Behaviour Research and Therapy 54 (2014) 30–37

Contents lists available at ScienceDirect

Behaviour Research and Therapy

journal homepage: www.elsevier.com/locate/brat

Cognitive behaviour therapy for hyperacusis: A randomized controlled trial

Linda Jüris [a,b,*], Gerhard Andersson [c,d], Hans Christian Larsen [b], Lisa Ekselius [a]

[a] Department of Neuroscience, Psychiatry, Uppsala University, Uppsala University Hospital, SE-75185 Uppsala, Sweden
[b] Department of Surgical Sciences, Otolaryngology and Head & Neck Surgery, Uppsala University, Uppsala University Hospital, SE-75185 Uppsala, Sweden
[c] Department of Behavioural Sciences and Learning, Swedish Institute for Disability Research, Linköping University, SE-58183 Linköping, Sweden
[d] Department of Clinical Neuroscience, Karolinska Institutet, SE-14157 Huddinge, Sweden

ARTICLE INFO

Article history:
Received 8 June 2013
Received in revised form
12 January 2014
Accepted 16 January 2014

Keywords:
Cognitive behaviour therapy (CBT)
Hyperacusis
Randomized controlled trial (RCT)

ABSTRACT

Hyperacusis, defined as unusual intolerance to ordinary environmental sounds, is a common problem for which there are no controlled trials on psychological treatment. Given the avoidance strategies present in hyperacusis, and similarities with problems such as tinnitus and chronic pain, cognitive behaviour therapy (CBT) is hypothesized to be helpful for patients with hyperacusis.

In this randomized controlled study of 60 patients with hyperacusis, CBT was compared with a waiting list control group using the Loudness Discomfort Level test (LDL), the Hyperacusis Questionnaire, the Hospital Anxiety and Depression Scales, the Quality of Life Inventory and an adapted version of the Tampa Scale of Kinesiophobia.

There were significant between-group effects in favour of the CBT group on all measures except for the HADS anxiety scale. Between-group effect sizes were moderate to high, with Cohen's $d = 0.67$ and 0.69 per ear, respectively, for the primary measure LDL, and ranging from $d = 0.32$ to 1.36 for the secondary measures. The differences between groups ceased to exist when the waiting list group was treated later with CBT, and the treatment results were largely maintained after 12 months. In conclusion, CBT is a promising treatment for hyperacusis, although more research is necessary.

Introduction

Hyperacusis as a primary problem has been defined as "*unusual intolerance to ordinary environmental sounds*" (Vernon, 1987). Persons with hyperacusis are sensitive to sounds such as music, clatter, mechanical sounds and/or paper noises (Andersson, Lindvall, Hursti, & Carlbring, 2002), and often protect themselves from sounds in different ways such as by wearing hearing protection (when taking the bus, for example) – even when there is no confirmed risk of hearing damage (Baguley, 2003). The personal suffering related to hyperacusis has been described in the literature, with patients reporting feelings of fear, extensive use of ear protection devices, and avoidance of environments such as their places of work and settings for social activities (Baguley & Andersson, 2007; McKenna, Baguley, McFerran, 2010). A high percentage of sick leave from work has also been found in this group of patients (Jüris, Andersson, Larsen, & Ekselius, 2013).

Prevalence studies of hyperacusis are rare. In a Swedish study where data were collected via either a postal survey or the internet, the prevalence rates were 7.7% ($n = 39$) and 5.9% ($n = 28$), respectively, when excluding individuals with hearing impairment (Andersson et al., 2002). In a Finnish study, where a broader definition of hyperacusis was used, the prevalence of self-reported hyperacusis was 17.2% (Hannula, Bloigu, Majamaa, Sorri, & Mäki-Torkko, 2011).

