
The Psychological Management of Tinnitus: Comparison of a Combined Cognitive Educational Program, Education Alone and a Waiting-List Control

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Abstract: Sixty subjects with chronic tinnitus were randomly allocated to one of three experimental conditions: (1) cognitive coping skills training (attention diversion, imagery training and thought management skills) combined with education, (2) education-only, or (3) waiting-list control. The two treatment groups improved significantly more than the waiting-list control on measures of frequency of use of coping strategies, benefits derived from the use of coping strategies, irrational beliefs and knowledge about tinnitus. Subjects who received the combined cognitive/education intervention demonstrated significantly greater reductions in distress and handicaps associated with tinnitus, and engagement in dysfunctional cognitions, than the subjects who received education alone. No significant effects were obtained on measures of depression, locus of control, or on daily ratings of subjective loudness, noticeability or bothersomeness of the tinnitus. At the 12-month follow-up, the differential treatment effects had dissipated. Although the treatment resulted in statistically significant effects, the size of the clinical effects is rather modest. Implications for the further development of treatment techniques are discussed.

INTRODUCTION

A relatively small body of research has examined the role of psychological interventions in alleviating the psychological distress which may be associated with chronic tinnitus. The earliest controlled studies investigated the application of behavioral techniques such as relaxation training and biofeedback, e.g.^{1,2,3,4} More recent controlled outcome research has tended to examine the efficacy of interventions which incorporate some cognitive component such as attention diversion, distraction and imagery.^{5,6,7,8} This research suggests that such approaches do not produce alterations in the acoustic properties of tinnitus, but may produce improvements in level of psychological distress and coping ability.

Studies which have investigated relaxation training techniques combined with training in distraction, or

attention diversion exercises reveal beneficial improvement.^{5,6,7,8} However, the cognitive components only represented a small proportion of the total treatment package. This raises the possibility that the rather modest treatment effects that have been obtained to date may be strengthened by devoting a greater proportion of the total package to cognitive interventions. A further question which is raised by the existing research concerns the potential impact of providing tinnitus sufferers with reassurance and information about tinnitus. These issues received some attention in a study conducted by Jakes et al.⁵ which included an "orientation" phase prior to the receipt of other treatments. However, in that study there was no control condition against which the effectiveness of the orientation phase could be assessed. Thus, the specific effects of education and information on tinnitus distress and coping ability remains unknown.

Much of the available research on psychological approaches is characterised by methodological shortcomings, including: (1) small sample sizes; (2) lack of specific and standardised measures of treatment outcome; (3) failure to use clearly defined criteria for selecting

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subjects, particularly with regard the level of distress associated with tinnitus; (4) lack of any clear definition of the standards by which clinical significance of the reported treatment effects is determined; and (5) lack of long-term follow-up to assess the maintenance of effects over time.

The present study was designed to address some of the issues and questions raised by previous research. Firstly, an effort was made to incorporate some methodological improvements. Secondly, the study aimed to investigate the effects of devoting a greater proportion of the total treatment to instructing subjects in cognitive coping strategies, including attention diversion, distraction and imagery. These cognitive strategies were not combined with any procedures such as relaxation training. The effects of this treatment were compared to an alternative approach in which subjects were provided with reassurance, information and education about tinnitus. In contrast to the study conducted by Jakes et al.⁵ the educational program in the present study was purely didactic. No reference was made to the potential role of psychological factors, or of attitudes and beliefs. Research in the broader field of behavioral health psychology has investigated the impact of educational intervention in the management of a variety of medical conditions. However, it would appear that the mere acquisition of knowledge does not in itself lead to any specific behavior change.^{9,10} Thus, it was anticipated that the educational program would lead to an increase in knowledge, but not to any other specific benefits. The methodological improvements incorporated into the design of the experiment included: (1) recruitment of a relatively large sample of subjects; (2) selection of subjects with a demonstrable level of distress associated with tinnitus; (3) inclusion of specific and standardised measures of treatment outcome, and (4) inclusion of adequate follow-up (12 month) to assess the maintenance of effects over time.

METHOD

Design

The experiment consisted of a three (experimental conditions) by three (occasions) design. The three experimental conditions were: (1) cognitive coping skills training combined with education; (2) education alone, and (3) a waiting-list control. The three occasions of measurement were: pre-treatment, post-treatment, and 12-months follow-up. The subjects were randomly allocated to one of the three experimental conditions.

