

Original Article

Cognitive behavioral therapy for management of tinnitus

Audio-Vestibular
Medicine

Dalia M. Al Mostafa¹, Naema M. Ismail², Hala T. Mohamed³

¹Audio-vestibular Department, Banha Educational Hospital, Benha, Egypt.

²Audio-vestibular Unit of Otolaryngology Department, Faculty of Medicine for Girls, Cairo, Al-Azhar University, Egypt.

³Neuropsychiatry Department, Faculty of Medicine for Girls, Cairo, Al-Azhar University, Egypt.

ABSTRACT

Background: Severe tinnitus causes many, often psychological symptoms (e.g., tension, frustration, impaired concentration, disrupted sleep). Tinnitus sufferers may benefit from cognitive behavioural therapy (CBT), which has been shown useful.

Objective: to assess whether cognitive behavioural therapy is effective in management of patients suffering from tinnitus.

Methodology: It was Randomized controlled clinical trial (RCT) that was conducted in Audio-vestibular units and psychiatric departments at Al-Zahraa university Hospital and Banha Educational Hospital. The study consisted of 60 participants, were divided into 2 groups: Group (1): study group: 30 tinnitus cases receiving CBT over 8 weeks, only 22 patients had complete sessions and the other refused completing sessions because they were not interested. Their mean age was (46.23 ± 13.98). They were 10 males (45.5%) and 12 females were (40.0%). Group (2): waitlist control group: 30 control subjects, their mean age (48.43 ± 13.64). They were 12 male (54.5%) and 18 female 60.0%). Basic audiological evaluation by using Pure tone audiometry (PTA), tympanometry, speech audiometry and Psychophysical parameters (Tinnitus pitch • tinnitus loudness), Questionnaires (Tinnitus handicap inventory (Arabic version) General health questionnaire (GHQ). Beck depression inventory. PCASEE Quality of life questionnaire).

Results: Study group showed significant improvement of tinnitus related symptoms after intervention when compared to control group evidenced by improvement in GHQ, BDI, PCASEE scores when compared to control group. Otherwise, no significant difference was found regarding THI score between the two groups.

Conclusion: Cognitive behavioural therapy (CBT) could be effective in reducing the impact of tinnitus on quality of life evidenced by improvement in PCASEE Quality of life scores. Nevertheless, we are fully aware that the sample size is too small to draw a definitive conclusion out of our study.

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Corresponding author: Dalia Mohamed Almostafa, Audio-vestibular department, Banhaeducational hospital, Benha, Egypt. Tel: 01063201448. E-mail: daliaalmostafa272@gmail.com

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INTRODUCTION

At this time, no treatment for tinnitus has been shown to be effective for all of its sufferers. A hearing aid may help many people who suffer from tinnitus and also have a considerable hearing loss. The intensity of their tinnitus may also be lessened as a result of this treatment^[1].

Disabling symptoms as sleeplessness, difficulty focusing, and problems in social contact are common for many individuals who suffer with tinnitus. Those patients with tinnitus may also suffer from worry and depression^{[2],[3]}.

Numerous psychological procedures that were established and evolved from cognitive and behavioural therapies are included in the term "cognitive behavioural therapy" (CBT). CBT focuses on reducing the response of tinnitus rather than on reducing the perceived volume^[4].

The CBT is based on the idea that the patient's frightened thoughts are hypotheses that need to be thoroughly evaluated and tested. There are two ways to do this: (a) get a better knowledge of how thoughts and emotions are linked to basic beliefs and (b) adjust these beliefs by altering their behavioural and cognitive responses, which are generally retained.

The treatment includes education, discussion of evidence for and against the beliefs, imagery alteration, attentional manipulations, exposure to frightened stimuli, and relaxing methods. To assess beliefs, behavioural and cognitive assignments are utilized. Successful and therapeutic outcomes are achieved when the probable traps and hurdles are recognized, and the feasible objectives are defined^[5]. The aim of this research was to determine whether cognitive behavioural therapy is useful in the treatment of people with tinnitus.

PATIENTS AND METHODS

The studied participants were recruited from the Audio-Vestibular Units and Psychiatric departments, Al-Zahraa University Hospital and Banha Educational Hospital in Egypt. The study was conducted over one year duration, from January 2020 to January 2021. A written informed consent was obtained from all the participants before inclusion in the study. The whole study design was approved by the Institutional review board, Faculty of Medicine for Girls AL-Azhar University. Confidentiality and personal privacy was respected in all levels of the study.

