Tinnitus in Children

Practice Guidance

British Society of Audiology
KNOWLEDGE | LEARNING | PRACTICE | IMPACT
Improving the lives of adults and children with hearing and balance problems

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Foreword

The James Lind Alliance Tinnitus Priority Setting Partnership was set up at the instigation of the British Tinnitus Association. Its aim was to identify the top ten research uncertainties for tinnitus. In 2011 and 2012, the Partnership carried out an extensive, nationwide consultation of tinnitus patients and clinicians and at the 2012 British Society of Audiology annual conference, an appeal to address these top ten research priorities was launched. One of the top ten questions is: "what is the optimal set of guidelines for assessing children with tinnitus?"

It was hoped that the identification of research priorities would be a catalyst for more research and encourage funders and researchers alike to rise to the challenge of addressing the selected priorities. The Tinnitus in Children Practice Guidance is a response to that challenge. We welcome comments and feedback, which can be sent to: bsa@thebsa.org.uk.

The development of this Practice Guidance was undertaken through the Paediatric Audiology Interest Group (PAIG) of the British Society of Audiology by a working party of national specialists in paediatric tinnitus. The project was kindly supported by the British Tinnitus Association.

This document presents Practice Guidance by the British Society of Audiology (BSA). This Practice Guidance represents, to the best knowledge of the BSA, the evidence-base and consensus on good practice, given the stated methodology and scope of the document and at the time of publication.

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BTA

Contents

Terminology

Child
The term 'child' is used throughout this document to include children up to the age of 16 years.

Parents
This includes mothers, fathers, carers and other adults with responsibility for caring for a child or young person, including for example, those with responsibilities for looked after children and young offenders.

Professional
This term has been used generically to refer to doctors, audiologists, teachers and any other allied professionals that may be involved in the child's care.

Red Flags
Red flags are used as indicators for onward referral to another specialty as appropriate.

Management
This term has been used to refer to both assessment and treatment.

Tinnitus Distress
This term is used to cover the range of negative emotions that children and parents may feel as a consequence of their tinnitus, such as annoyance, anger, fear, worry, anxiety.

Abbreviations

ADHD
Attention Deficit Hyperactivity Disorder

APD
Auditory Processing Disorder

ASD
Autistic Spectrum Disorder

AVM
Audiovestibular Medicine

BSA
British Society of Audiology

BTA
British Tinnitus Association

CAMHS
Child and Adolescent Mental Health Service

CBT
Cognitive Behavioural Therapy

ENT
Ear, Nose and Throat

GP
General Practitioner

IEP
Individual Educational Plan

IHP
Individual Hearing Profile

LDLs
Loudness Discomfort Levels

LIFE
Listening Inventory for Education Efficiency

PINCHE
Policy Interpretation Network on Children's Health and Environment

PTA
Pure Tone Audiogram/Audiometry

SENCO
Special Educational Needs Co-ordinator

VAS
Visual Analogue Scale

Executive Summary

- Tinnitus is a common experience in childhood.
- The evidence base on paediatric tinnitus is scarce. In view of this, the underlying principles of managing adult tinnitus are applied to the management of children with tinnitus. However the aetiology, presentation and management of the child's tinnitus needs to take into account the child's age, cognitive and linguistic ability and individual circumstances. The evidence base for the management of childhood anxiety and pain is relevant to aspects of the tinnitus profile of children.
- This practice guidance offers a pragmatic approach to the management of children with tinnitus at all levels of severity, for children up to 16 years, as this is a common age for transition into adult services.
- In general, in hearing appointments other than routine ENT audiometry and school screening, children should routinely be asked whether they 'hear noises in their ears or head' and if they do, whether they are bothered by them. The vast majority of children are untroubled by these noises and a simple explanation and reassurance are all that is required. Further assessment will be required for the minority of children where tinnitus distress is identified.
- Whenever possible, healthcare professionals should involve children in the assessment and management of their symptoms and should not rely upon information provided by parents alone.
- The focus of management should be on the child and not the ear or tinnitus. A holistic approach (child, family and school) is required to meet the needs of children who present with tinnitus.
- Where tinnitus impact and distress is found to be minimal, simple information counselling will frequently be sufficient, and this may prevent tinnitus distress from developing.
- Skills for the management of children with mild to moderate distress should be available within most paediatric audiology services.
- Children with severe distress and/or complex presentations should be managed within regional centres of excellence where specialist skills in paediatric tinnitus assessment and therapy are available (DoH 2008). The exact members and roles of this team will vary according to the service.
- Children should be managed in an appropriate paediatric setting by health care professionals with appropriate paediatric skills and knowledge of care pathways and legislation relevant to the paediatric population.
- This practice guidance acknowledges that hyperacusis often co-exists with tinnitus, but hyperacusis requires different assessment and management methods and therefore is not covered here.
- This practice guidance has been developed and promoted as a result of public and professional consultation exercises.

1

Introduction & Overview

How to use this practice guidance

This practice guidance has been composed to provide key text within the body of the main chapters for a broad range of professionals that may see children with tinnitus. More detailed information has been provided in the appendices to allow the reader to acquire more information where necessary, or where particularly relevant to their interest.

Aims of this practice guidance

Tinnitus in children is a neglected area, from both a clinical and a research perspective. To date, research provides information about prevalence and co-morbidity of tinnitus in children, but very little, if anything, about managing distressing tinnitus in a children's clinic, or effective therapies for alleviating the distress it can cause. Given the lack of an evidence base, many views about tinnitus in children are held largely on the basis of common belief or personal opinion.

This practice guidance has been written on the basis of the evidence base where it is available, and from the clinical experience and practice of the working party members. Our aim is that the practical and pragmatic advice offered will enable others to develop their clinical skills in tinnitus management with children, and that in turn this will lead to further clinical developments, research, and ultimately a firm evidence base for the management of tinnitus in children.
This practice guidance is intended for the wide range of professionals who may be involved in the management of a child with tinnitus. This can include audiologists, medical professionals, nurses, hearing therapists, educational audiologists, teachers of the deaf, psychologists and other mental health professionals. Some sections are of more relevance to specific professionals than others.

As an introduction, below are a collection of common questions about tinnitus in children:

Do children experience tinnitus?

A commonly held view is that tinnitus only occurs in adults, relates to an ageing auditory system, and occurs very rarely in children. A number of research studies internationally have looked at the prevalence of tinnitus in children (see appendix 2). Although the quality of these studies are variable, the overall findings suggest that children commonly experience tinnitus (Sheyte 2010). Juul *et al* have suggested that tinnitus in children may be on the increase (Juul 2012), but this may be a reflection of increased awareness and therefore reporting. Tinnitus appears to be twice as common in children with hearing loss compared to children with normal hearing (Graham 1987; Raj-Kosiak 2011). There is some evidence to suggest that it may be common in children with a history of otitis media (Mills 1984), and more research is needed into this.

Whilst the experience of tinnitus is common, most children with tinnitus are not bothered by it, and a simple explanation and reassurance are all that is required. Only a small number of children will require further

management to help with distress or impact upon their lives.

Is tinnitus in children a clinical concern?

There is some debate as to whether tinnitus in children is a significant clinical concern. Referral numbers for children with tinnitus are reported to be low (Baguley 2013a), suggesting that children do not express their distress of tinnitus or require intervention in the same way as adults; further research is needed. For those children whose tinnitus is distressing however, tinnitus can have a significant effect upon their physical and psychological well-being and their educational progress, all of which can have lifelong consequences if left untreated.

There are currently few services in the UK available for children with tinnitus. It appears that where such a service is available, and when children attending audiology appointments are routinely asked about tinnitus, that referral numbers steadily increase, and this suggests that there is an unmet need.

Is tinnitus in children the same as in adults?

Research available is limited and of variable quality, but suggests that children with tinnitus share many similarities to adults with tinnitus. There is some evidence that, as with the adult population, tinnitus in children is associated with higher rates of psychological difficulties such as worry, anxiety and depression.

The impact of tinnitus upon children is similar to adults in many ways, affecting emotional well-being (Holgers 2006); concentration and listening skills (Kentish 2000). Sleep difficulties are frequently mentioned by children and parents (Gabriels 1996; Kentish 2000; Kim 2012): poor sleep can in turn lead to other problems such as poor memory and concentration, irritability, behavioural problems, and can affect the whole family's well-being.

How does tinnitus in children differ from adults?

Whilst children and adults with tinnitus share much in common, there are differences that have important implications for clinical practice.

Several authors have noted that children tend not to tell adults spontaneously about their tinnitus. Savastano found that the number of children with tinnitus rose from 6.5% to 34% when children are specifically questioned (Savastano 2009). Children are also unlikely to mention it spontaneously to their parents (Raj-Kosiak et al 2011). When directly asked, children are generally able to describe their symptoms, although this may not always be in ways that adults are familiar with (Section 3).

Some healthcare professionals and parents are concerned that asking a child about tinnitus may create awareness and anxiety, and turn non-troublesome tinnitus into troublesome tinnitus. The experience of the working party members is that the opposite is the case. Asking about tinnitus provides the opportunity to normalise the experience for the child.

Asking children whether they hear noises in their ears or their head, and whether it bothers or annoys them needs to be done sensitively and in a non-leading manner. Care should be taken, particularly with very young children who can give answers in order to please the adult, when they don't fully understand the question. It is important to be confident that the child has understood the question. Vague, fanciful, or inconsistent descriptions of noises from a child should be treated with caution.

Non-troublesome tinnitus will probably make up a large proportion of the tinnitus reported, and simple reassurance will be all that is needed. However, asking about ear noises gives the healthcare professional the opportunity to identify those children whose tinnitus is troublesome and require intervention.