Subjects

Sixty-five subjects were selected from a total sample of 99 tinnitus patients who were primarily referred by

audiologists and/or otolaryngologists at a Veterans Hospital out-patients clinic. The subjects were accepted into the program provided that they met the following criteria: (1) a primary complaint of chronic tinnitus (i.e., duration greater than six months), (2) the tinnitus has been assessed by both an otolaryngologist and an audiologist, (3) traditional medical and audiological treatments were not recommended, or had been attempted and had failed, (4) no provision of a hearing aid, masker or tinnitus suppressive medication within the previous six months, (5) a demonstrated level of distress associated with tinnitus as indicated by a total score of at least 17 points on the Tinnitus Reaction Questionnaire (TRQ),¹¹ (6) able to read and speak English, (7) willing to participate in a research-oriented treatment program.

Of the 65 subjects who were selected for inclusion, 63 commenced the program. A further three subjects discontinued during the intervention, resulting in a total of 60 subjects who completed the program. This final sample consisted of 52 males and eight females. The mean age was 64.6 years (range = 33-77 years). The majority of the sample (n = 54) were currently retired. Seven subjects reported their tinnitus to be located in the left ear; seven in the right ear; 37 described it as being "all over the head" and nine described it as being located "external to the head". Forty-eight subjects reported tinnitus accompanied by hearing impairment.

Treatment Procedure

The two treatment programs (combined cognitive coping skills and education, and education alone) were of equivalent duration. Both treatment programs involved one 90-minute session per week for six weeks. Treatment was conducted in small groups of five to seven subjects. All psychological treatment was provided by a clinical psychologist (J.L.H.) who had four years experience in the provision of cognitive-behavioral therapies with individual clients and groups.

Cognitive Coping Skills Training Plus Education

The cognitive techniques employed in this treatment were based largely on the work of Turk, Meichenbaum and Genest¹² in the area of chronic pain management, and the work of Bakal¹³ in the application of psychological interventions for chronic headache. Adaptations were made to the techniques to allow their application to the management of tinnitus. It was explained to subjects that often it is a person's reaction to tinnitus, rather than the sound itself which may lead to distress. Subjects were encouraged to learn to approach the problem of tinnitus in more adaptive and constructive ways, and to regard their reaction to tinnitus as potentially manageable and

subject to modification as emphasised by Sweetow.^{14,15} Subjects were informed that it is likely that there are several factors which may contribute to a person's reaction to their tinnitus. It was explained that the amount of attention that is directed towards the tinnitus may be important and that focusing excessive attention on the tinnitus may heighten the sensation and associated distress. Subjects were informed that people can influence what they choose to attend to, and can re-direct their attention from one aspect of their environment to another. They were trained in attention diversion strategies in order to achieve this goal (e.g., guided exercises whereby they practiced re-focussing attention from internal stimuli to external stimuli). One exercise which was used was to train subjects to focus on the tinnitus and then to switch their attention to another part of the body such as the toes. Subjects were taught to switch back and forth to various stimuli, such as other parts of the body, kinaesthetic cues (heat, muscle tension) external noises, or other external visual stimuli. The main aim of this technique is to help the person to learn that the location of their attention can be brought under self-control. Imagery training formed a further component of treatment. Mental imagery was presented as an important part of behavior which is closely related to attention diversion. Several suggestions were offered of ways to use imagery techniques to transform the tinnitus (e.g., imagine that the sound of tinnitus is not just a sound in your head but imagine it is actually what it sounds like - an external source of sound). Imagery techniques involving focusing on a pleasant mental image (e.g., a favourite place) or even, neutral images (e.g., imagine the wheel of a watermill turning) were demonstrated. Subjects practiced this technique under guidance from the therapist in the sessions. In addition to the attention diversion exercises and mental imagery techniques, subjects were introduced to techniques to identify and challenge negative automatic thoughts.¹⁶ It was explained that the interpretation of the noises, and the train of thoughts associated with tinnitus might also play an important role in their reaction to the tinnitus. Subjects were instructed in strategies to change distressing, negative thoughts to more rational coping-oriented statements, and to use the presence of distressing thoughts as a cue to employ positive coping statements. This approach, known as cognitive restructuring, involves the identification of thoughts which frequently accompanied distress about the tinnitus, and the teaching of skills which the person could use to challenge any dysfunctional thoughts. For example, a person may be aware that they engage in the following thoughts: "the tinnitus has ruined my life", or "I can never experience peace and quiet again". The therapist assists the client to identify the irrational or unconstructive nature of such