This study included 60 participants who were divided into two groups by simple randomization method (Individuals are listed and then assigned to the treatment or a wait-list groups using random numbers and issued by a random number generator).

- **Group 1:** Included 30 patients who were subjected to cognitive behavioural therapy (study group).
- **Group 2:** Included 30 waitlist patients as a control group who were not subjected to CBT .

Inclusion criteria

- Patients should have symptomatic tinnitus interfering with their life activities.
- Duration of tinnitus more than 3 months.
- Ability to attend the sessions.
- Age between 18 and 65 years of age.

Exclusion criteria

- Previous psychological treatment for tinnitus.
- Patients with psychosis or seriously disabling brain damage.
- Patients with any treatable organic cause of tinnitus.

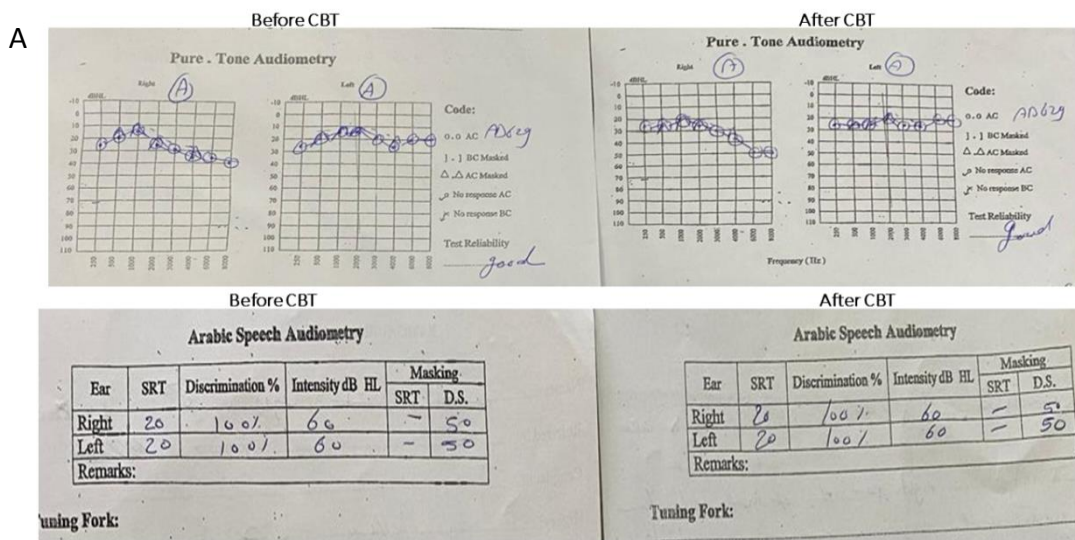
All Participants(study and control) were subjected to the following: History taking Otological examination, Basic audiological evaluation by using PTA , tympanometry, speech audiometry and Psychophysical parameters (Tinnitus pitch - tinnitus loudness), Questionnaires (Tinnitus handicap inventory (Arabic version) - General health questionnaire (GHQ). - Beck depression inventory -PCASEE Quality of life questionnaire).

Therapeutic intervention (CBT)

The CBT is a structured, time-limited psychological therapy. It is usually offered on an outpatient basis with between eight and 24 weekly sessions^[6]. CBT sessions were offered to study group while control group was waiting list. In this study , eight sessions delivered once a week for 8 weeks, one to one with a psychologist or audiologist face to face or over the phone due to corona virus pandemic and lasted for about 30 min. Five patients offered the sessions over the phone and received self-help book. Later on receiving the self-help book with less therapist support ^[7].

Post-intervention stage for the two groups

Basic audiological evaluation by using PTA, tympanometry, speech audiometry and Psychophysical parameters(Tinnitus pitch • tinnitus loudness), Questionnaires (Tinnitus handicap inventory (Arabic version)General health questionnaire (GHQ). Beck depression inventory. PCASEE Quality of life questionnaire). An example of case for psychophysical parameters before and after CBT was shown in tabe 1 and figure 1).