If a child attempts to tell adults about tinnitus and feels dismissed, they may worry about why adults won't discuss it. The child may then become scared of the tinnitus, what it might mean, or fear being ridiculed if they know it is not a 'real' sound. The child will have less opportunity to discover that others have the same symptoms, including their peers.

Healthcare professionals should provide children with troublesome tinnitus the opportunity to talk about the noises they hear, and offer practical advice for managing it. This includes age appropriate information about tinnitus, strategies for managing any distress and difficulties in the classroom. Further suggestions regarding advice are provided in section 4.

Working with children often involves two patients, the parent and the child, who may have differing information, perspectives, and worries about what the child's tinnitus means and clinicians cannot rely upon information gathered from one or other alone. Assessing and counselling a child with tinnitus takes time and cannot be rushed. These two factors have implications for

service providers in terms of the amount of time required by clinicians working in a paediatric tinnitus service.

Children have limited access to information. Currently, information on websites is directed to adults and much of it is inappropriate, especially for young children. There is an urgent need for age-appropriate literature for children. A discussion about their tinnitus enables the child and parent to learn reassuring information about tinnitus and practical strategies for managing it.

Can adult models of tinnitus management be applied to children?

Children are not mini-adults and the effectiveness of applying adult models of tinnitus management to children can be questioned. There is little or no direct research available to answer this question. Given that children with distressing tinnitus share many similarities with adults in terms of audiological symptoms, impact and psychological distress, it is pragmatic to assume that management strategies applied to adults are of relevance to children. However, these treatment strategies need to be adapted for use with children, and used as part of a child-friendly approach. Children should be seen by health care professionals with experience of assessing and managing children. Appointments should take place within a paediatric clinical setting as opposed to being an add-on to an adult tinnitus clinic. This may be difficult for some services, however this recommendation is in line with national guidelines for paediatric care (NDCS 2000; NSFC 2003; DoH 2008).

What is a child-friendly approach?

A child-friendly approach means putting the child at the heart of the process, and providing services in settings that are appropriate to the needs of children and their families. It means listening respectfully to the child, and communicating at the child's level both developmentally and linguistically, while being aware of the factors that will influence the way the child communicates with you. It means utilising activities such as play, drawing and other more visual and concrete ways of getting across complex ideas (Appendix 3).

2

Tinnitus in Children - Implications for Clinical Practice

Key points:

- Compared to adults, children are much less likely to spontaneously tell others about their tinnitus. When they do, their descriptions may be in unfamiliar terms.
- Practitioners must be alert to "soft" signs that a child has identified tinnitus.
- Children of all ages can have a variety of worries about tinnitus.
- Parents and children should be asked about their worries and concerns individually as these may not be the same.

Professionals' reluctance to talk about tinnitus – and its consequences

Parents are often unaware that their child has tinnitus (Raj-Kosiak 2011) and an audiological assessment may be the first time that a parent becomes aware of it. Young children may lack the cognitive and linguistic skills to describe their tinnitus in ways that adults are familiar with. If the tinnitus has always been present, the child may assume that everyone shares the same experience and remains untroubled by it. Clinically, older children describe reluctance to tell people about tinnitus because they do not want to be seen as being different in any way, or feel that they will not be believed if they talk about it.

Soft signs of tinnitus

Tinnitus may have an impact on different areas of a child's life. Information about this may not be spontaneously volunteered. So the practitioner needs to be mindful of this. It is important for the practitioner to be aware of 'soft' signs, present in varying combinations, which are suggestive of unidentified tinnitus.

Behaviour

- Parental reports of sleep difficulties, particularly in young children. The child may demand sound e.g. story tapes, music, the TV or will not fall asleep on their own or in their room.
- The child shows distress or avoidance of quiet or noisy environments.

School

- Children with tinnitus report difficulties with listening and concentration (Kentish 2000) and it is unlikely that the child has spontaneously mentioned it to their teacher.
- Unexplained listening difficulties, not usually generalised across the school day, and possibly having a specific association.
- The child reports worry or anxiety about being able to hear the teacher's voice easily, and concern about being told off for not paying attention in class. The child may describe feelings of anger, frustration, helplessness, fear, or of feeling disconnected from the classroom.
- Children with hearing loss or a history of hearing loss may describe difficulties with classroom listening that are distinct from descriptions of speech perception difficulties associated with hearing loss – perhaps because the sound has no apparent source and is not a shared experience.
- Speech perception difficulties are described in background noise or acoustically poor environments and in quieter listening environments, or in quiet situations only.

Audiological testing

- Changes in the child's behaviour that do not 'match' observations of the child outside hearing tests. These include signs of agitation, avoidance strategies in anticipation of PTA (Section 3) or an audiological assessment that has been challenging. The child shows low confidence in relation to audiological testing, and their anxiety levels are high, especially in sound proofed testing rooms. These children may possibly be mistaken as having a non-organic hearing loss.
- Difficulty with hearing aid use for no obvious reason. There may be a distrust or dislike of the sound in one ear, and perception that hearing is worse in this ear, although thresholds are similar.

Worries about tinnitus

Very young children may not know why they hear sounds in their ears, or may believe that there is actually something there, for example bees, monsters, rice crispies, or voices singing inside their heads. Older children can share similar worries that there is something in their head, but may be worried that they are losing their hearing, "going mad", or of being unable to go to university or get a job when they are older. Parents are often concerned that their child's tinnitus might relate to hearing loss; mental health problems, a brain tumour or other neurological condition (Kentish 2000). They frequently describe feeling helpless about how to help their child. Child and parent worries therefore need to be identified separately.

3

Assessment of Tinnitus in Children

Key points:

- Tinnitus is a symptom and must be considered in the context of hearing loss and other audiological or neurological symptoms.
- Children require assessment according to their age and level of cognitive and linguistic understanding. As far as possible, information must be obtained from both child and parent. It is important to appreciate that the parent may also be anxious or distressed by the child's symptoms.
- With young children, in addition to gathering information from the child and parent, the clinician should be able to utilise other techniques such as play and drawing to gain information about the child's tinnitus symptoms.
- Audiological assessment can be difficult and anxiety-provoking for children with tinnitus. Plenty of time should be allowed for testing and a flexible approach taken where necessary to ensure accurate results.
- Throughout the assessment, it is important to note any symptoms or findings which suggest that an onward referral is required to a specialist multidisciplinary paediatric tinnitus service where available, medical service, or child mental health service. Signs and symptoms suggesting onward referral have been highlighted as red flags at the end of this section.
- Appendix 4 summarises the key elements of the clinical assessment.

The aim of assessment is to establish the level of distress and impact upon the child and family, ascertain any causal or influencing factors and begin to plan the management strategy. The following section outlines the key elements of the clinical assessment.

As with any other paediatric appointment it is important that the clinical environment and approach taken is child-friendly. Putting the child and family at ease will help facilitate information gathering during the appointment. **It should be routine to ask all children seen for audiological assessment whether they hear noises in their ears or head.**

Questions should be asked in an open, non-judgemental manner in order to allow the child to describe their experiences freely. For those who report tinnitus, the levels of both distress and impact vary enormously.

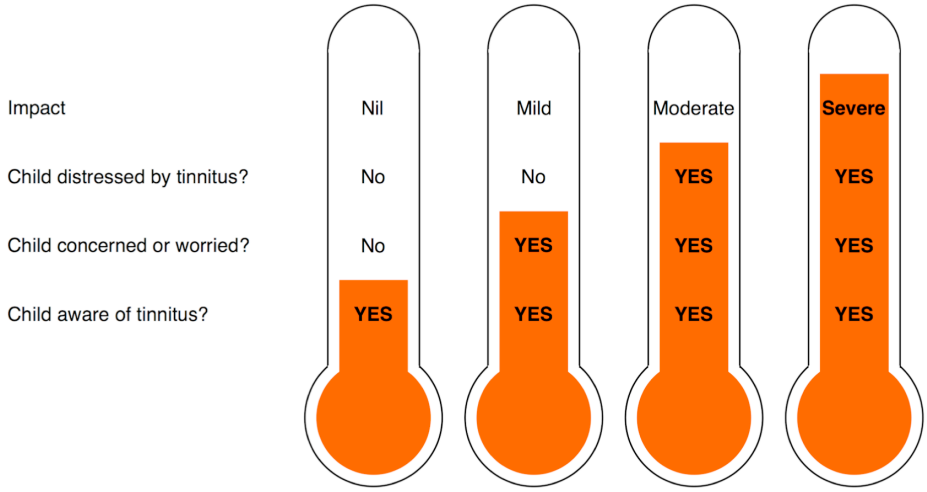
History taking

Key elements to consider are:

1. Tinnitus characteristics – description of sounds

If children report that they have noises in their ears, asking them to tell you about it can obtain more information than specific or direct questioning. Descriptions vary, in part depending upon the age of the child. Older children may use familiar terms such as 'ringing', 'buzzing', ''wheezing', 'peeping', 'murmur' 'humming', 'swishing' and 'whistling' sounds. Younger children will often use creative descriptions, referring to objects within their experience such as 'buzzing bees', 'car beeping' 'rice crispies', 'like drums', 'choo choo' or 'like a faraway train'. The use of emotive terms for example 'angry bees' helps to identify tinnitus which is distressing.

Creative descriptions of tinnitus such as singing or voices can make



The above figure illustrates the levels of distress and the impact that tinnitus may have on a child. Four distinct levels are depicted, however, in reality distress and the impact of tinnitus manifest as a continuum.

parents more anxious about what their child is experiencing than the child themselves.

Young children or those with limited language can find it very difficult to describe their tinnitus. Inviting the child to draw a picture of the tinnitus can help give it a name and a visual description of the child's experience. Use the child's name for the tinnitus as you talk about it in the appointment. Older children's description of their tinnitus helps to identify whether it is pulsatile, clicking, tonal, or complex.