thoughts, and to develop alternative ways of thinking (i.e., counter-statements) about the tinnitus when they notice that they are engaging in these thoughts. Examples of counterstatements for the above-mentioned thoughts could include: "the tinnitus is unpleasant, but I can get control over my reactions to it - I can do things to make my life better despite the tinnitus", "because my tinnitus is part of me, there is no need to fight against it", "I can get peace through relaxation even if I cannot experience total quiet", or "my tinnitus has been this bad before, but it does not mean that it will stay like this - in fact, it normally improves after a while". In practice, the precise counterstatements are developed on an individual basis because it is important that the person attaches a high degree of credibility to them. In a group context, ideas can be generated by members of the group, but the individual is encouraged to consider which thoughts would be useful in real life. Finally, lack of knowledge or misconceptions were also cited as potential contributors to adapting a maladaptive reaction to tinnitus. Subjects were provided with education about tinnitus to ensure thorough knowledge and to resolve any misconceptions. Each subject received a written treatment manual which covered the attention diversion strategies, imagery techniques, thought management skills and the educational material. They were also supplied with audio-cassettes of attention diversion and imagery exercises for use in home practice of the techniques.

Education

The aim of this treatment program was solely to educate subjects about tinnitus. The material was presented in a written treatment manual. The sessions were didactic in nature and followed a sequence of specific topics each week. Topics covered were: (1) the auditory system, language and speech, and the nature of tinnitus; (2) audiological assessment; (3) causes of tinnitus; (4) theories of tinnitus and medical treatments; (5) audiological treatments; (6) history of tinnitus, and details of the Australian Tinnitus Association. Subjects of this education-only program were not instructed in any active coping skills. The educational material was identical to that provided to subjects in the combined cognitive coping skills/education program. However, the material was provided at a slower pace in the education-only program.

Waiting-List Control

Subjects assigned to the waiting-list control condition were informed that due to present demands and limited facilities their participation in the program would be delayed. Subjects were assured that they would be treated when further groups were scheduled. Waiting-list subject

received treatment (cognitive coping skills/education) immediately following the post-treatment assessment period.

Measures

Treatment outcome was assessed via several self-report questionnaires. All questionnaires were administered at the three assessment occasions with the exception of one measure of knowledge about tinnitus which was only administered at pre-treatment and post-treatment. In addition, a self-monitoring record (Tinnitus Rating Form) was administered at the three assessment occasions. This rating form was completed for seven subsequent days at each occasion. The experimenter (J.L.H.) conducted all of these assessments.

Tinnitus Reaction Questionnaire (TRQ)

The TRQ is a 26-item self-report questionnaire designed to assess the psychological distress associated with tinnitus.¹¹ The items describe some of the potential effects tinnitus might have on an individual's lifestyle, general well being and emotional state. Respondents are asked to indicate the extent to which the effects listed have applied to them over the past week. Each item is rated on a five-point scale where 0 = not at all; 1 = a little of the time; 2 = some of the time; 3 = a good deal of the time; 4 = almost all the time. The scoring procedure for the TRQ involves the simple addition of the number circled by the respondent for each of the 26 questions to obtain a total score with a potential range from 0 to 104. All items are scored in the same direction since they are all negative descriptors. Thus, a high score represents worse distress. The psychometric properties of the TRQ indicate good test-retest reliability and high internal consistency.¹¹

Tinnitus Handicaps Questionnaire (THQ)

The THQ is a 28-item self-report questionnaire designed to measure perceived degree of handicap due to tinnitus.¹⁷ The items describe potential effects of tinnitus on hearing, lifestyle, health and emotional status. Respondents are asked to assign a number between "0" and "100" to represent how much they agree with each specific item, with "0" indicating strongly disagree with the item and "100" indicating strongly agree with the item. The THQ appears to possess good internal consistency but there are no data on test-retest reliability.¹⁷ In the present study the scoring procedure for the THQ involved the simple addition of the number assigned for each of the 28 items. This total score was then divided by 28 to obtain a mean total score.

Tinnitus Effects Questionnaire (TEQ)

The TEQ is a self-report questionnaire designed to assess dimensions of complaint about tinnitus.^{18,19} It consists of 52 statements which describe commonly reported effects of tinnitus on emotions, sensory and perceptual difficulties, and sleep difficulties. For each item the response alternatives are "True", "Partly True" and "Not True". The presence of complaint is almost always indicated by an affirmative response with the exception of items 1, 7, 32, 40, 44, and 49.

