

Results of tinnitus retraining therapy

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A retrospective study of 483 patients were offered Tinnitus Retraining Therapy (TRT) based on the Jastreboff neurophysiological model, at the London Tinnitus and Hyperacusis Centre. 381 attended at 6–12 months and of these 224 attended a final appointment, over a median period of 21 months. Of the 224 patients receiving full TRT, 83.7% achieved a significant benefit using the 40% improvement criteria. The group that did not reach this significance level did however show a beneficial change in tinnitus effect on life.

Introduction

At the London Tinnitus and Hyperacusis Centre patients with tinnitus and hyperacusis form the majority of our referrals. However a full spectrum of neuro-otological and otological conditions are encountered and treated. Over 95% of tinnitus and hyperacusis patients enter into a Tinnitus Retraining Therapy (TRT) programme, and all patients are offered this option. This is an habituation based treatment using the Jastreboff neurophysiological model where they are treated by a multi disciplinary team. The centre deals with many tertiary referrals, where treatment has been unsuccessful elsewhere.

This is an observational study carried out by the team and has not been subjected to randomisation and is not of a rigorous experimental design. It has been undertaken to give a realistic idea of the expectation and outcome of TRT in a clinic setting.

Method

Data has been taken from those patients seen between 1997 and 1999. All patients were seen by an otologist (mostly the second author) and were referred to the audiologist (first author) for management by TRT. Some patients were in a second term of treatment. TRT was carried out according to its strict criteria [1,2].

After audiometric evaluation and careful history taking [2] patients were allocated to Jastreboff diagnostic categories and treatment decisions made in accordance with this regime:

Category 1 with tinnitus, and no significant hearing difficulties;

Category 2 with tinnitus, and significant subjective hearing difficulties;

Category 3 hyperacusis with or without tinnitus, hearing loss irrelevant, and having no kindling effect as in Category 4;

Category 4 hyperacusis with or without tinnitus and with a prolonged effect on symptoms after noise exposure (kindling);

Category 0 tinnitus presenting as a minor problem, prolonged treatment not indicated.

Treatment decisions for:

Category 1 directive counselling and sound enrichment often using noise generators;

Category 2 counselling and sound enrichment with hearing aids to amplify environmental sound;

Category 3 counselling and desensitisation using noise generators;

Category 4 intensive counselling, sound enrichment with or without noise generators;

Category 0 one or two sessions of directive counselling with advice on sound enrichment.

For the purpose of this study the measurements used were:

- (1) Percentage awareness of tinnitus over the previous week during waking hours;
- (2) Percentage of the time it causes distress or annoyance;
- (3) Number of life factors affected (including concentration, quiet recreational activities, sleep, work, social, sport or family activities).

Data were recorded during a direct, structured interview with the patient, as we have found this to be more accurate than questionnaire data, although this can sometimes bias the answers.

Results

These are presented in three data sets. The first data set is from the first visit, and the second data set

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between six to twelve months after the first visit. The third and final data set was taken at the completion of treatment, or at the last clinic visit for those still in treatment. Some patients required to be seen more frequently than every six months, others delayed their second visit, so the second data set is taken from the visit closest to six months after the first visit.

The length of time between first and last visit is shown in Figure 1. The median time was 20.7 months (mean 27.7 months), but some patients remained in treatment for up to 93 months, mainly those patients in a second term of treatment, or those in category 2 (hearing aid group), who continue to attend for auditory habilitation and care of hearing aids. Figure 2 shows the number of patients reaching each data set. 483 patients were treated and entered into the trial without any selection process. The reduction of number of patients seen after the first visit is explained by some category 0 patients needing only one visit 4.8% ($n = 23$), those who have been in treatment for less than 6 months 4.8% ($n = 23$), and 12.4% ($n = 56$) who did not attend their next appointment (defaulters). Of the 381 patients reaching the second data set, there was a further reduction in numbers of which 6.8% ($n = 26$) were category 0, 16% ($n = 61$) were still in treatment less than 12 months and 18% ($n = 70$) were defaulters. The defaulters ($n = 126$) are excluded from the treatment outcome analysis, as they had not completed a proscribed course of TRT. The reasons for defaulting are discussed below