The onset, duration and frequency should be ascertained where possible, together with identifying the site of the sounds (one ear, both ears, or in the head). The child's ability to describe these will depend on their age. Parents are sometimes able to help link the onset to a particular event or circumstance or may have noticed that the child has a particular dislike of one ear. Very young children are not always able to provide answers to these questions.

2. Tinnitus – impact and distress

There are currently no standardised tinnitus questionnaires for use with children. Standardised measures do, however, exist for screening psychological difficulties such as anxiety and depression and these can be of help in assessing the impact of tinnitus on the child's well-being (Appendix 7). Existing questionnaires for children with hearing loss or auditory processing disorder can be adapted to gather qualitative information about tinnitus impact on listening, concentration and school performance.

The level of distress, the nature of any worries and the impact of tinnitus should be determined separately for parent and child if possible. The child may have habituated to their tinnitus and be unconcerned about it, and it is the parent that expresses concern and worry about what is wrong with their child. Similarly, parents can be unaware of the impact of tinnitus and the level of distress that it causes their child.

Information should be gathered about tinnitus impact in all aspects of the child's life, at home and school. This may include changes in behaviour, difficulties with sleeping, concentration, listening or exams, withdrawal from usual activities, complaints of headaches, dizziness or ear pain. Some children describe difficulties with listening and attention in class when their tinnitus is intrusive. They may miss information given by the teacher, and fear being told off by their teacher for not paying attention. Tinnitus related difficulties may compound other attention and listening difficulties caused by hearing loss, APD, ADHD, or speech and language difficulties.

Generally speaking, children aged 6 or 7 years and upwards can reliably use a simple VAS to indicate tinnitus loudness or tinnitus distress (Appendix 7). The scale can also be used to indicate the child's tinnitus distress in different situations (such as home and school). The term distress describes a variety of responses such as worry, annoyance, fear, and anger. In the VAS, the child's preferred term should be used. Some children find it easier to convey their distress through this method rather than trying to describe it verbally. A VAS rating can be repeated at follow-up appointments as an indication of change.

3. Family History of tinnitus and hearing difficulties

It can be helpful to know if anyone else in the family has tinnitus or a history of hearing problems. How that person has responded to their tinnitus or hearing difficulty will influence the child and the family's view of tinnitus, it's impact, and ways of coping with it.

4. Hearing difficulties and other audiovestibular symptoms

It is important to establish whether the child has noticed any change in their hearing, or any other ear symptoms such as pain or a feeling that their ears are blocked. It can be difficult to distinguish a change in hearing level from a feeling that tinnitus makes it difficult to hear, so careful questioning is required to avoid any ambiguity. Appropriate management of any new hearing loss, or change in an established hearing loss, may help reduce the child's tinnitus.

A history of otological disease (e.g. chronic middle ear disease) or risk factors for otological problems (e.g. cleft palate) should be noted. Tinnitus in children often occurs in children with otitis media with effusion (Mills 1984). The child may describe 'clicking' and 'popping' sounds and have a history of resolving otitis media with effusion. Tinnitus that is suggestive of middle ear myoclonus should be referred for a medical opinion despite the difficulties in treating this. Enquiring whether the child has a history of rhinitis or hayfever will identify whether there may be a connection with a general ENT condition.

Establishing whether there are any vestibular symptoms can be difficult in children. Parents of younger children may be able to give more general information about whether they feel their child is particularly unsteady. Older children will be able to describe any feelings of dizziness or unsteadiness and any link between the occurrence of these and their tinnitus should be noted.

Although the management of hyperacusis is beyond the remit of this guidance, it is important to identify whether the child has any intolerance to loud sounds and respond to this appropriately.

5. Medical and neurological history

Any history of trauma, both head and noise trauma should be noted. A child who has had a significant head injury may well have had further investigations performed, but should nevertheless be referred to an ENT surgeon or an Audiovestibular Physician. With both younger and older children, prolonged exposure to loud sound should be enquired about (for example, listening to loud music through personal music players or at social events). If tinnitus has occurred after such exposure, appropriate advice can be given about hearing protection (Appendix 9).

A line of enquiry regarding a history of previous severe illnesses will reveal any aetiology related to the use of ototoxic medications; examples being: chemotherapy for childhood cancers, or high dose intravenous antibiotics for severe infection.

Other general medical problems might be relevant; for example, migraine can be associated with auditory sensitivity and tinnitus.

6. Factors affecting tinnitus

Some children and their parents have already noticed things that make tinnitus better or worse. Parents may have noticed that their child's tinnitus is affected by illness, stress, tiredness, or important life events, or improves during school holidays. Older children may describe times of the day, or places or situations when they notice their tinnitus is worse, (for example at bedtime or the end of the school day), or times and places when they do not notice their tinnitus.

Tinnitus rarely exists in a vacuum – other aspects of a child's life will affect their experience of tinnitus and will inform the management plan. Medical or care needs, social care support, educational support, and psychological support are relevant. Any external stresses can be carefully and delicately asked about for example family issues, divorce, bereavement, or problems at school such as bullying.

Children with tinnitus often present for help at a time of transition, for example, moving to a new school, exams, or times of change in family dynamics. This information may not be forthcoming initially, and some children and families may open up more or see the relevance of the questions once a full explanation of tinnitus and the links between anxiety and stress have been given. It is important to remain open to such discussions throughout the assessment.

A combination of tinnitus and hearing loss has been associated with mental health difficulties, substance abuse, and school problems (Brunnberg 2008). Where there is concern that significant psychological factors are associated with the child or

teenagers tinnitus distress, it may in some circumstances be appropriate for some healthcare professionals with appropriate training and competence to sensitively enquire about any alcohol or drug use. Substance abuse can be indicative of stress and other social and psychological difficulties that may be significant. Onward referral to a local mental health service, such as CAMHS, should be considered as the child and parent may need help with underlying psychological disorders.

7. Current coping strategies for tinnitus

How the child and the parent have managed the tinnitus so far can provide helpful information regarding tinnitus severity, impact and family coping style. Children are often remarkably resourceful at finding ways to manage their tinnitus, for example by avoiding silence, or finding ways to distract themselves. Information should also be sought about how the parent has tried to help their child, for example by distracting the child, giving painkillers, and involving the school. This information is important for planning tinnitus management where poor or ineffective coping strategies have failed.

Clinical examination

Otoscopy should be performed by someone who is confident in excluding the presence of external or middle ear disease, occluding wax or foreign bodies.

Audiological assessment

By involving the child in the history taking, hopefully the child will be feeling comfortable in the clinic prior to starting any testing. The child may have previously found audiometry stressful due to their tinnitus and may therefore be apprehensive about further testing.

It is important to establish accurate hearing thresholds, both air conduction and bone conduction where necessary. Age-appropriate audiometry, ear-specific wherever possible, following BSA recommended procedures, should be completed. Carrying out audiometry when the tester is in the room with the child is preferable to sitting the child within the test booth and having the tester outside. This way the tester can observe the child more closely throughout the test and it is less daunting and 'clinical' for the child. Children with tinnitus can find audiometry testing particularly difficult close to thresholds and at frequencies around the tinnitus sound.

Observing the child throughout the test, looking for signs of anxiety such as a change in breathing pattern, fidgeting or repeated swallowing allows the tester to offer reassurance throughout.

Case example: Ellie, aged 16, had a ringing tinnitus and was very worried that she might have noise damage, after PTA testing in an adult setting revealed a 6 kHz dip binaurally. Re-testing in a paediatric clinic, that was familiar with assessing children with paediatric tinnitus, identified this to be an artefact. It was more likely that Ellie could hear her tinnitus when tested at this frequency.

The child should be allowed to carry out the test in their own time. Pushing the child and constant reminders to listen can increase their anxiety, making the test harder and their responses more erratic. Some children find that wearing the headphones for audiometry makes their tinnitus sounds more audible. Letting them know that this is normal can be reassuring and reduce anxiety. The use of frequency modulated tones (warble tones) for testing is helpful if the tinnitus is a steady tone and vice versa. It can be helpful to encourage the child to tell you if the test sounds are like their tinnitus noises. For some children it

may be necessary to carry out sound field testing, if wearing headphones causes too much interference from their tinnitus, in order to obtain a more accurate idea of their binaural hearing.

Tympanometry should always be carried out, regardless of whether any hearing loss is detected, as the presence of middle ear effusion can exacerbate the perception of tinnitus with or without any associated hearing loss. Using tympanometry to look at eustachian tube function can be useful in those children reporting cracking/popping sensations. Where a child has found audiometry difficult and has given erratic responses, measuring transient otoacoustic emissions can be useful in order to establish normal cochlear function. In some cases it may be necessary to carry out electrophysiological testing to confirm normal hearing thresholds.

It is not recommended to carry out LDLs or any tinnitus matching tests. There is no evidence for either the diagnostic or therapeutic benefit of these in children.

Specialist tests

In cases where there is a complex medical history referral to an ENT surgeon or Audiovestibular Physician is necessary so that further specialist neuro-otological tests or blood tests can be considered. Imaging is recommended if pulsatile tinnitus, unilateral tinnitus, or asymmetrical bone conduction is identified. Serious pathologies, such as vestibular schwannomas, or palatal myoclonus have been identified in young children. If imaging is indicated an initial referral for a medical assessment would be recommended.

Red flags for onward referral

Throughout the history and audiological assessment it is important to be aware of signs or symptoms that would require an onward referral to another agency for further management. Where a referral is necessary this should be done in conjunction with any tinnitus management plan. Good links with medical and mental health services are necessary to ensure smooth care pathways for these children.