Hallam et al.¹⁹ conducted a factor analysis which revealed three main factors: "sleep disturbance", "emotional distress", and "auditory perceptual difficulties". Jakes, Hallam, McKenna, and Hinchcliffe²⁰ report that an "irrational beliefs scale (IB)" can also be extracted from the TEQ based on questions which were designed to tap absolutist, all-or-none thinking and catastrophic beliefs about tinnitus. Hallam et al.¹⁹ found that TEQ scores discriminate subjects who do and do not regard tinnitus as a significant problem. Jakes et al.²⁰ report satisfactory test-retest reliability figures for each subscale. Only the "Emotional Distress" scale scores and "Irrational Beliefs" scale scores were selected for inclusion as outcome measures because changes on these measures have been reported following psychological intervention.⁵

Tinnitus Cognitions Questionnaire (TCQ)

The TCQ is a 26-item questionnaire designed to assess the kinds of cognitions in which people might engage in response to their tinnitus.²¹ There are 13 negative items (items 1 to 13), followed by 13 positive items (items 14 to 26). For each item, respondents are asked to indicate how often they have been aware of thinking a particular thought on occasions when they have noticed their tinnitus. Ratings are made on a 5-point Likert rating scale with the extreme points ranging from "never" to "very frequently". The negative items are scored 0 to 4, while the positive items are reverse scored. Thus, a high score represents a greater tendency to engage in negative cognitions in response to tinnitus, and low engagement in positive cognitions. Psychometric analyses of the TCQ indicate adequate test-retest reliability ($r = 0.88$) and very good internal consistency (Cronbach alpha = 0.91).²²

Tinnitus Coping Strategies Questionnaire (TCSQ)

The TCSQ is a self-report questionnaire designed specifically for the present study in order to assess the use of cognitive and behavioral coping strategies in response to tinnitus.²² Items for the TCSQ were constructed primarily using a variety of coping models or strategies described in the general literature on stress

and coping,²³ and those described in the literature on pain coping.^{24,12} Indeed, many of the items were drawn from Rosenstiel and Keefe's Pain Coping Strategies Questionnaire²⁴ and adapted for use with tinnitus sufferers. The TCSQ consists of 33 items which represent a variety of cognitive and behavioral coping strategies. Respondents were asked to rate each of the 33 items on two separate rating scales. First, they were asked to rate how often they have been using the coping strategy whenever they are aware of their tinnitus (TCSQ - Frequency scale). This rating was made on a 0-4 scale, where 0 = not at all; 1 = a little of the time; 2 = about half of the time; 3 = a good deal of the time; 4 = almost all of the time. Second, respondents were asked to rate each item according to how helpful they found each coping strategy (TCSQ - Benefits scale). This rating was made on a 0-4 scale where, 0 = not at all helpful; 1 = a little helpful; 2 = moderately helpful; 3 = very helpful; 4 = extremely helpful. Two total scores were obtained by summing the responses to the two rating scales separately with a maximum possible score for each scale being 132. A higher score on each subscale indicates greater frequency of use of coping strategies and greater benefit from the strategies. Psychometric analyses of the TCSQ indicate both scales possess adequate reliability in terms of internal consistency and test-retest stability (TCSQ Frequency scale, Cronbach alpha = 0.88, test-retest correlation = 0.90; TCSQ-Benefits scale, Cronbach alpha = 0.88, test-retest correlation = 0.91).²²

Tinnitus Knowledge Questionnaire (TKQ)

The TKQ is a self-report questionnaire specifically designed for the present study in order to assess an individual's knowledge of tinnitus and its management and to evaluate the effects of the education program on knowledge about tinnitus.²²

Because central interest focussed on the immediate impact of education on knowledge, the TKQ was only administered at pre-treatment and post-treatment. A total of 27 items were generated and the questionnaire was designed along a multiple choice format. Respondents were asked to read each question and then select the correct answer from a choice of four or five alternatives. For scoring purposes the total of correct responses was summed and the maximum total score is 27.