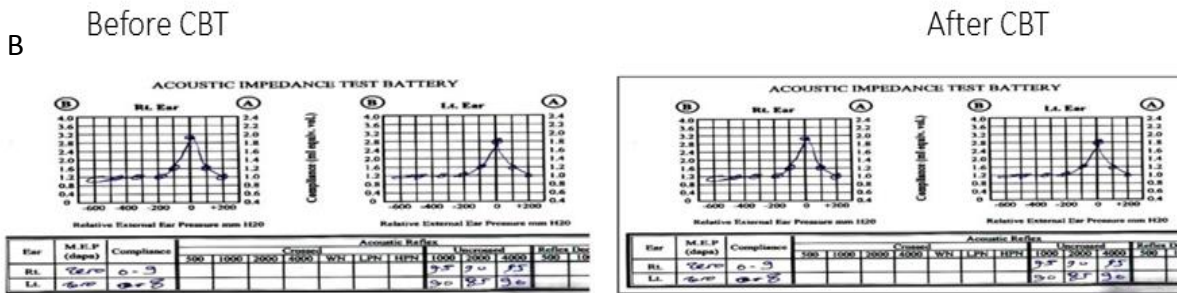


Figure (1): Basic audiological evaluation.

- A. Audiometry of one of our cases has tinnitus. It shows a unilateral sensorineural hearing loss with excellent speech discrimination before and after CBT.
- B. Tympanogram of one of our cases has tinnitus showing bilateral type A tympanogram (standard) before and after CBT.

Table (1): A case example for psychophysical parameters before and after CBT

	Tinnitus pitch	Tinnitus loudness
Before cognitive behavioural therapy (CBT)	1000	40
Before cognitive behavioural therapy (CBT)	1000	40

Psychophysical parameters of one patient has unilateral tinnitus showing tinnitus pitch 1000 and Tinnitus loudness 40 before and after CBT

Statistical analysis

Sorting and analysis of data were performed by using Statistical Package for Social Sciences (SPSS) version 21. In this study the qualitative data were described using number and percent. Quantitative data were presented as mean and standard deviation (SD). For numerical data, Independent Samples t-test was used to compare unrelated variables and Paired Samples t-test was used to compare related variables. For categorical variables, Chi-square test was used for analysis of unrelated variables. P<0.05 was adopted as the level of significance

Study group: 30 patients who received CBT. Control group: 30 waitlist controls. Eight patients from study group were lost to follow-up and the other 22 patients have completed the duration. Mean age for cases group was 46.23±13.98 years and for control group was 48.43±13.64 years. Male patients were 45.5% in cases and 54.5% in controls. Regarding social class, employees were 45.5% and 54.5%, housewives were 40.0% and 60.0%, and manual workers were 43.8% and 56.3% in cases and controls, respectively. No significant difference was found between cases and control. No significant association was found regarding pre-intervention assessment scores (THI, GHQ, BDI, PCASEE) between study and control group as shown in table (2).

RESULTS

The current study is randomized controlled trial. It included 60 patients who were divided into two groups.

Table (2): Tinnitus handicap inventory, general health questionnaire, Beck depression inventory, PCASEE quality of life questionnaire pre intervention between study and control group

	Cases n=22 n (%)	Control n=30 n (%)	Stat. test	P
Basal THI score				
Mild	7 (46.7)	8 (53.3)	0.423	0.809
Moderate	9 (37.5)	15 (62.5)		
Severe	6 (46.2)	7 (53.8)		
Basal GHQ score				
<9	0 (0.0)	0 (0.0)	0.001	1.000
>9	22 (42.3)	30 (57.7)		
Basal BDI score				
Mild	8 (47.1)	9 (52.9)	0.554	0.778
Moderate	8 (36.4)	14 (63.6)		
Severe	6 (46.2)	7 (53.8)		
Basal PCASEE Quality of life score				
Impaired	8(42.1)	11(57.9)	0.001	0.982
Less impaired	14(42.4)	19(57.6)		

χ²: Chi-square test

Table (3): Tinnitus handicap inventory, general health questionnaire, Beck depression inventory, PCASEE quality of life questionnaire post intervention between study and control group