Red flags supporting a referral for medical assessment

- Ear discharge
- Persistent ear pain or headache
- Dizziness/vertigo
- Unilateral or pulsatile tinnitus
- Head injury
- Middle ear myoclonus
- Abnormal findings on otoscopy
- Progression of known hearing loss
- Identification of any unmanaged hearing loss, conductive or sensorineural

Red flags supporting a referral to child mental health services

- Depression and significant anxiety
- Reports of self-harm or suicidal thoughts
- Reluctance to attend school or socialize with peers
- Reluctance to engage in normal activities
- Significant family emotional issues, e.g. bereavement

4

Management Strategies

Key points:

- A good explanation of tinnitus forms the basis of all management plans.
- Management uses a set of tools rather than rules.
- Children with significant psychological difficulties should be referred on to an appropriate child mental health service or child psychology service.
- Advice and strategies need to be provided to support the child at school where tinnitus impacts the child's classroom performance.

Effective tinnitus management strategies individualise care. No single treatment protocol or care pathway will fit the needs of all children and their families and each child will manage their tinnitus and distress in their own individual way. The level of distress the child presents with does not equate prescriptively to a particular strategy, device or need for onward referral.

It is important to acknowledge any anxieties or distress the parents may experience, as this may need to be addressed separately.

Effective management needs to address the impact of tinnitus upon the child's health: their psychological well-being, educational progress, and any life stressors, both at home and at school, that exacerbate tinnitus distress. It is important for healthcare professionals to identify children in need of psychological support, and to refer onwards to appropriate services where necessary.

It is recognised that, currently, each paediatric tinnitus service will vary in its make-up in terms of the professionals involved, access to devices, skill-sets and roles. The following suggestions are not intended as a prescriptive approach to tinnitus management but rather as a tool-kit to guide professionals in developing appropriate management plans for each child. This tool-kit includes: explanation, advice and information giving; tinnitus management strategies; sound enrichment including hearing aids; psychological approaches; and tinnitus management in the classroom.

Explanation, advice and information giving

Reassurance:
A thorough audiological and medical assessment means that concerns of child and parent can be answered by reassurance that the child's hearing is normal, or hasn't changed (assuming this is the case), there are no underlying medical causes for the child's tinnitus and that tinnitus will not damage the child's hearing.

Normalise tinnitus:
Children are generally surprised and pleased to discover that lots of other children hear noises in their ears and they are not alone in experiencing it.

Develop a sense of control:
Suggestions can be given for simple practical strategies, for example the use of environmental sound, coping thoughts, or strategies that can be used in the classroom. However, helping the child to come up with their own strategies and solutions to the difficulties they experience is often more effective in giving them a sense of control over their tinnitus. This can include identifying times when tinnitus is better or worse, and helping the child develop a sense that "there are things they can do about it".

Explaining tinnitus to young children:
Very young children appreciate very simple explanations that are within their realm of experience and they can relate to. For example, tinnitus can be explained as the sound that our ears sometimes make when they are working, in the same way that a tummy rumbles or the sound we make when breathing. A fun approach can be to ask the child (and parent) to listen out for any sounds that their bodies are making. Once they have noticed for example, the sound of their breathing, then one can compare this to the sound that ears sometimes make.

Explaining tinnitus to older children and parents:
Older children are more likely to have developed the linguistic and cognitive skills to understand, through explanation, the complex relationship between tinnitus symptoms and thoughts, emotions, physiological reactions, and life events. There are a number of tinnitus models used for counselling adult tinnitus patients but these are generally too complex and 'wordy' even for older children and need to be simplified and made child-friendly. This can be done for example, by replacing words used in models with images of thoughts, worries or feelings. Again, images must be ones with which the child can identify as being within their realm of experience. If children can produce their own images, this will be even more meaningful to them and increase feelings of ownership.

A detailed example of this approach is the Child Friendly Tinnitus Model (Emond 2013) and this has been found to be helpful in explaining tinnitus distress to parents also.

Tinnitus management strategies

Relaxation

There is no current evidence for the use of relaxation in the management of tinnitus in children. Published studies relate specifically to relaxation training in adults and suggest there is little evidence of its effectiveness as a stand-alone approach. However, on the basis that stress can exacerbate tinnitus, relaxation is widely suggested as part of a holistic approach to tinnitus management for adults and is consistently suggested by approved sources promoting information on current practices, e.g. the BTA: Information & Publications. It is reasonable to assume that the same principle applies to children. Lamontagne *et al*. report findings which indicate "that relaxation may be learned by children and may be beneficial in coping with stress" (Lamontagne 1985).

It is important to identify the causes of worry or stress and the intervention needed to reduce it. As part of this relaxation can be one useful self-management tool, reducing physiological arousal in response to stress, and promoting a sense of calm and well-being.

Simple breathing exercises can be carried out anywhere, and in a variety of situations. There are a variety of more formal techniques, including diaphragm breathing; however techniques need to be suitable for the child's age. Breathing exercises change the rhythm and technique of how we breathe, and it is important to bear in mind certain potential difficulties such as hyper-ventilation, or any other medical conditions which may give rise to problems and may be contraindications for the use of breathing exercises. Visualisation techniques are also frequently used to help children relax. These can be either self-directed or guided (Appendix 10).

It must be noted that in learning relaxation techniques, progress needs to be reviewed and supported appropriately. Thus in delivering the techniques, on-going guidance and help must be provided to ensure that relaxation techniques are carried out in a way that offers maximum benefit to the agreed management plan.

Mindfulness Techniques

Evidence for the effectiveness of mindfulness techniques in the management of tinnitus is still in its infancy but pilot studies indicate positive findings in treating chronic tinnitus and its co-morbid symptoms in adults (Gans 2014).
Mindfulness practice may therefore prove useful for children in learning how to manage stress and anxiety, which may in turn relate to more effective tinnitus management. It has been introduced in some UK schools and at the time of writing an evidence base for its effectiveness is beginning to emerge. (Kuyken 2013).
Mindfulness is also being introduced in schools through the .b programme for 11-18 year olds and Paws.b for reception to year 6 children (Appendix 10).

Sleep

Sleep difficulties are commonly reported by children with tinnitus and their parents. As a starting point, it is important to find out what tinnitus sounds the child hears, what they think those sounds are, and any worries that the child has about the sounds.

Case example: Jack, aged 9, worried a great deal, and this included fears about people breaking into the house at night. He said that his tinnitus sometimes sounded like the stairs creaking, and this made him feel very scared and then he can't get to sleep.

Many children are helped by introducing quiet, soothing environmental sound to the bedroom (e.g. fans or gentle music) Parents should be encouraged to develop a good bedtime routine for their child, which includes avoiding mentally stimulating activities before bedtime such as TV or computer games.

Case example: Luke, aged 15, watched TV in his bedroom to distract from the tinnitus sounds at night. He watched documentaries about servicemen in Afghanistan and was then unable to relax. Luke was encouraged to use other sounds to aid relaxation and to distract him from his buzzing sounds.

Although the child's sleep difficulties may be ascribed to the tinnitus, other explanations should be considered, for example a more general sleeping problem due to a poorly established bedtime routine, or long standing sleep onset anxiety – namely, difficulty falling asleep due to excessive fears and worries. Children with more general sleep difficulties may benefit from referral to a local sleep clinic or other community service via their GP.

Noise exposure and evasion

Within the framework of the PINCHE project it was concluded that the auditory effects of noise on children can be long-term and cumulative (PINCHE 2006). Subsequent hearing loss or tinnitus experience should be viewed from a life-course perspective.

The use of hearing protection is not routinely recommended apart from in particular circumstances where noise levels are unusually loud, such as a concert. Protecting ears from such loud sound levels needs a careful approach, and as far as possible an understanding of the individual's personal preferences. For example - advising volume restricted headphones for someone with a love of loud music is unlikely to be successful, but talking about filtered ear plugs and their use by the music industry may have more weight. It is equally important that the child is provided with a good explanation of noise induced hearing impairment where appropriate (Appendix 9).

Sound enrichment: hearing aids and other devices

If a child with tinnitus is found to have a hearing loss, hearing aids should be considered as a first line of treatment. The selection, fitting and programming of a hearing aid in a child should follow current guidance (MCHS 2005).

Hearing aids

Currently there is no evidence to support or refute the effectiveness of hearing aid use for tinnitus management across the paediatric population.

Studies have looked at whether there is a correlation between the level of hearing impairment and impact of tinnitus. Their conclusions suggest that children with moderate sensori-neural hearing loss tend to report tinnitus more readily than those with severe to profound loss (Coelho 2007).

It is generally deemed sensible to offer hearing aids to children with tinnitus where a loss is present. In the adult population, it has been suggested that a hearing aid device helps to lessen tinnitus impact in a number of ways, not least the reduction in listening fatigue. Hearing aids are used primarily to enable improved listening, and often, as a by-product to this function, tinnitus perception is reduced and its impact lessened. Hearing aid fitting may be counterproductive in certain cases due to ear canal occlusion by the hearing aid mould (Gabriels 1996). Access to open fitting technology where appropriate may of course minimise this concern.

Children with severe to profound hearing loss and tinnitus may find tinnitus more noticeable when they take off their hearing aids at bed time and environmental sound will be of little use. Alternative strategies that aim to normalise tinnitus and reduce associated worry and distress are required.

Case example: Matthew, aged 11, has a severe bilateral loss. He is only aware of tinnitus at bedtime when trying to sleep. Matthew hears his tinnitus and has worked on this noise being the same noise a character in his favourite console game makes. He plans his next move in the game and it helps him to sleep.