Beck Depression Inventory (BDI)

The BDI is a widely used self-report measure of depression which has good evidence in support of its reliability and validity.^{25,26} The BDI consists of 21 items, each of which contains four descriptions of depression-related thoughts and behavior on a continuum from nor-

mal through to depressive content. The response format to each item is scored 0 to 3, and these item scores are added to form a total score. The total score has a potential range from 0 to 63. A measure of depression was included in order to provide a more general index of emotional state which was not directly linked to tinnitus.

Locus of Control of Behavior Scale (LCB)

The LCB is a 17-item self-report scale designed to assess locus of control of behavior - the extent to which a person perceives events as being a consequence of his/her own behavior, and therefore, potentially under personal control.²⁷ Respondents are asked to indicate the degree to which they agree with each item. Degree of agreement is rated on a 0-5 point scale with the 10 items relating to external control being scored 0 = strongly disagree; 1 = generally disagree; 2 = somewhat disagree; 3 = somewhat agree; 4 = generally agree; 5 = strongly agree. The seven items which relate to internal control are reverse scored. High scores on the LCB, therefore, indicate externality. This measure was included in order to examine whether changes in locus of control occur as a function of exposure to self-management intervention.

Self-Monitoring of Tinnitus

Monitoring forms were designed along similar lines to the monitoring devices employed in headache and chronic pain research. Subjects were provided with monitoring forms to be completed for seven consecutive days. For each day subjects were asked to rate: (1) the amount to which they noticed their tinnitus on a 0-4 scale; (2) the loudest their tinnitus was on a 0-4 scale; (3) the degree to which they were bothered by their tinnitus. Subjects were instructed to complete the self-monitoring forms at the end of each day throughout each monitoring period. For scoring purposes, the score for each day on the three rating scales were summed and divided by seven to obtain a mean score for each of the three rating scales.

Statistical Analysis

Thirteen dependent variables were used to assess outcome: TRQ, THQ, TEQ-Emotional Distress, TEQ-Irrational Beliefs, TCQ, TCSQ-Frequency, TCSQ-Benefits, TKQ, BDI, LCB and three self-rating measures (loudness, noticeability, bothersomeness). Each variable was analysed separately in a repeated measures analysis of variance. In view of the large number of dependent variables, the Bonferroni correction was adopted as a means of avoiding inflation of the Type I error rate.²⁸ The following planned orthogonal contrasts (between groups) were performed: (1) cognitive coping skills/

education, and education only conditions versus the waiting-list control condition; (2) the cognitive coping skills/education condition versus the education-only condition. These between-groups contrasts were factorially combined with comparisons between occasions (pre-treatment versus post-treatment, pre-treatment versus 12-month follow-up). Pre-treatment differences between conditions on each dependent variable were examined without application of the Bonferroni correction.

RESULTS

The means, standard deviations, and numbers of subjects for each variable at pre-treatment, post-treatment, and 12-month follow-up are presented in Table 1. It should be noted that waiting-list subjects received treatment immediately following the post-treatment assessment occasion. Therefore, assessments conducted on waiting-list subjects at the 12-month follow-up represent assessments conducted after their receipt of treatment.

Measure	Occasion	Condition		
		Cognitive/ Education	Education Alone	Waiting List
TRQ	Pre Mean	43.20	44.85	47.46
	SD	21.19	21.96	21.63
	n	(20)	(20)	(20)
	Post Mean	34.35	45.45	46.60
	SD	19.95	22.28	21.89
	n	(20)	(20)	(20)
	F-up Mean	44.06	45.94	46.29
	SD	21.81	21.56	21.50
	n	(16)	(17)	(14)
THQ	Pre Mean	54.06	57.39	59.95
	SD	18.17	20.79	21.43
	n	(20)	(20)	(20)
	Post Mean	43.72	59.34	60.88
	SD	15.46	19.44	18.95
	n	(20)	(20)	(20)
	F-Up Mean	52.47	55.23	55.91
	SD	16.14	18.80	17.03
	n	(16)	(17)	(14)
TEQ-ED	Pre Mean	10.20	10.70	11.60
	SD	2.30	2.77	2.85
	n	(20)	(20)	(20)
	Post Mean	8.30	11.00	11.45
	SD	0.73	2.36	1.95
	n	(20)	(20)	(20)
	F-Up Mean	8.87	10.52	8.42
	SD	1.31	1.66	0.75
	n	(16)	(17)	(14)