The age and sex distribution is shown in Figure 3. The age distribution is in agreement with other studies, however there was a preponderance of (young) males. The numbers of patients in each of the 5 diagnostic categories is shown in Figure 4. Only 4% fall into category 4, a smaller number than in studies published elsewhere. Table 1 shows the instruments that were fitted in each diagnostic category. Category 0 by definition received no instruments. Although we advocate binaural fitting of both wide band noise generators (WNG) and hearing aids, some patients were fitted monaurally, because of asymmetrical hearing loss, and occasionally because of lack of compliance. Instruments were fitted on open moulds wherever possible.

Evaluation of success of treatment follows a technique first devised by Jastreboff [3]. Using the '40% rule' (our practice) patients are assessed as being successfully treated, if they have either

- 40% improvement in annoyance and awareness; or
- 40% improvement in annoyance or awareness, plus an improvement/facilitation of one life factor.

The results of TRT are summarised in Figure 5. They show those patients who have achieved the 40% significance level of improvement (the better group) and those who have not (the no-better group). At six months 70% of patients have reached

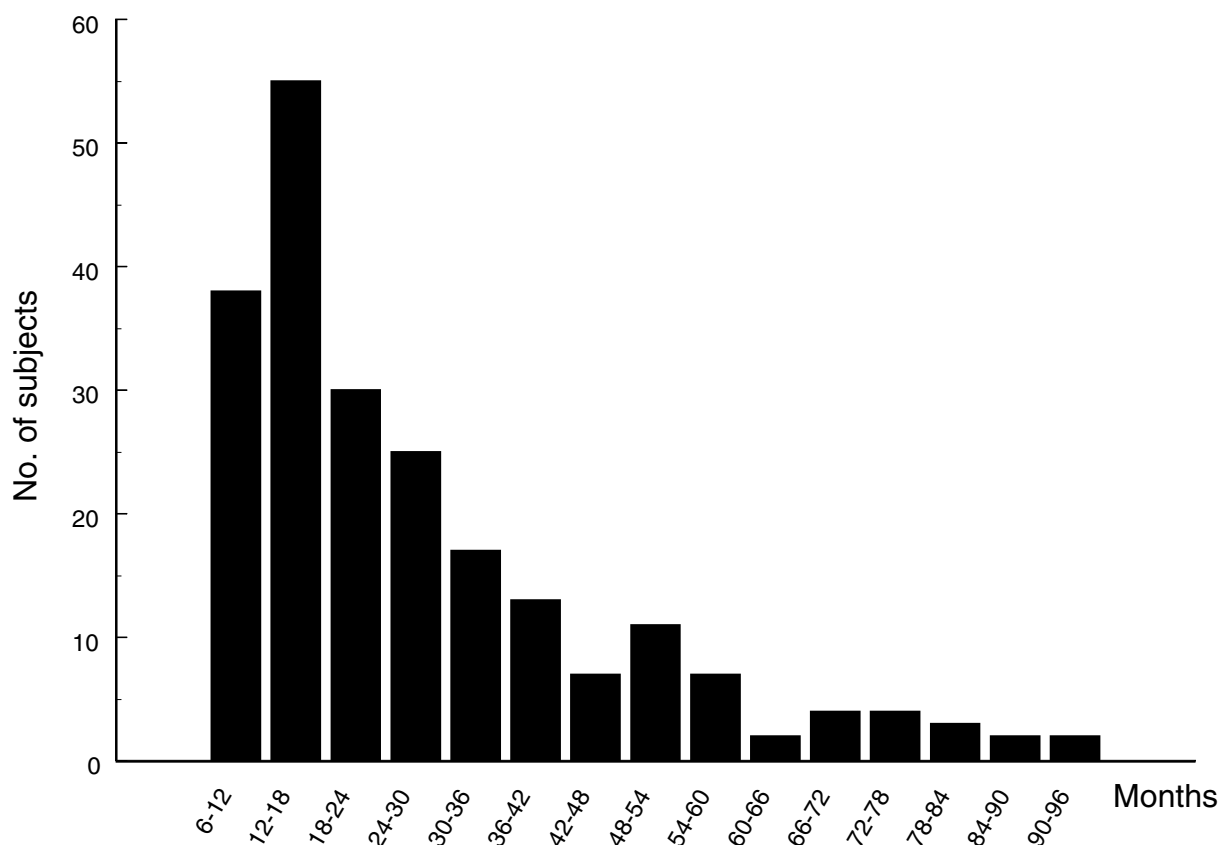


Figure 1 Time from first to last visit by numbers of patients

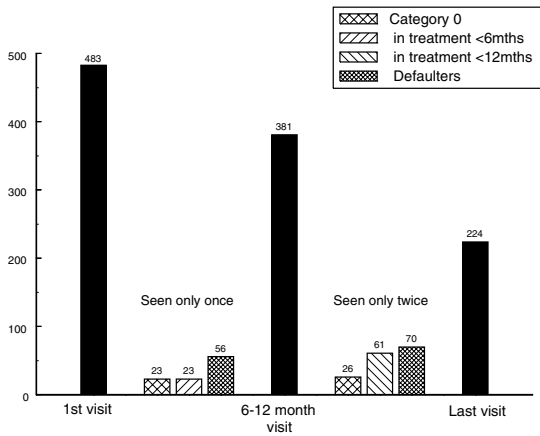


Figure 2 Number of patients in treatment at each data set

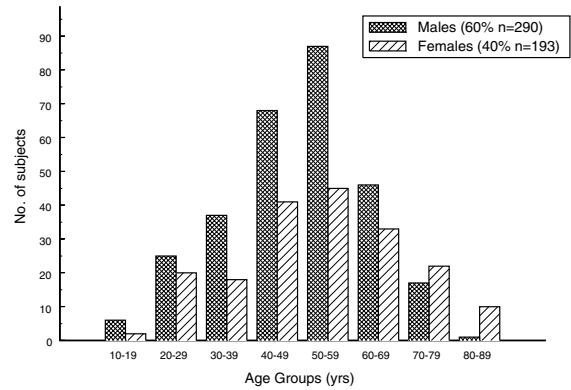


Figure 3 Distribution of patients by age and sex

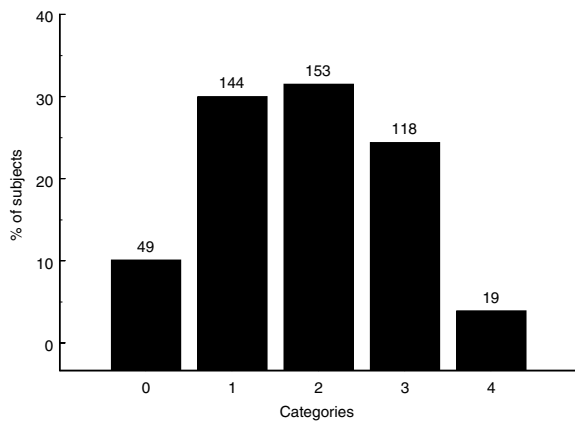


Figure 4 Distribution of patients by diagnostic category

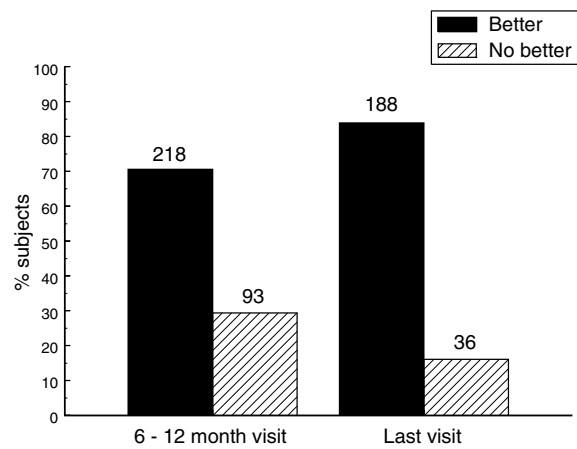


Figure 5 Percentage of patients achieving significant improvement. Defaulters are excluded from this analysis