Little has been published concerning the aetiology and natural course of hyperacusis. Disturbed metabolism of 5-hydroxytryptamine (5-HT; serotonin) has been proposed as a mechanism in hyperacusis (Marriage & Barnes, 1995) and might also account for development of hyperacusis in depression and anxiety disorders (Attri & Nagarkar, 2010). The central gain hypothesis views hyperacusis as a result of a problematic compensatory gain process in the auditory pathways (Jastreboff & Hazell, 1993). Hyperacusis is reported to co-exist with many other conditions, including migraine and William's syndrome

Abbreviations: dB, Decibel; HADS, Hospital Anxiety and Depression Scale; HQ, Hyperacusis Questionnaire; Hz, Hertz; LDL, Loudness Discomfort Level; QOLI, Quality of Life Inventory; TSK, Tampa Scale of Kinesiophobia.

* Corresponding author. Department of Neuroscience, Psychiatry, Uppsala University, Uppsala University Hospital, SE-75185 Uppsala, Sweden. Tel.: +46 18 6115243; fax: +46 18 515810.
E-mail addresses: linda.juris@neuro.uu.se, linda.juris@kbt-centrum.se (L. Jüris).

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http://dx.doi.org/10.1016/j.brat.2014.01.001

(Katzenell & Segal, 2001). There is also a large comorbidity between tinnitus and hyperacusis (Baguley, 2003), as 40 per cent of patients with tinnitus suffer from hyperacusis (Jastreboff & Jastreboff, 2000), and up to 86 per cent of patients with hyperacusis in clinical samples report tinnitus (Anari, Axelsson, Eliasson, & Magnusson, 1999). In a recent study almost half of the patients diagnosed with hyperacusis suffered from anxiety disorders (Jüris et al., 2013). The most common anxiety disorders were social phobia and agoraphobia, as measured with the Mini-International Neuropsychiatric Interview (MINI, Swedish version 5.0.0.) (Sheehan et al., 1998). Furthermore, the patients also displayed high scores on anxiety-related personality traits, measured with the Swedish universities Scales of Personality.

As no underlying medical condition can be found in the large majority of affected patients (Baguley, 2003), researchers have suggested that hyperacusis is maintained and exacerbated by avoidance of sounds and increased anxiety (Schaaf, Klofat, & Hesse, 2003). It has been shown that persons who do not suffer from hyperacusis become more sensitive to sounds when they overprotect their ears (Formby, Sherlock, & Gold, 2003), while exposure to low-level noise treatment later desensitizes the same subjects. In another study, hyperacusis was found to be associated with noise-related avoidance behaviour and anxiety (Blaesing & Kroener-Herwig, 2012). This is in accord with the fear-avoidance model, which deals with fear of pain and focuses on the individual response of either confronting or avoiding the pain itself (Lethem, Slade, Troup, & Bentley, 1983; Vlaeyen & Linton, 2000). The avoidance of pain is assumed to predict further avoidance and increased fear of pain, leading to inactivity, which in itself leads to further disability. This model has found support in the literature (Vlaeyen & Linton, 2012). In a study of healthy participants, fear-avoidance beliefs were quite rare. When present, however, they increased the risk of future pain episodes (Linton, Buer, Vlaeyen, & Hellsing, 2000). Fear-avoidance is also a risk factor for poor health in patients suffering from burns (Willebrand, Andersson, Kildal, Gerdin, & Ekselius, 2006). To our knowledge, there are no published randomized controlled trials (RCT) of any psychological treatment for hyperacusis. We assume that most patients who suffer from hyperacusis receive an audiological examination and some form of counselling, or are prescribed ear attenuation devices at their audiology clinic. An existing method for treating tinnitus, and also hyperacusis, is Tinnitus Retraining Therapy (TRT) (Jastreboff & Hazell, 1993), but there are few published controlled studies focusing on hyperacusis (Formby et al., 2013). Treatments involving measures to help patients avoid ear protection and promote exposure to increasing levels of pink noise have been reported to have good effect (Vernon, 1987).