Measure	Occasion	Condition		
		Cognitive/ Education	Education Alone	Waiting List
TEQ-IB	Pre Mean	8.75	7.75	7.50
	SD	2.40	1.71	1.57
	n	(20)	(20)	(20)
	Post Mean	8.20	7.20	8.70
	SD	1.57	1.76	1.34
	n	(20)	(20)	(20)
	F-Up Mean	8.68	7.05	7.00
	SD	2.21	1.24	1.51
	n	(16)	(17)	(14)
TCQ	Pre Mean	51.30	52.00	39.15
	SD	19.02	17.83	11.27
	n	(20)	(20)	(20)
	Post Mean	39.85	51.60	39.40
	SD	15.74	15.47	10.75
	n	(20)	(20)	(20)
	F-Up Mean	39.06	53.11	31.92
	SD	15.69	15.81	14.44
	n	(16)	(17)	(14)
TCSQ-F	Pre Mean	36.00	35.45	38.50
	SD	16.53	23.25	25.57
	n	(20)	(20)	(20)
	Post Mean	42.45	36.55	34.30
	SD	16.43	26.05	20.46
	n	(20)	(20)	(20)
	F-Up Mean	39.75	34.82	40.00
	SD	13.46	16.36	13.29
	n	(16)	(17)	(14)
TCSQ-B	Pre Mean	35.25	29.50	30.15
	SD	19.86	26.25	23.95
	n	(20)	(20)	(20)
	Post Mean	43.45	31.70	28.15
	SD	19.41	26.61	21.81
	n	(20)	(20)	(20)
	F-Up Mean	37.12	31.58	39.92
	SD	16.59	16.21	16.34
	n	(16)	(17)	(14)
TKQ	Pre Mean	12.15	10.20	9.60
	SD	5.86	5.66	4.34
	n	(20)	(20)	(20)
	Post Mean	16.30	15.50	10.65
	SD	4.70	4.28	5.11
	n	(20)	(20)	(20)
	F-Up Mean	-	-	-
	SD	-	-	-
	n	-	-	-

Measure	Occasion	Condition		
		Cognitive/ Education	Education Alone	Waiting List
BDI	Pre Mean	13.20	10.30	10.85
	SD	7.84	9.02	6.29
	n	(20)	(20)	(20)
	Post Mean	11.90	11.45	11.50
	SD	6.94	8.58	6.01
	n	(20)	(20)	(20)
	F-Up Mean	11.00	13.00	11.42
	SD	7.61	9.57	9.14
	n	(16)	(17)	(14)
LCB	Pre Mean	27.00	28.85	32.85
	SD	10.33	15.24	9.84
	n	(20)	(20)	(20)
	Post Mean	26.45	30.35	29.75
	SD	8.28	10.99	7.11
	n	(20)	(20)	(20)
	F-Up Mean	29.25	37.11	31.07
	SD	7.01	13.61	7.78
	n	(16)	(17)	(14)
Loudness	Pre Mean	2.78	3.05	3.06
	SD	0.91	0.82	0.90
	n	(20)	(20)	(20)
	Post Mean	2.76	2.83	3.03
	SD	1.07	0.73	0.99
	n	(20)	(20)	(20)
	F-Up Mean	2.75	3.17	3.35
	SD	0.85	0.95	0.74
	n	(16)	(17)	(14)
Noticed	Pre Mean	2.86	3.16	2.84
	SD	1.03	0.87	0.97
	n	(20)	(20)	(20)
	Post Mean	2.63	2.96	2.84
	SD	1.18	0.78	0.96
	n	(20)	(20)	(20)
	F-Up Mean	2.56	3.05	2.71
	SD	1.09	1.08	1.06
	n	(16)	(17)	(14)
Bother	Pre Mean	2.64	3.04	2.66
	SD	0.84	1.02	0.95
	n	(20)	(20)	(20)
	Post Mean	2.31	2.77	2.77
	SD	0.91	0.64	0.86
	n	(20)	(20)	(20)
	F-Up Mean	2.25	2.88	2.21
	SD	1.06	1.11	0.89
	n	(16)	(17)	(14)

Pre-treatment Comparisons

No significant differences between groups at pre-treatment were found on any contrast for the TRQ, THQ, TEQ, TKQ, BDI, LCB, TCSQ-frequency, TCSQ-benefits, and ratings of subjective, loudness, noticeability, or bothersomeness. However, there was a significant difference in TCQ scores between the two treatment conditions and the waiting-list control condition, ($F(1,57) = 7.74, p < 0.01$). The waiting-list condition scored significantly lower on the TCQ indicating less of a tendency to engage in negative cognitions in response to their tinnitus than subjects in the two treatment conditions. Mean scores on the TCQ for the two treatment conditions were relatively equivalent at pre-treatment.