Table 1 The instruments fitted within different categories. WNG wide band noise generators; HA hearing aids; Combi combination hearing aid and WNG; PA post aural; AIE all-in-the-ear; DC deep canal.

| Instrument | Category | | | | |
|------------|----------|-------------|----------------------------------|------------------------------|------------|
| | 0 | 1 | 2 | 3 | 4 |
| None | 49 | 26 | 23 | 23 | 2 |
| 1 WNG | 0 | 8 (PA) | 4 (2PA 2AIE) | 6 (PA) | 2 (PA) |
| 2 WNGs | 0 | 109 (PA) | 11 (PA) | 75 (PA) | 11 (PA) |
| 1 HA | 0 | 0 | 31 (8 PA 10 DC 13 AIE) | 6 (1 PA 5 DC) | 2 (AIE) |
| 2 HAs | 0 | 0 | 84 (51 PA 20 DC 13 AIE) | 8 (5 PA 2 DC 1 AIE) | 2 (PA) |
| Combi | 0 | 0 | 1 (PA) | 0 | 0 |

this level of improvement, and by the last visit 83%. If the defaulters are included in the calculation the results at six months are unchanged (70.6% better).

The no-better group does not represent failure, only those patients not achieving 40% improvement by the time stated. The second data set at 6–12 months excludes the defaulters identified in Figure 2 (126 patients).

An analysis of the different components of habituation are shown in Figure 6. Mean awareness of tinnitus (indicating habituation of perception), and distress (indicating aversive reaction) are shown for 1st visit, 6–12 month visit, and last visit. Error bars indicate the standard error of the mean. In the ‘better group’, significant improvement in both habituation of perception and reaction are shown. This is clearly shown between the 1st and 2nd data set, and also between the 2nd and 3rd data set. In the ‘no-better’ group there was no significant improvement in distress or awareness over this time period. However a reduction in life factors affected by tinnitus did occur.

Discussion

This study shows that after treatment with TRT 83.9% of our patients from an unselected group of tinnitus referrals achieved a successful outcome on