	Cases (n=22)	Controls(n=30)	Stat. test	P
	n (%)	n (%)		
Post THI score				
Mild	9 (52.9)	8 (47.1)	$\chi^2 = 1.46$	0.481
Moderate	10 (40.0)	15 (60.0)		
Severe	3 (30.0)	7 (70.0)		
Post GHQ score				
<9	14 (100.0)	0 (0.0)	$\chi^2 = 26.12$	0.001*
>9	8 (21.1)	30 (78.9)		
Post BDI score				
Mild	15 (62.5)	9 (37.5)	$\chi^2 = 7.84$	0.024*
Moderate	6 (30.0)	14 (70.0)		
Severe	1 (12.5)	7 (87.5)		
Post PCASEE Quality of life score				
Impaired	2 (15.4)	11 (84.6)	$\chi^2 = 5.147$	0.023*
Less impaired	20 (51.3)	19 (48.7)		

χ^2 : Chi-square test, *: Significant p-value

Table (4): Tinnitus handicap inventory, general health questionnaire, Beck depression inventory, PCASEE quality of life questionnaire scores pre and post intervention in cases group

	Pre n (%)	Post n (%)	Stat. test	P
Post THI score				
Mild	7 (31.8)	9 (40.9)	$\chi^2 = -2.23$	0.025*
Moderate	9 (40.9)	10 (45.5)		
Severe	6 (27.3)	3 (13.6)		
Post GHQ score				
<9	0 (0.0)	14 (63.6)	$\chi^2 = -2.82$	0.005*
>9	22 (100.0)	8 (36.4)		
Post BDI score				
Mild	8 (36.4)	15 (68.2)	$\chi^2 = -2.97$	0.003*
Moderate	8 (36.4)	6 (27.3)		
Severe	6 (27.3)	1 (4.5)		
Post PCASEE Quality of life score				
Impaired	8 (36.4)	3 (13.6)	$\chi^2 = -2.23$	0.025*
Less impaired	14 (63.6)	19 (86.4)		

χ^2 : Chi-square test

*: Significant p-value

We found significant improvement of tinnitus related symptoms after intervention when compared to control group evidenced by improvement in GHQ, BDI, PCASEE scores when compared to control group. Otherwise, no significant difference was found regarding THI score between the two groups as shown in table (3). The study group showed significant decrease in tinnitus symptoms after intervention as

evidenced by significant improvement of GHQ, BDI, PCASEE, THI scores after treatment as shown in table (4). In the present study, we found no significant difference between patients with normal hearing and patients with hearing loss after CBT as shown in table (5). There was no statistical difference in loudness regarding pre and post intervention in study group as shown in table (6).

Table (5): Post cognitive behavioural therapy sessions regarding hearing loss

	Normal hearing	Hearing loss	Stat. test	P
Post THI score				
Mild	5 (55.6)	4 (44.4)	$\chi^2 = 4.53$	0.104
Moderate	1 (10.0)	9 (90.0)		
Severe	1 (33.3)	2 (66.7)		
Post GHQ score				
Not prone	5 (35.7)	9 (64.3)	$\chi^2 = 0.26$	0.604
Prone	2 (25.0)	6 (75.0)		
Post BDI score				
Mild	5 (33.3)	10 (66.7)	$\chi^2 = 0.48$	0.783
Moderate	2 (33.3)	4 (66.7)		
Severe	0 (0.0)	1 (100.0)		
Post PCASEE Quality of life score				
Impaired	1 (50.0)	1 (50.0)	$\chi^2 = 0.33$	0.563
Less impaired	6 (30.0)	14 (70.0)		

Table (6): Tinnitus loudness among cases before and after cognitive behavioural therapy sessions.

	Before CBT	Post-CBT	Stat. test	P
Right tinnitus loudness				
Mean± S.D.	40.28 ± 7.37	40.06 ± 7.34	t = 0.72	0.481
Range	30.0 - 60.0	30.0 - 60.0		
Left tinnitus loudness				
Mean± S.D.	43.13 ± 8.73	43.06 ± 8.58	t = 0.29	0.791
Range	30.0 - 60.0	30.0 - 60.0		

CBT: cognitive behavioural therapy t: Independent Samples t-test

DISCUSSION

Before intervention, there was no significant change in (THI, GHQ, BDI, PCASEE) ratings between the study and control groups. Consistent with our study Li et al.^[6] who found that before treatment, there was no significant difference in THI score between two groups (P >0.05). Also, Robinson et al.^[7] researchers discovered no significant differences between the two groups in terms of age, gender, ethnicity and educational attainment as well as tinnitus duration, HRSD and BDI scores, TQ, THI, MSPQ and PSC scores..