Post-treatment

There were significant overall effects for time on the TRQ, $F(1,57) = 10.01, p < 0.05$, TCSQ-Benefits, $F(1,57) = 9.11, p < 0.05$ and TKQ, $F(1,57) = 52.78, p < 0.01$. All these effects were in the direction of improvement. Subjects assigned to the two treatment conditions improved significantly more than subjects in the waiting-list control condition on the TEQ-Irrational Beliefs scale $F(1,57) = 25.00, p < 0.01$, TCSQ-Frequency, $F(1,57) = 9.24, p < 0.05$, TCSQ-Benefits, $F(1,57) = 13.39, p < 0.01$ and TKQ, $F(1,57) = 12.93, p < 0.01$. Subjects assigned to the combined cognitive/education condition improved significantly more than subjects in the education only condition on the TRQ, $F(1,57) = 16.19, p < 0.01$, THQ, $F(1,57) = 12.91, p < 0.01$, TEQ-Emotional Distress scale, $F(1,57) = 15.45, p < 0.01$, and TCQ, $F(1,57) = 9.89, p < 0.05$.

Follow-up

There were significant overall effects for time on the LCB and TEQ-Emotional Distress scale. These effects were in the direction of improvement. The repeated measures ANOVAs revealed no significant pre-treatment to 12-month follow-up differences on any of the planned Group x Time contrasts for any of the dependent variables.

DISCUSSION

This study was designed to investigate the relative efficacy of a combined cognitive and educational intervention in the management of the psychological sequelae associated with chronic tinnitus. This experimental condition was compared to education-alone and a waiting-list control condition. The Bonferroni-adjusted statistical analyses indicated that there were significant (overall) within-subjects pre-treatment to post-treatment

improvements on measures of distress associated with tinnitus, benefits derived from coping strategies and knowledge about tinnitus. Subjects who received treatment (combined cognitive/education or education alone) improved significantly more than waiting-list controls on measures of frequency of use of coping strategies and benefits derived from such coping strategies (TCSQ-F and TCSQ-B), irrational beliefs (TEQ-IB scale), and knowledge about tinnitus (TKQ). Subjects who received the combined cognitive-education intervention demonstrated significantly greater reductions in distress (TRQ and TEQ-Emotional Distress scale) and handicaps associated with tinnitus (THQ), and dysfunctional cognitions (TCQ), than subjects who only received educational input. No significant effects were obtained on measures of depression, locus of control, or on daily ratings of subjective loudness, noticeability or bothersomeness.

The finding of greater change on the measures of distress and handicap in the combined cognitive/education intervention, in comparison with the education-alone program or the waiting list control condition, suggests that neither non-specific treatment factors nor the passage of time are likely to be responsible for the improvements. Rather, it would appear that the observed improvements may be attributed to the particular components of the cognitive/educational intervention. The education program was designed as an intervention in its own right. However, it would be expected that both active treatment conditions would include non-specific components which may contribute to any observed effect. In light of the failure of the education-alone treatment to produce beneficial outcomes on tinnitus distress, it could be argued that non-specific factors contributed little to the observed effects in the cognitive/education program.

Both education-alone and the combined cognitive-educational program produced increases in the reported use of coping strategies, decreased engagement in irrational beliefs, and improvements in level of knowledge about tinnitus. Thus, education may have the impact of increasing knowledge and may lead tinnitus sufferers to report the use of coping strategies, but it does not produce any changes in tinnitus-related distress or handicap. The specific benefits on psychological distress were only observed in those subjects who received the cognitive component in addition to education.

The combined cognitive/education condition also resulted in changes in dysfunctional thinking as measured by the TCQ. Of course, results obtained for the TCQ are difficult to interpret because there was a significant pre-treatment difference between the three groups. That is, at pre-treatment waiting-list subjects obtained significantly lower scores compared with the combined cognitive/education group and education-alone group. These latter

two groups obtained relatively equivalent scores. Thus, irrespective of the problem with the waiting-list subjects, the combined group showed significant improvements on the TCQ compared to the education-only group.

