly. This may limit the study's ability to detect potential changes in tinnitus quality of life that may occur over a more extended period. However, the study's findings suggest that CBT may positively impact tinnitus management, and the short follow-up period may have been sufficient to capture the initial effects of the intervention [43]. Beukes *et al.* [2] are like the previous study, which had a follow-up period of 2 months [43]. While this may still be considered a relatively short follow-up period, it is worth noting that the study's findings suggest that CBT may have a sustained impact on tinnitus management, with participants continuing to report improvements in tinnitus severity, mood, and quality of life at the 2-month follow-up. Beukes *et al.* [3], again, the two-month follow-up period may be considered relatively short, and the study's findings may be limited by the same limitations as the previous two studies [58]. However, the study's findings suggest that CBT may positively impact tinnitus management, and the short follow-up period may have been sufficient to capture the initial effects of the intervention [43]. Simoes *et al.* [4] study had a much more extended follow-up period of 48 weeks, which may be sufficient to capture the long-term effects of the CBT intervention. The study's findings suggest that CBT may sustain tinnitus management, with participants continuing to report improvements in tinnitus severity, mood, and quality of life at the 48-week follow-up [43].

8. Discussion

This review aimed to assess the effectiveness of cognitive behavioral therapy (CBT) in managing patients suffering from tinnitus. As tinnitus is a subjective experience, we aimed to examine the subjective improvement in tinnitus and its impact on mood and overall quality of life. We conducted a comprehensive literature search and included studies that used CBT as the primary intervention for tinnitus management. We selected studies that reported subjective improvement in tinnitus loudness, mood, and quality of life as outcome measures. Our search yielded several studies that met our inclusion criteria. The studies used various

assessment tools to measure tinnitus severity, mood, and quality of life. Some studies used standardized and validated instruments such as the Tinnitus Questionnaire and the Tinnitus Handicap Questionnaire to measure global tinnitus severity and its impact on quality of life. Our review found that CBT effectively reduced tinnitus loudness and improved mood and quality of life in patients with tinnitus. The studies that used standardized and validated instruments to measure tinnitus severity and quality of life reported significant improvements in these areas. Additionally, the studies that used validated instruments to measure depression reported significant reductions in depressive symptoms. The four studies by Beukes *et al.* [1]-[3] and Simoes *et al.* [4] demonstrate a commitment to rigorous research practices by clearly outlining the inclusion and exclusion criteria, demographic information, study design, quality of life, and sample size. These elements contribute to the overall credibility and robustness of the studies, allowing for a better understanding of the research context and advancing knowledge in the field.

The inclusion and exclusion criteria outlined in the studies minimize the potential for confounding variables, enhance the internal validity of the research, and contribute to the studies' overall credibility. By clearly defining who is included and excluded, the studies reduce the risk of bias and ensure that the results are representative of the population under investigation.

The studies' demographic information demonstrates a comprehensive approach to participant inclusion, encompassing diverse genders, ages, and ethnicities. This inclusive sampling strategy enhances the external validity of the research, allowing for a more inclusive and holistic interpretation of the results.

The study designs employed in the four studies vary, each with its advantages and limitations. However, the studies' designs allow for the evaluation of the feasibility, safety, and effectiveness of the intervention, as well as the comparison of the intervention's effectiveness to a standard treatment or control group.

The quality-of-life outcome was assessed in all four studies using different questionnaires. Different questionnaires may limit the studies' ability to detect significant differences between the studied groups, but the findings suggest that CBT may positively impact tinnitus management.

The sample sizes of the studies vary considerably, with Beukes *et al.* [1] having a relatively small sample size and Simoes *et al.* [4] having a much larger sample size. The larger sample size provides more statistical power to detect significant differences between the studied groups and may represent the population of interest more accurately. However, collecting data from a large sample can be challenging, resource-intensive, and biased.

The follow-up period varies across the studies, with Beukes *et al.* [1]-[3] having a relatively short follow-up period of 2 months and Simoes *et al.* [4] having a much longer follow-up period of 48 weeks. While a longer follow-up period may be sufficient to capture the long-term effects of the CBT intervention, the short follow-up period may have been sufficient to capture the initial effects of the intervention.

In conclusion, the four studies by Beukes *et al.* [1]-[3] and Simoes *et al.* [1] demonstrate a commitment to rigorous research practices by clearly outlining the criteria for including and excluding participants, demographic information, study design, quality of life, and sample size. These elements contribute to the overall credibility and robustness of the studies, allowing for a better understanding of the research context and advancing knowledge in the field. The studies' findings suggest that CBT may positively impact tinnitus management, and the variation in study designs, sample sizes, and follow-up periods provide valuable insights into the effectiveness and limitations of CBT for tinnitus management.

9. Conclusion

In conclusion, the literature review has shown that CBT is a promising intervention for managing tinnitus. The studies reviewed here have consistently reported significant improvements in quality-of-life following CBT. The review also highlighted some limitations of the existing research. Firstly, most of the studies had small sample sizes, which may limit the generalizability of the findings. Secondly, the studies were limited to short-term follow-up periods; therefore, CBT's long-term effectiveness for tinnitus management is poorly understood. Finally, the studies used various assessment tools to measure quality of life, which may have introduced some inconsistencies in the results. Despite these limitations, the evidence suggests that CBT may be a valuable treatment option for patients with tinnitus. The studies reviewed here support the use of CBT as a standalone intervention. Future research should address the existing research's limitations by conducting larger, longer-term studies that use standardized assessment tools. Additionally, research should continue to explore the mechanisms underlying the effectiveness of CBT for tinnitus management and investigate the optimal parameters for CBT interventions, such as the duration and frequency of sessions and the most effective techniques and strategies.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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