Tinnitus symptoms were significantly reduced in the current research's study group when therapy was implemented, as shown by substantial gains in the GHQ, BDI, PCASEE, and THI scores. Cognitive behavioural treatment may have had a role in reducing or eliminating this improvement's unfavourable association with tinnitus. As a result, it shifts from negative to more optimistic and realistic thoughts. As a result, even if they have tinnitus, people with tinnitus may go on normal live ^[8]. In agreement with our results Fuller et al. ^[4] tested the effectiveness of CBT in randomized studies vs no treatment. Treatment-induced tinnitus improvement was demonstrated to be possible with CBT). The Tinnitus Handicap Inventory converts this into a numerical value Tinnitus Handicap Inventory (THI). Depression may be reduced as a consequence of CBT.. Robinson et al.^[7] in their research which has been done to examine the effects of a short, "manualized" cognitive-behavioural group

therapy on tinnitus discomfort, quality of life and mental health issues such as depression. Based on the BDI, they noticed improvements in depression. Furthermore, Nolan et al. [9] in their research found a significant change between baseline and post-discharge assessment values for all outcome measures, including BDI, which evaluates depression symptoms.

Li et al. ^[6] declared substantial decreases in psychotic somatization and other symptoms of psychosis in the intervention group compared to the control group following intervention. There was no significant change in THI score before therapy between the two groups. After treatment, the THI score in each group was significantly lower than that before treatment, and that in study group was significantly lower than that in control group.

Many studies have evaluated the effect of cognitive behavioural therapy on tinnitus. Hesser et al. ^[10] stated that tinnitus-related symptoms as well as anxiety and sadness may be reduced by CBT, according to a new study. A follow-up study found that the positive effects of the treatment lasted for a long time. Andersson et al. ^[11] carried out a research investigation on 23 patients. Hearing and tinnitus evaluations were performed on all individuals before to their participation in the study. Six weekly two-hour group sessions were used to offer a CBT therapy program. For one week before and after treatment, participants completed validated self-report

assessments and kept daily diaries in which they recorded their feelings of irritation, loudness, and sleep quality. Participants in the control group received therapy at the same period as those in the study, but the treatment was delivered in a more condensed fashion over the course of three months. A considerable decrease in tinnitus-related distress was seen in the study results. As a result, CBT was preferable to no treatment. Andersson and Lyttkens,^[12] Research on tinnitus's psychological therapy has been included in this meta-analysis. Tinnitus annoyance was reduced by strong to moderate effects in controlled experiments. The findings on the loudness of tinnitus faded with time and were no longer present at the second visit. Patients with normal hearing and those with hearing loss did not change significantly after CBT, and there was no statistical difference in loudness in the study group before and after intervention. In agreement with our results, Grewal et al.^[13] stated that the subjective tinnitus loudness was not improved by CBT and was not addressed in the tinnitus retraining treatment research. In contrast to our results Martines-Devesa et al.^[14] in their study, they looked at eight RCTs. In all three groups (treatment, passive control, and active control), the loudness of tinnitus decreased, although the drop was not substantial. Rief et al.^[15] found tinnitus loudness (diary data) also decreased significantly from pre-treatment to follow up. Due to tinnitus loudness decreasing in the waiting list group as well, it was not possible to ascribe this decrease to the therapy. Due to these factors, a decrease in perceived tinnitus loudness may have been achieved just by doing the exam and keeping daily diaries.

The disparity between results may be explained by difference in the number of CBT sessions. Also, Reif et al.^[15] Patients were asked to assess the subjective loudness of their tinnitus, the subjective control they had over their tinnitus, and the length of their tinnitus perception in a tinnitus diary (in minutes) Results might differ because of differences in research' methodological quality. Tinnitus-specific self-report measures have been employed in most research to evaluate treatment outcomes. Other research used just non-validated self-report measures, such as visual analogue scales.

The regimen used in this study described before in many literatures. In this study, eight CBT sessions were offered for study group^[16]. The sample size is small as there were no studies in our area before, it is short term study to see if we make use of our results to be extended in larger study later.

CONCLUSION

CBT could be effective in reducing the impact of tinnitus on quality of life evidenced by improvement in PCASEE Quality of life scores. CBT for tinnitus appears to have some benefit for people who also experience depression evidenced by improvement in GHQ and BDI scores. No evidence of a significant difference in the subjective loudness of tinnitus as no improvement in tinnitus loudness. Nevertheless, we are

fully aware that the sample size is too small to draw a definitive conclusion out of our study.