Devices

The principle of sound based-therapy can include the use of everyday devices. Sweetow and Sabes describe wearable sound generators, music, hearing aids, radio, TV, fans and relaxing sounds as devices for sound–based therapy (Sweetow 2010). The device should provide sounds that can be incorporated into the background sound environment. Sounds if used, should be used at a quiet level.

Sound enrichment is also often used as a tool to aid relaxation and to lessen anxiety. With adults, sounds such as white noise, sea waves, rain noise, wind sounds or pulse tones are frequently used. Research is needed to identify which sounds are most meaningful and effective for use with children. Sounds that are soothing to children and evoke pleasant associations are likely to be both age dependent and personal. There are many ways to access environmental sounds, such as soft music and the nature sounds such as those mentioned above. Many children will have access to such sounds in downloadable formats. Apps on tablets such as relaxation melodies or the material produced by companies such as www.relaxkids.com can be downloaded and also played in CD format.

Wearable sound generators

There is no research on wearable sound generators as a stand-alone treatment for tinnitus in children. A 2012 study reports significant improvement using sound generators as part of Tinnitus Retraining Therapy for children (Bartnik 2012). However, we know little from the study about the counselling input and other strategies used alongside the devices, or its benefits compared to other treatment strategies for children. Further research is required to determine whether there are specific child populations likely to benefit from wearable sound generators, for example children with complex special needs, ASD, limited language and communication skills.

Sound generators may prove helpful for children who like to use sound therapy for their tinnitus but are in a situation where they are unable to use environmental sound or music players.

Case example: Mia, aged 16, was about to sit a 3 hour art exam at school in silence. Using sound generators at this time helped her to focus on the exam and allowed her to be with other classmates whilst sitting it.

Psychological approaches to tinnitus

There is often a complex relationship between tinnitus, emotional well-being, stress and the context of the child's life. It seems clear that worries and anxiety about the tinnitus result in increased awareness (Halford 1991). Psychological disorders such as anxiety and depression may arise from tinnitus but equally they may also reflect other stressful events in the child's life, yet be attributed to the tinnitus by the child (i.e. "if only my tinnitus went away, then everything would be better"). Parents and the child can be helped to understand that other difficulties in the child's life may co-exist with, or exacerbate, tinnitus distress.

Treatment for psychological disorder needs to be provided by a trained mental health practitioner, and services such as CAMHS (Child and Adolescent Mental Health Service Tier 3), local Child Psychology Service or other similar local services may be the appropriate place to provide psychological support. Early identification and treatment of psychological difficulties are essential (Appendices 5 and 6).

For treating the co-morbid psychological symptoms associated with tinnitus distress there are a number of widely used psychological therapies, such as CBT and Narrative Therapy. Their effectiveness in alleviating tinnitus distress in children has not been evaluated and they can only be provided by staff with relevant training in these therapeutic techniques.

Cognitive Behavioural Therapy

There is support for CBT techniques for tinnitus management in the literature (Martinez-Devesa 2010). There is accumulating evidence indicating that CBT techniques result in clinically significant improvements in children with anxiety although its efficacy compared to other active interventions with very young children has yet to be consistently determined (Stallard 2009). Little is known about the effectiveness of CBT with children under 7 years of age and the younger the child the greater the focus upon behavioural aspects (Stallard 2002) Older children are more able to work with cognitions.

Case example: Max, aged 14, was not attending school on a regular basis and was very anxious about his hissing tinnitus. He did not sleep well because of the anxiety and had begun to miss days of school at a time and to sleep through the day. He went out with friends at night. CBT techniques were used to help reduce his anxiety and objectify his reasons for non-attendance in school which helped him and his parents manage the situation more effectively.

Narrative Therapy

Narrative therapy refers to techniques developed largely by Michael White and his colleagues, and is used with people of all ages. The word narrative in the context of therapy means listening to others' stories. Over time, individuals develop narratives or stories about themselves that help make sense of their lives and what happens to them. These 'stories' in turn have the effect of filtering future experiences, selecting what information gets focused in or focused out. Information is selected because it confirms existing beliefs, leading to dominant stories, for example that "tinnitus stops me getting to sleep". Narrative therapy aims to help the child bring to mind other stories, for example, of a time when the child got to sleep, even though they had tinnitus.

Externalisation is a key component of narrative therapy. A problem is often seen as integral to the person, and a part of the person's existence, and hence there is a perception that nothing that can be done to change it. Externalisation techniques are used to reverse this belief and to separate the person from the problem by putting it "outside the person" for example by drawing it or by giving it (the problem) a name. Once the problem (i.e. tinnitus) is separated from the child, one can then begin the process of constructing new stories about the way the child can respond to it differently.

There is no research to date demonstrating the effectiveness of narrative therapy for children with tinnitus. Nevertheless it is well suited for use particularly with young children because its techniques can be playful, imaginative and fun, and utilise storytelling, with which children are very familiar. A more detailed description of the use of narrative therapy for children with tinnitus is available (Kentish 2006; Kentish 2014).

Case example: Cara aged 5 called her tinnitus "wiggly worm" and said that it had got into her head through her ears and was banging on it with a stick, making a noise. It stopped her getting to sleep, and she was very frightened of it. Cara wanted help to be brave and tell "wiggly worm" to be quiet when she was trying to get to sleep. She drew another picture of "brave Cara" who stroked the wiggly worm, told him to be quiet and go to sleep. This brought forward a new story in which Cara could feel brave and in charge, rather than helpless.

Tinnitus management in the classroom

There are no standard management strategies for tinnitus within the classroom, or during social interaction at school. A pragmatic and personalised approach is therefore needed. It is helpful for schools and colleges, as well as students who have tinnitus, to have access to written information about management of tinnitus; what it is and how it can impact on learning in the classroom. In particular, advice regarding exam techniques and silence management can provide teaching staff with enough information to help individual children.

Tinnitus can impact on the functional listening abilities of children in the classroom, and therefore on educational progress. For teachers and support staff the impact of tinnitus in class may be observed as an unexplained change in level of attention, reduced learning focus, and student frustration.

Compromised speech perception may be described in the presence of background noise and in quiet listening situations. When intrusive tinnitus is present, listening, concentrating, and learning is likely to be tiring and effortful for the child, and this may well impact upon their psychological well-being as well as their educational progress.

Comments about experiencing tinnitus in class

- 'I 'catch words' but I can't understand them. It's not like that when my tinnitus isn't there'.
- 'Competing signals (tinnitus vs. speech) are confusing and it's all muddled so I make mistakes'.
- 'It's like I'm disconnected from what's going on in class'.
- 'I try hard but all I can do is focus on my tinnitus'.
- 'I feel stressed and unhappy'.

Assessing tinnitus in the classroom

Exploration of everyday listening difficulties, in a range of classroom learning scenarios, is essential (see appendix 4 for recommended assessment measures). The assessment can also include a VAS for listening effort (from 'no effort/ not tiring' to 'lots of effort / very tiring'), a detailed exploration of classroom listening geography, personal learning style and levels of academic confidence.

Tinnitus may also be identified during investigations and assessment for other difficulties.

Case example: Matthew, aged 9, had a mild left sided conductive fluctuating hearing loss and was assessed by a teacher of the deaf for functional listening difficulties, assumed to be hearing loss related.

Using drawings of his classroom and a LIFE questionnaire he commented that 'when my friend chats and it's noisy I can't hear my teacher's words'. Matthew didn't enjoy some parts of the school day as he couldn't hear as well. He also said he heard a 'train like noise followed by a ringing sound', and this occurred when his functional listening should have been good i.e in a quiet environment.

In silent reading he felt 'overwhelmed' by his tinnitus, and he found concentration difficult. During spelling tests his tinnitus often masked his teacher's voice, and he made mistakes as a result of mishearing.

Simple information about tinnitus was provided. We looked at the times he had difficulty in class linked to his hearing loss, and times when tinnitus alone impacted on his functional listening skills. Action points were devised.

Action Plan: Discussion points for a meeting with the SENCO, Matthew and his mother:

- Matthew wanted to tell his teacher about his tinnitus himself
- He wanted to design his own tinnitus 'alert card' for use in class
- We considered that a different room be used for quiet reading along with a small group who had teacher/TA supervision
- His choice for dealing with spelling tests was for his teacher to look at him to make sure he had 'heard' the word; to time presentation so he looks before she speaks

Classroom based strategies

A pragmatic and personalised approach is suggested, for each individual case. Advice assumes that teachers have been well informed about tinnitus, and that the child's self-help strategies and teacher led management have been agreed formally with the school.

Key points for discussion with student and school team

- Tinnitus impact to be assessed and summarised into key areas of concern.
- Keep things simple, manageable and achievable.
- Together with the student, work out what strategies will help – linked to their key difficulties.
- Communication with the SENCO through direct approach and face to face discussion. It is very important that students are encouraged to talk to a trusted teacher / SENCO about their tinnitus.

Planning

An action plan for when tinnitus impacts on functional listening and causes some level of distress, may include:

- Time away from the classroom so the student can 'rest' quietly for a few minutes.
- Use of environmental sound (e.g. fan, low level music through iPod / computer).
- Use of other techniques (such as relaxation) that the student has been taught.

- Change in the seating plan in class if tinnitus is triggered by particular loud environmental sound, or people's noise.
- Avoidance of trigger situations when practical e.g. quiet library time .
- Student self-help skills: Ask a friend; ask the teacher for help.

Professional support and management

Where a child with tinnitus is already known to have special educational needs it is important to liaise with relevant professionals, especially the school SENCO. Additional information and targets can be included in the child's IEP, and methodology of input, such as teacher assistant support (TA), reviewed. If the child has a statement of Special Educational Needs, information about tinnitus and its management can be included at the annual statement review.

For a student not already known to the SENCO, and where tinnitus requires management in school, the SENCO needs to be informed. This facilitates whole school awareness and training, if required. IEP targets may need to be devised and management changes put in place.