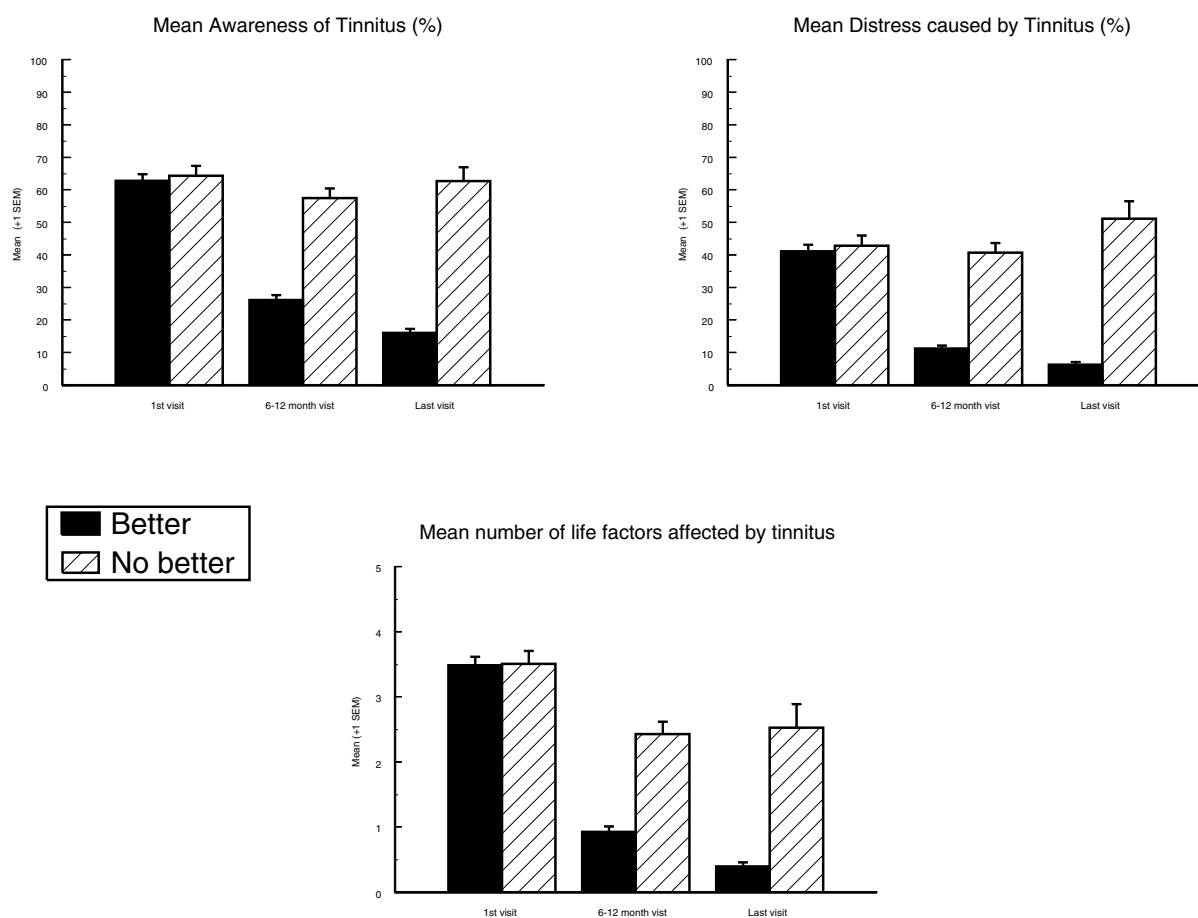


Figure 6 Mean levels of tinnitus awareness, distress and changes in life factors during treatment in the better and no-better groups

completing treatment. The criteria for success is strict and is chosen to help avoid any possibility of placebo effect. The success rate is also far above the highest estimated placebo effect for tinnitus treatment [4] and has been maintained over a 2-year period. Subsequent studies on this cohort of patients will look to see how this improvement is maintained over a longer period.

The process of habituation induced by TRT depends on plasticity, and plastic changes occurring in the central auditory system and its connections with the limbic and autonomic nervous system [5]. This process is a gradual one, particularly when it involves the reversal of powerful aversive conditioned reflex responses to tinnitus. This is clearly seen in Figure 6 in the group achieving significant improvement.

An important question is what happens to patients in the no-better group. Although they do not reach the level of significant improvement in the given time, this does not mean that they have not received any benefit from TRT. In Figure 6 it is clear that there is an improvement in life factors affected by tinnitus, even though awareness and dis-

trass from tinnitus is unchanged. From Figure 1 it is clear that some patients take considerably longer than the median 21 months to achieve habituation. It will be important to follow patients in the no-better group, who opt to continue in treatment, to see whether they do eventually reach significant levels of habituation or not.

In this study 126 (26%) of the initial patient group did not reach the final appointment. This is a high figure, and in the worst case could be seen as the percentage of patients who could not be helped by TRT. No calculations could be made for 56 patients who defaulted before the second visit, as data does not exist for them. However analysis of results for the defaulters at the 2nd data set (n = 70) showed that many of them had already achieved significant improvement. 52 defaulters (74.3%) had reached the criteria for the 'better group' by 6 months even though they had not completed full TRT. This suggests that after 6 months the majority of patients who do not keep their follow-up appointment do so because they do not feel the need for further treatment.

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