Despite the statistically significant improvement in tinnitus distress (TRQ) for the cognitive/education intervention compared with education-alone, it should be recognised that the post-treatment mean score for the cognitive/education group remained well above the criterion for entry into the study. The post-treatment mean score for the cognitive/education group was 34 points which remains well above the minimum criterion for entry (TRQ greater than or equal to 17). Similarly the THQ mean displayed a reduction from 54 to 43.7. Whilst the results on both the TRQ and THQ suggest that the cognitive/educational approach may be beneficial, the gains should be considered as modest in terms of their clinical significance.

At 12-months follow-up, the differential effects found at post-treatment between the combined cognitive/education treatment and the education-alone treatment had dissipated. At this point there were no significant differences in improvement between the cognitive/education and education-alone conditions on any of the dependent measures. Thus, although the results for the cognitive/education treatment are positive in the short-term, the long-term efficacy of this treatment is less encouraging.

Some caution is clearly needed in the interpretation and generalization of the results of the present study although the methodological strengths of the study do represent an improvement on some of the shortcomings noted in much of the previous research in this area. The strengths of the study are: the inclusion of a waiting-list condition to control for the effects of the passage of time; selection of subjects according to a demonstrated level of distress associated with tinnitus; inclusion of a relatively large sample; and the employment of several measures specifically designed to assess psychological and emotional sequelae of tinnitus (TRQ; TEQ; THQ). In addition, statistical analyses of the results employed the Bonferroni correction to guard against the possibility of increased risk of Type I errors when a number of dependent variables were being analysed. This approach represents a far more stringent and conservative analysis than that employed in many of the earlier published reports. Thus, the significant results obtained in this study may be accepted with confidence.

The present study provides evidence that a psychological treatment which consisted of training in cognitive strategies (attention diversion, distraction and imagery) is effective in producing an amelioration of the

psychological and emotional sequelae which may be associated with chronic tinnitus. This finding is reflected in the significant improvements observed on measures of distress and handicaps associated with tinnitus, and engagement in negative tinnitus-related cognitions. Despite the changes on these questionnaire measures, the psychological treatment employed in the present study failed to elicit any corresponding alterations in the daily diary ratings of bothersomeness, noticeability, and subjective loudness. The lack of any significant change in ratings of noticeability is consistent with the findings of studies which have employed similar measures, such as ratings of awareness.^{1,2} However, the lack of treatment effects on the ratings of noticeability is surprising given that the treatment in the present study aimed to teach subjects to divert their attention away from their tinnitus. One might expect that this would result in their noticing their tinnitus to a lesser degree, but this expectation is not portrayed in the daily rating measure. It is possible that asking subjects to monitor the degree to which they noticed their tinnitus in itself produces some bias in their self-report. An alternative explanation for the discrepant findings on daily diary measures may relate to semantic differences in the various daily diary recordings used in different studies. There are differences between studies in terms of the frequency of monitoring and time of day at which it occurs.

Despite the lack of any treatment effects on daily diary ratings in this present study, an amelioration in distress was observed for the combined cognitive/education group. This finding is reflected in the three self-report questionnaires: TRQ, THQ, TEQ-Emotional Distress. The consistency of this effect on these three measures suggests that one can be reasonably confident in the result. However, it must be acknowledged that these measures are all self-report questionnaires and that the experimenter conducted treatment and assessment sessions. Thus, one cannot rule out the potential impact of demand characteristics. Furthermore, it has been proposed by Kirsch and colleagues³ that global rating of symptoms may overestimate the magnitude of improvement.

In the present study treatment was conducted over six, ninety-minute sessions with half of the time being devoted to educational material, and the other half to the cognitive strategies. Therefore, the overall treatment time devoted to the cognitive components of treatment was only brief. Extending the length of treatment represents an issue worthy of further study. Future research must include lengthy follow-up, and efforts need to be made not only to determine ways of improving on the modest effects of treatment but of ensuring maintenance of treatment gains over time.

CONCLUSION

The results obtained in the present study suggest that cognitive interventions such as training in attention diversion, distraction, and imagery produce an amelioration in the psychological distress and handicaps associated with tinnitus, and diminished engagement in dysfunctional tinnitus-related cognitions. These improvements were found to be greater than the provision of an educational program or waiting-list control. Further research must endeavour to examine methods of obtaining broader and larger treatment effects which are both clinically relevant and more robust over time.

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ACKNOWLEDGMENT

The authors wish to thank A. Crittenden, M. Jones and Mrs. D. Sheridan, Audiologists, Concord Hospital, Sydney, Australia for their assistance in this research.