Therefore, we recommend to systematically examine modules of CBT interventions or compares specific CBT protocols in order to reduce heterogeneity and further refine treatment protocols. Deliver CBT by healthcare professionals (trainee psychologists) to provide effective CBT for tinnitus is recommended then there would be scope to increase access to treatment. Another study to compare CBT versus alternative treatment is warranted to not to leave control for only waiting list. Alternative ways for CBT e.g.(on-line) could be administered. Another study included larger sample size.

Conflict of interest: No direct or indirect conflict of interest.

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الملخص العربي

العلاج السلوكي المعرفي لعلاج الطنين

داليا محمد المصطفى¹، نعيمه محمد إسماعيل²، هاله طه محمد³

¹وحدة طب السمع و الاتزان، مستشفى بنها التعليمي، بنها، جمهورية مصر العربية.

²وحدة طب السمع و الاتزان بقسم الانف و الاذن و الحنجرة، كلية طب بنات، جامعة الازهر، جمهورية مصر العربية.

³قسم النفسية و العصبية، كلية طب بنات، القاهرة، جامعة الازهر، جمهورية مصر العربية.

ملخص البحث

الخلفية: يسبب طنين الأذن الحاد العديد من الأعراض النفسية في كثير من الأحيان (مثل التوتر والإحباط وضعف التركيز والنوم المتقطع). قد يستفيد المصابون بطنين الأذن من العلاج السلوكي المعرفي، والذي ثبت أنه مفيد

الهدف: تقييم ما إذا كان العلاج السلوكي المعرفي فعالاً في إدارة المرضى الذين يعانون من طنين الأذن

الطرق: تم إعداد دراسة تجارب معشاة ذات شواهد في الوحدات السمعية وأقسام الطب النفسي في مستشفى الزهراء الجامعي ومستشفى بنها التعليمي. تكونت الدراسة من 60 مشاركاً، تم تقسيمهم إلى مجموعتين: المجموعة (1): مجموعة الدراسة: 30 حالة طنين تتلقى العلاج المعرفي السلوكي على مدار 8 أسابيع، فقط 22 مريضاً لديهم جلسات كاملة بينما رفض الآخرون إكمال الجلسات لأنهم لم يكونوا مهتمين. كان متوسط أعمارهم (46.23 ± 13.98) . كانوا 10 ذكور (45.5%) و 12 إناث (40.0%). المجموعة (2): مجموعة مراقبة قائمة الانتظار: 30 فرداً، متوسط أعمارهم (48.43 ± 13.64) . كانوا 12 ذكر (54.5%) و 18 أنثى (60.0%). التقييم السمعي الأساسي باستخدام مقياس السمع النقي (PTA)، وقياس الطلبة، وقياس سمع الكلام والمعايير النفسية الفيزيائية (طنين الأذن، ارتفاع طنين الأذن)، استبيانات (جرد إعاقة الطنين (النسخة العربية) استبيان الصحة العامة (GHQ)، جرد بيك للاكتئاب، استبيان جودة الحياة (PCASEE).

النتائج: ظهرت مجموعة الدراسة تحسناً ملحوظاً في الأعراض المرتبطة بطنين الأذن بعد التدخل عند مقارنتها بمجموعة التحكم التي يتضح من التحسن في درجات GHQ و BDI و PCASEE عند مقارنتها بمجموعة التحكم. خلاف ذلك، لم يتم العثور على فرق كبير فيما يتعلق بنتيجة THI بين المجموعتين

الاستنتاجات: يمكن أن يكون العلاج السلوكي المعرفي فعالاً في الحد من تأثير طنين الأذن على نوعية الحياة كما يتضح من التحسن في درجات جودة الحياة في PCASEE. ومع ذلك، فإننا ندرك تمامًا أن حجم العينة صغير جداً بحيث لا يمكن استخلاص نتيجة نهائية من دراستنا

كلمات مفتاحية: سلوكية، العلاج السلوكي المعرفي، ذهني، طنين

الباحث الرئيسي:

الاسم: داليا محمد المصطفى، وحدة طب السمع و الاتزان، مستشفى بنها التعليمي، بنها، جمهورية مصر العربية.

الهاتف: 01063201448

البريد الإلكتروني: daliaalmostafa272@gmail.com