School counselling services can be considered where emotional distress or anxiety are part of the child's profile. Access to projects such as '.b' - a mindfulness in school project - may be a positive way forward (Kuyken 2013).

Teacher of the Deaf / Sensory Support Service

If a school has a specialist teacher of the deaf already visiting, or can request the services of a local team in an advisory role, it is suggested that contact is made with the team. Initially this may be for assessment and advice around hearing and listening function, when the child's tinnitus is as yet unknown, but school have concerns about the child's performance and auditory access. Where tinnitus has recently been identified then referral to the local Teacher of the Deaf team would be indicated to provide advice and training.

Additional information

When tinnitus impacts upon a student's performance during external formal examinations, advice and support can be requested from the SENCO regarding access arrangements or reasonable adjustments. Recommendations for internal school examinations, where the quiet environment combined with tinnitus causes difficulty, may include use of a separate room, and introduction of an additional low level sound source (such as a fan).

5

Development of a Paediatric Tinnitus Service

The findings of the surveys outlined in Appendix 1 suggest that many healthcare professionals in the UK are not confident in their management of children with tinnitus. NHS services already face a wide range of demands upon their hard pressed resources. These two factors have been taken into account, as well as national frameworks and other relevant guidelines, when making our recommendations for future organisation of tinnitus services for children. Our recommendations are:

- Children should be seen in appropriate paediatric settings and not in adult settings. This will inevitably create difficulties for centres with established tinnitus services for adults wishing to extend this to children. Nevertheless, this recommendation is in line with national guidelines (NDCS 2000; NSFC 2003; DoH 2008)

- Given the variety of professions involved in paediatric audiology, we do not recommend specific job titles or professions, but rather that there is a skill set that needs to be fulfilled. It is highly likely that to cover all the skills a variety of professionals will be involved. Access to psychological services is necessary, so referral routes for the service must be identified.

- Healthcare professionals should have, or will need to acquire, the essential skills and knowledge that enables them to work with children. These include knowledge of policies and legislation relevant to children, local and national protocols for audiological and medical assessment and skills in listening and communicating with children, including children with disability. They also need to be able to work with families and liaise with local education support services.

- Paediatric tinnitus services may attract vulnerable children where safeguarding issues are particularly relevant. This must be appreciated and processes put into place to ensure that all staff have the appropriate level of training for local safe guarding procedures.

- Skills for the management of children with mild to moderate tinnitus distress should be available within most paediatric audiology services and community paediatric services. Children in this category will benefit from assessment and information counselling, which can be provided by a number of different professionals. Many paediatric audiology services will already have the skill set and facilities to see these children without making significant changes to the clinical structure or resources.

- Ideally, multidisciplinary, regional centres of excellence, where there are specialist skills in paediatric tinnitus management, will be available for children with severe distress and/or complex presentations of tinnitus. The exact members and roles of this team will vary (DoH 2009).

Appendix 1
Service Provision

There is no published information about the current services available in the UK for children with tinnitus. In 2009, a survey of British Society of Audiology (BSA) members was conducted of working practices of managing children with tinnitus. There were 94 respondents to the survey which included audiologists, audiovestibular physicians, audiological scientists, paediatricians in audiology, hearing therapists, a teacher of the deaf, and a psychologist.

Most respondents felt that tinnitus was very rarely mentioned spontaneously as a problem. Only 6% routinely asked children in clinic if they had tinnitus. Around one third (36.7%) usually asked, or did so on special occasions. Approximately half (55%) never or rarely asked. Factors influencing their decision included the child's age and communication level, whether tinnitus was the presenting symptom, and the nature of other audiovestibular symptoms.

Under half (41%) of respondents routinely or sometimes investigated a child with tinnitus, 30% did not investigate, while 15% said that they would like to do so. Whether investigations were carried out depended on the severity of the tinnitus and the presence of other symptoms and findings. Investigations offered were those recommended by the adult tinnitus care pathway and considered if, for example, there is sensorineural hearing loss, a family history of hearing loss, developmental delay, or asymmetric hearing loss were present. Investigations included standard hearing tests/ tympanometry, acoustic reflexes, OAE's and, if indicated, ABR or MRI. On the other hand, several respondents said that the investigations were not considered as there is no clear care pathway for children.

The use of hearing aids, and counselling were the most common management strategies. Sound generators were used by a third of respondents. Voluntary bodies, websites and leaflets were recommended by around half, although many commented that there was little or nothing suitable for younger children.

A few respondents felt tinnitus was not a sufficient problem to warrant treatment, or a paediatric service. Most however felt that managing tinnitus in a child was beyond their scope of practice. Around three quarters were unhappy with their current level of knowledge and management skills, felt they needed further training, and expressed a desire for a standardised approach, guidelines for referral, age appropriate counselling strategies, and tinnitus information geared towards children. Many respondents felt that they did not have suitable networks currently in place or access to a specialist interested in paediatric tinnitus.

A small scale survey in 2012 by the BTA* of paediatric tinnitus service provision found that currently the vast majority of paediatric tinnitus services are located in paediatric audiology departments, and a small number located in hearing therapy, ENT, AVM, and adult audiology departments. Respondents expressed a wish for advice on performing a good paediatric and audiology assessment, a specific assessment to rule out neurological or ENT causes of tinnitus and successful management strategies including age appropriate explanations to parents and age-appropriate information for children.

*****_Survey by the BTA on service provision for children with tinnitus was sent to past delegates of the UCL Tinnitus and Hyperacusis Masterclass and to members of BAAP, BAPA and the BSA's Paediatric Audiology Special Interest group. There were 35 respondents._

Appendix 2
Evidence Base

Prevalence of tinnitus

Studies looking at tinnitus in children have a number of methodological difficulties, including the wide age range of the children; the child's linguistic ability to describe tinnitus; reliance upon parental report; and definition of tinnitus. Taking this into account, research suggests that tinnitus is a relatively common experience in children, and in terms of prevalence, is on a par with the adult population. Reported prevalence figures vary from 12% to 36% in children with normal hearing (Sheyte 2010) and is more common in children with hearing loss compared to those with normal hearing (Graham 1987; Viani 1989; Stouffer 1991; Brunnberg 2008; Raj-Koziak 2011). A comprehensive, and recent review of the prevalence and incidence of tinnitus in children, can be found in the following recent chapter: 'Tinnitus and Hyperacusis in Childhood and Adolescence' In 'Tinnitus – a multidisciplinary approach' (Baguley 2013c). The prevalence of tinnitus in children with cochlear implantation has yet to be conclusively determined. However, one study suggests it may be prevalent in this population also (Chadha 2009). Of the 40 children, aged 3 -15 years in this study, 38% reported tinnitus, most commonly in the implanted ear and when the implants were not in use. Tinnitus was most common in implantees with an inter–procedure delay of at least two years. The children were generally untroubled by it although two reported difficulties sleeping.

In a recent study (Juul 2012) of 706 children, 41% of children with normal hearing reported some experience of tinnitus and 58% of the children with hearing loss reported tinnitus sensations, either noise induced or spontaneous. Increased exposure to loud noise can be considered to be one worrying cause for this.

Incidence of tinnitus in children

There is very little research relating to the incidence of tinnitus In a recent publication, Baguley *et al.* conducted a retrospective case review of patients under 18, referred to four international specialist centres in 2009 with a primary complaint of tinnitus (Baguley 2013b). In total, 88 children were referred, which represented 3.8% of the paediatric clinical workload in that year. Of those referred, 93% were aged 10 years or older. In 18%, tinnitus classified as severe. Tinnitus was accompanied by hyperacusis in 39%. The authors suggest that epidemiological data for the prevalence of childhood tinnitus should be interpreted with caution as it is dissonant with the data presented in their study. However, it is also likely that, as with adults, most children with tinnitus self manage and/or are not referred for treatment.

Co-morbidity

Tinnitus commonly occurs with hyperacusis. Baguley (2013) found nearly 40% of children with tinnitus had associated hyperacusis. Coehlo found the presence of hyperacusis to be the highest risk factor for tinnitus suffering, however the presence of tinnitus was not found to be a risk factor for hyperacusis (Coehlo 2007b). Tinnitus has also been associated with otitis media (Mills 1984; Ben-David 1995). Associated reported physical health symptoms include headache dizziness and vertigo (Aust 2002; Aksoy 2007; Kim 2012). It has been associated with juvenile Meniere's disease, and with vestibular schwannoma, particularly in relation to neurofibromatosis type 2 (Evans 2009). Exposure to noise has been identified as a risk factor in studies by both Holgers (Holgers 2005) and Coehlo (Coehlo 2007a).

Psychological factors and tinnitus in children

Research is very limited, but suggests a similar pattern to adults, with rates of anxiety and depression in a child with troublesome tinnitus being higher than in the general population. Predisposing factors for tinnitus severity include hearing loss, anxiety and depressive disorders (Holgers 2006). A combination of tinnitus and hearing loss has been reported to increase the risk for mental health symptoms, substance use and school problems (Brunnberg 2008) In a study of 10 -12 year olds with tinnitus, Kim *et al.* conclude that tinnitus in children had a considerable influence on their levels of stress and anxiety (Kim 2012).

Tinnitus treatment in children

To date, only one study has directly looked at treatment outcomes for children with tinnitus (Bartnik 2012). Given the lack of an evidence base, there is an urgent need for further research in this area to help clinicians determine the most effective treatment strategies for children with tinnitus.

Pain and anxiety in children

Tinnitus is considered to be similar to pain in a number of ways (Moller 2000). Both result from an interplay between biological, psychological and social factors. Both are subjective experiences and with a strong component in the form of accompanying disorders such as anxiety, depression and sleep disorders. Neuroplastic changes have been shown to be important for the development and maintenance of both pain and tinnitus suffering (Weise 2013).