Cognitive behaviour therapy (CBT) is effective for a range of psychiatric disorders and could be considered the primary psychosocial treatment of choice for many, if not most, patients with mild to moderate psychiatric problems (Tolin, 2010). CBT is also effective as an adjunct for many somatic problems such as chronic pain (Eccleston et al., 2012). For the psychological problems associated with tinnitus, CBT is the treatment of choice (Hesser, Weise, Westin, & Andersson, 2011; Martinez-Devesa, Perera, Theodoulou, & Waddell, 2010). CBT is also effective for anxiety disorders (Hofmann & Smits, 2008), and has been proposed as a reasonable strategy for treating anxiety and stress associated with hyperacusis (Baguley, 2003), as there are similarities between anxiety disorders and hyperacusis. For persons with hyperacusis, avoidance behaviour protects the individual from the instant unpleasantness of certain sounds, but in the long run overprotecting the ears exacerbates hyperacusis (Vernon, 1987), and may lead to isolation and a depressed mood. Similar behavioural avoidance is also an important factor in the development of anxiety disorders, and motivates the use of exposure treatment (Murphy, Lindsay, & Williams, 1997; Salkovskis, Clark, Hackmann, Wells, & Gelder, 1999).

The aim of this study was to investigate whether CBT could be helpful for patients with hyperacusis. The hypothesis was that patients with hyperacusis would benefit from CBT, as measured by loudness discomfort levels, hyperacusis symptoms, anxiety and depressive symptoms, quality of life, and fear of injury/reinjury due to exposure to sounds.

Methods

The study was registered, and its International Clinical Trial registration number is NCT01321814. In addition, the study was approved by the Uppsala University Ethics Committee. All patients gave their written informed consent to participate, in accordance with recommendations in the Declaration of Helsinki.

Participants

For inclusion in the study patients had to: a) report hyperacusis as their primary audiological problem; b) present with average loudness discomfort levels (LDL) under 90 dB at the frequencies of 500, 1000 and 2000 Hz in at least one ear (Anari et al., 1999); c) have hearing levels better than 40 dB in the best ear; d) be between 18 and 65 years of age; e) understand and speak Swedish fluently. A total of 81 individuals were considered for the study, of which 74 were consecutive patients referred to the Ear, Nose and Throat Department at Uppsala University Hospital, and the remaining seven patients were self-referred.

Measures

The primary outcome measure

Loudness discomfort levels test (LDL). Audiometry was performed using ascending technique (Arlinger & Kinnefors, 1989) on an AC 40 audiometer from Interacoustics, calibrated in accordance with standards (ISO 1963/2001). Audiological assessments took place in a soundproof test room. The measurements were administered by an audiologist, blinded to whether the patients belonged to the treatment or the control group, and also blinded to which stage of the project the patients were in. The LDL was defined as the average of the sound levels in dB (HL) that first became uncomfortable in each ear, as indicated verbally by the patient. The measured frequencies were 250, 500, 1000, 2000, 3000 and 4000 Hz for both ears.

The secondary outcome measures

The Hyperacusis Questionnaire (HQ). The HQ measures hyperacusis severity and was developed for use in the quantification and characterization of hyperacusis (Khalfa et al., 2002). The questionnaire has been translated into Swedish (Blomberg, Rosander, & Andersson, 2006) and consists of 14 items that are rated on a 4-point Likert scale with alternatives from “no” = 0 points to “yes, a lot” = 3 points. An example of an item is: “Do you ever use earplugs or earmuffs to reduce your noise perception (Do not consider the use of hearing protection during abnormally high noise exposure situations)?”. Three dimensions have been isolated by principal component analysis: attentional, social, and emotional impact, with satisfactory internal consistency reliability values of 0.66, 0.68 and 0.67, respectively, as assessed by the Cronbach coefficient alpha (Khalfa et al., 2002).

The Hospital Anxiety and Depression Scale (HADS). The HADS was developed for use with somatic patients and measures symptoms of anxiety and depression (Zigmond & Snaith, 1983). The instrument has been recommended for use in patients with hyperacusis (Baguley & Andersson, 2007) and consists of 14 items divided into