Pain is a relatively common childhood experience, and impacts all aspects of a child's life. The prevalence of chronic pain in children is estimated to range from 15% to 30% with headache and abdominal pain being the commonest recurrent pain problems (Huguet 2008). Currently, paediatric chronic pain is theorised to be an interplay between the physical experience, emotional reactions and cognitions (Mahrer 2012). Parental behaviours have been shown to influence the child's adaptation to pain, with parental solicitousness and parental discouragement associated with increased disability. In a systematic review of randomised controlled trials of psychological therapy for chronic pain in children and adolescents, Eccleston *et al.* concluded that there is strong evidence that psychological treatments, principally relaxation and Cognitive Behaviour Therapy (CBT), are highly effective in reducing the severity and frequency of chronic pain in children and adolescents (Eccleston 2002). In view of this, relaxation and CBT could be considered as promising treatments for children and adolescents with severe tinnitus, and this is an important area to be researched.

Appendix 3
Child-Friendly Interview Techniques

We recommend that children with tinnitus are assessed and managed within a paediatric service.

Healthcare professionals who work within paediatrics are familiar with the skills required to obtain information from children and families and also in family friendly ways of delivering information.

Learning to listen to a child's point of view takes time, but can be a time-saver in the long run as it will inevitably help the intervention to be more effective. However in a time-limited appointment, skill is needed to manage the conversation well so that it remains open enough for a child's point of view to come out, and narrowed enough to hone in on the specific information needed. Parents and children in audiology clinics want access to clear unbiased information given in a respectful manner, and don't want professionals who provide quick answers to complex questions. (Spencer 2000). To aid those professionals not used to working with families or those with limited experience, the following key points can help to make the appointments child and family friendly.

Environment

We are often limited by the appearance of the rooms in which clinics are held, but a simple rearrangement of the furniture can make a room appear less formal. It helps to keep medical and audiological equipment out of sight as far as possible. The healthcare professional should position themselves and the child at relatively equal eye level to diminish an authoritative image. Sitting on low chairs around a small table rather than at a desk is less intimidating and clinical. Having a variety of toys or activities available that can serve as rapport-builders or props for the assessment session also makes the environment child-friendly. Access to drawing materials or story boards (e.g.' My World' Paediatric Counselling Tool from http://idainstitute.com/tool_room/pediatric_audiology/) can provide prompts to help a child describe their symptoms and difficulties.

Time

Giving the child a few minutes at the beginning of the appointment often enables them to adjust and feel comfortable in their surroundings, enabling communication to happen more effectively. Allow the child to explore the room and give them some simple choices such as where to sit or what to play with initially. Get an idea from the child about why they think they are there, and make a plan together with the parents as to what everyone wants to accomplish in the appointment time.

Communication

Quality communication is unlikely to happen without taking the time to establish trust initially. Allowing the child to honestly share their feelings and thoughts about their tinnitus experience is important. Asking open questions allows the child to express what is most important to them. As children present with tinnitus at a variety of ages, it is important to use age-appropriate vocabulary and language.

Appendix 4
Key Elements of the Clinical Assessment

History:

- Child's description of noises or sounds heard
- Tinnitus characteristics (e.g. onset, location)
- Annoyance / distress
- Impact (e.g. health, home, school)
- Family history (e.g. tinnitus, hearing loss)
- Otological (e.g. hearing loss, dizziness, vertigo, hyperacusis, ear infections)
- Medical history (e.g. meningitis, head injury)
- Neurological (e.g. headache, facial nerve palsy)
- Noise exposure
- Drugs (e.g. chemotherapy, antibiotics, all other medications)
- Social / psychological (e.g. school performance, bullying, family break-up etc)
- Mental health (e.g. depression, anxiety)
- Current coping strategies

Clinical tests:

- Otoscopy
- Audiometry
- Tympanometry

Appendix 5
Signs of Tinnitus Distress

- Reluctance to talk about tinnitus
- Seems scared, poor eye contact especially during audiological testing
- Moody, outbursts of temper, difficulty sleeping
- Description of tinnitus as personified: "alive" "monsters" "have to fight it"
- Tinnitus occurs in specific circumstances e.g. home vs. school
- Triggers (e.g. quiet, noise, stress, emotionally charged situations - people shouting, being told off by teacher, particular lessons)
- Seems helpless in ability to manage tinnitus
- Unable to describe successful coping strategies
- Onset of tinnitus linked to significant life event
- Complains about an uncomfortable "something" in the ear
- Strong dislike of sounds or distrusts sounds in one or both ears

Appendix 6
Psychological Associations with Tinnitus

There is often a complex relationship between tinnitus, emotional well-being, stress, and the context of the child's life. Psychological disorders such as anxiety and depression may arise from tinnitus but equally they may also reflect other stressful events in the child's life and exacerbate tinnitus distress. Research suggests that the prevalence of anxiety and depression is higher in children with tinnitus. It is important to be able to recognise significant psychological distress and refer onwards to a child mental health service.

Anxiety disorders

Worries in children are common and a normal part of child development. The three most common areas of worry relate to school, health, and personal harm (Silverman 1995) Children with anxiety disorders tend to have more intense, excessive and persistent worries. There are a number of different types of anxiety disorders, but these share in common a perception of threat that generates anxiety. Children with distressing tinnitus frequently experience tinnitus as a threat to their well-being and hence it is anxiety provoking.

In the general population, anxiety disorders are among the most prevalent disorders in children and adolescents. Diagnosable anxiety will affect up to one in ten children during childhood and adolescence (Davis 2011). It often goes undetected and untreated, and can cause significant impairment in social, academic and familial functioning.

Childhood anxiety disorder frequently persists into early adulthood.

Warning signs of anxiety include child descriptions of:

- Breathlessness or breathing fast, butterflies in tummy, "jelly legs", panic attacks
- Tingling sensations, heart beating fast, dry mouth
- Dizziness, feeling sick, increased need to go to toilet,
- Intense, worried thoughts about present or future events

Depression

It has been estimated that 1 in 33 children and 1 in 8 adolescents are suffering from depression at any one time. Depression often occurs with other mental disorders, including anxiety. Recognising depression in children can be more difficult because the way symptoms are expressed varies with the developmental age of the individual. Children who experience loss, high levels of stress, learning disorders or conduct disorders are at higher risk for depression. Younger boys and girls are at equal risk, but during adolescence, girls are twice as likely to develop depression (NICE 2005).

Signs of depression include:

- Unhappy, tearful, may show troublesome behaviour, low mood
- Headaches, tiredness or vague physical complaints with no obvious cause
- Sleeping badly or waking early
- Irritability, quiet or introverted
- Lack of self- worth, feeling hopeless

Appendix 7
Assessment Measures

It is well documented in both the adult and paediatric literatures that information provided by proxy respondents is not equivalent to that reported by the patient (Varni 2007). Parental responses can be complicated by unresolved concerns and distress over their child's health and well-being, thus influencing their perceptions of their child's health and well-being. Whilst parental information is important, it cannot be substituted for child reports.

Baseline Tinnitus Questionnaires

There are currently no standardised tinnitus questionnaires for use with children and there is an urgent need for one to be developed.

These are a number of widely used measures within the adult tinnitus population, but they are not standardised for use in children. If adult questionnaires are used with older children and teenagers, they can be helpful for the gathering of qualitative information, but should be used with great caution. They cannot be formally scored. Where appropriate, a questionnaire can be to read to the child, ensuring that questions and vocabulary are understood. Whilst descriptive measures such as the Likert and VAS are subjective, they can be a useful measure of a child's distress. This also provides the opportunity to talk in more detail about the child's answers.

Likert Scale

This is a three, five or seven point scale which allows the individual to express how much they agree or disagree with a particular statement. It has the advantage of being easily understood and quantifiable, and is a quick and efficient means of gathering information. A child's ability to complete a Likert scale will depend upon their age, cognitive and reading ability. Younger children tend to use the extremes of any Likert scale which means that if used to measure tinnitus severity, distress or impact, young children's responses should be treated with a degree of caution. (Chambers 2002). Even school age children, can find it difficult to acknowledge they can experience multiple feelings at the same time, for example feeling both happy and sad about different things, and a more complex evaluation of feelings does not fully develop until around 12 years of age.

There is some research to suggest that children prefer the Likert Scale over the numeric and simple VAS and find it easier to complete (Van Laerhoven 2004).

Visual analogue scales

This is a similar, but more visual form of rating, with the advantage that it does not force children into fixed categories as does the Likert. The minimum age at which children are able to complete VAS is debated, with some claiming it can be reliably used by children as young as 5 years. Others argue that children below the age of 7 may not have the conceptual ability to complete a VAS reliably (Van Laerhoven 2004). Cognitive ability, combined with chronological age are the best predictors of a child's accurate use of a VAS. Again, younger children have been found to have a position bias when using VAS, tending to choose the first answer among response options (Pantell 1987).

Psychological well-being

Questionnaires can be used to screen for associated psychological difficulties. Their use can sometimes facilitate referral to child mental health services, when necessary. There is very little comparative data between the available questionnaires.

Paediatric Index of Emotional Distress Questionnaire (PI-ED) (O'Connor 2010)

This is a paediatric version of HADS (Hospital Anxiety and Depression Scale). It has UK Standardisation. A reading age of 7 year is required. The PI-ED screens 8 –16 year olds for symptoms of emotional distress and somatic symptoms of distress. It may be useful for research or as an index of clinical change in emotional distress associated with tinnitus.

Strengths and Difficulties Questionnaire (SDQ) (Goodman 1991)

This is a widely used screening questionnaire for use with 3 -16 year

Example of visual analogue scale. The child is asked to indicate where on the line they think they are for a given situation, e.g. 'Can you show me how you feel when you can hear your tinnitus at school?'

olds. There are separate scales for parent and teacher rating of 4-16 year olds, and a self- rating scale for 11-16 year olds. The questionnaire covers emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, prosocial behaviour.

A follow up version can be used to measure change. It is freely downloadable from the internet at www.sdqinfo.org

Revised Children's Anxiety and Depression Scale (RCADS) (Chorpita 1998)

This is a well standardised questionnaire for 6-17 years. It is a 47 item self–report. There is a separate parent version - RCADS-P. The RCADS has 6 subscales covering: separation anxiety disorder (SAD), social phobia (SP), generalised anxiety disorder (GAD), panic disorder (PD), obsessive compulsive disorder (OCD), and major depressive disorder (MDD). It yields a Total Anxiety Scale (sum of five anxiety scales) and a Total Internalising Scale (sum of all 6 scales). Items are rated on a 4 point scale. It is downloadable from the internet (www.childfirst.ucla.edu) and includes an automated scoring. It is available in a number of different languages, although norms are currently based upon English (US).

Questionnaires for educational assessmentThe CHAPS, LIFE-R and SIFTER questionnaires can be accessed freely from: http://successforkidswithhearingloss.com

CHAPS

The Children's Auditory Performance Questionnaire evaluates listening, comprehension, memory and attention in different listening conditions. It helps to identify children who are at risk and need additional support related to auditory performance.The questionnaire is completed by a teacher, and does not ask students about their experience of functional listening and factors that may be impacting on the quality of the experience. However the questionnaire may provide information that can be used to guide a discussion with the student to establish factors influencing their learning and listening profile, and whether tinnitus is part of this.

LIFE

The Listening Inventory For Education Efficacy Tool Package is intended mainly for use with children with hearing loss. There are separate student and teacher sections. The Student section includes preliminary questions, 15 listening scenarios, and a measure of self- advocacy. The Teacher section includes pre- and post- questions and measure of self-advocacy of students. It has been adapted to UK context with LIFE – UK, and LIFE-UK IHP (Canning 1998).

Student section: Compromised speech perception is often described in background noise and in quiet listening conditions (separate questions in the LIFE questionnaire). In the case of a student experiencing speech perception difficulties associated with hearing loss, the question relating to listening in background noise will be the more challenging situation in school. Where a student indicates difficulty in quiet situations as well, it is important that this is explored carefully as a possible indicator of tinnitus impacting on listening ability.

As tinnitus can be triggered by increased noise levels, a student with hearing loss may describe both difficulties – hearing difficulty in noise and intrusive tinnitus that extends on into school situations where background noise levels have become much quieter. Spending time exploring the sequence of events and how each factor may be at play provides important information regarding tinnitus impact, and its future management (Canning1998).

SIFTER

Screening Instrument For Targeting Educational Risk. This is designed to screen children with a hearing loss who may be experiencing educational difficulties as a result of their hearing-impairment. It covers five content areas: Academics, Attention, Communication, Class Participation and School Behaviour. The questionnaire is completed by a teacher, who compares the student to hearing peers. It does not ask students about their own classroom learning experience. However the information can be explored further with teachers / staff working with the student to gain a fuller understanding of the student's classroom performance, and whether tinnitus is a factor in reduced academic skills.

My World Tool, Ida Institute

This is a set of moveable boards and figures to represent various listening situations and allows the child to qualitatively indicate how they are managing within the school environment.

Appendix 8
Tinnitus in the Classroom - Information Booklet

The following can be used as the basis for a personalised workbook and guide. As a resource, it includes an explanation about tinnitus and examples of how tinnitus can impact in the classroom.

This booklet can also be a resource for teachers and support staff. It can be part of an educational approach with a student, to assess their experience of tinnitus, and develop a management plan with them. This may be included in the child's Educational Health and Care Plan.

Tinnitus is a noise heard in your ears and /or in your head. This noise is described in many ways. Sometimes our brains focus on this internal sound, and it can be annoying, or make listening to people speaking quite difficult. Lots of children, teenagers and adults experience tinnitus and it's only a problem if it affects how you hear, how you sleep, or if it makes you feel worried.

Tinnitus may affect you in school when you are trying to listen to your teacher, or to your friends. Everyone is different – your tinnitus may be a problem to you when the class are very quiet (maybe when you are having a test or time in the library). Other people find that classroom noise can make their tinnitus sound louder. Perhaps a certain subject is hard for you and being in the lesson makes you feel anxious – for some people this may trigger their tinnitus. So working out when tinnitus is a bother for you is very important.

Step I:
When is your tinnitus a problem?

The noise/s I hear sound like:

…….....

When I'm in school it becomes a problem in:

…….....

…….....

…….....

Tinnitus can't be seen. People will have no idea you hear tinnitus and that it bothers you sometimes, unless you tell them. We want to help you learn how to explain to your teachers and friends what's happening. Here are some ideas on how you can do this.

Step 2:
Telling someone

'I try hard to listen to what you say but the noise I hear in my ears is louder than your voice. This is difficult for me, and you may think I'm not concentrating in your lesson. I find this is very annoying and upsetting, as I can't just listen and learn easily'

'I need to talk to you about the test we had last week. I kept asking you to repeat the questions, and I know I didn't do very well. I wasn't being out of order, and I was trying hard. The reason I was having a problem is because I have something called tinnitus – noises in my ears or my head. Lots of people have it, and mine becomes a problem when it's very quiet in class. Then I can't hear you very well, and my brain fixes on the tinnitus noise. It sounds like……

So what else can be done? Well, there are lots of ways to reduce the impact of your tinnitus when you are at school and you may have tried some already. Here are some situations and ideas from other people on what could be helpful.

Step 3:
What can be done?

'My tinnitus becomes really loud when the class are noisy or my teacher's voice is loud. Even when everyone settles down my tinnitus carries on. I can't hear what my teacher says very well and I often try to guess what she said and then make mistakes' (do make sure you tell your teacher Step 2)

- Ask to be moved away from very noisy groups / people
- Carefully explain to your teacher about voice level
- If you are in a lesson and your tinnitus is triggered, agree a way you can alert your teacher to help you – this could be a laminated card with a message that you show your teacher, or some other agreed signal (we can talk about this)
- During group work ask if you and your group can go somewhere quieter to work
- You may be able to have some time out if you are really struggling, but this needs a lot of planning and agreement with your teacher and school about how long for and where you will go.

‘Its quiet in class and my tinnitus becomes very loud. Its upsetting and can stop me concentrating on my work. Then when my teacher starts to speak I can’t hear her words, just my noise. I get very upset and I can get into trouble for asking my friends what’s been said. I mess up my work too because I don’t really know what to do. It also takes ages for my noise to go away’

- Agree a way with your teacher you can alert them / another adult / friend to help you – this could be a laminated card as before or maybe you can think of a better way to quietly let them know.

- Have your own support card – this could remind you about how to relax and to breathe to take your mind away from your tinnitus. It could be a lovely picture of your favourite place, or a big smiley face.

- Sometimes there is a low level noise in classrooms – a computer or heating fan perhaps. If you can sit close to this sound, it may help you ignore your tinnitus.

- Sometimes you may be working in a quiet place for a long time – maybe during library time, or in exams. If this is distressing for you and makes concentrating on your work very difficult, here are a few ideas that have worked for other students:

  - Sit near a sound source - this may be a fan or near some environmental sound (e.g the window is open) that is low level but loud enough to help you ignore your tinnitus.

  - Use iPod music at a low level just when you need it.

  - Use headphones linked to the library computer so you have another sound source.

All these suggestions will need to be agreed with your school in discussion with a teacher or the SENCO in the school. As there are strict rules about use of headphones / iPod / technology in schools it may not be possible for this to happen, but other ways forward may be agreed.

Appendix 9
Hearing Protection

Exposure to loud noise and music, either directly to the ear through a personal music player, or environmentally, is a risk factor for hearing damage. Headphones and in-the-ear playback devices may produce significantly higher SPLs in younger children because of their smaller outer ear volumes, particularly the small canal volumes in very young children.

Noise induced tinnitus is often reported as a consequence of attending music events, where there may be exposure to high volume music (up to 100–115dBA) and for prolonged periods, may be experienced. Loud levels are also likely using a personal music player – the sound level at the eardrum can be up to 100dBSPL, especially when ear buds are used in noisy environments. Concerns are well documented about the use of ear-buds which provide poor isolation from background noise thus resulting in higher listening levels (Hodgetts 2007).

Although ear damage and experience of noise induced tinnitus is likely, it is not possible to predict how much damage there will be, and for whom. It has been suggested (Davis 1998) that there may be a group of young people who are more susceptible to cochlea damage; indeed these children / teenagers may be within the cohort being seen in tinnitus clinics.

Research also suggests that older children and teenagers, the age group most likely to be using personal music systems and listen to high volume music at concerts, do not relate to taking preventative action to protect their hearing. A discussion about reasons to look after their hearing system should be approached from an imaginative and relevant stance.

A successful educational approach needs to give clear information about listening behaviours – e.g. why volume levels on personal music systems are increased in some listening environments – and how this simple change can impact on ear health.

Discussions about how to protect ears from loud sound levels needs a careful approach, taking into account the individual's personal preferences. For example: advising volume restricted headphones for someone with a love of loud music is unlikely to be successful, but filtered ear plugs and their use by the music industry may have more weight.

Choices of action:

- Use of software to limit volume levels at source.
- Use of filtered ear plugs, including 'off the shelf' plugs, can reduce volume levels by approximately 16dB across the sound spectrum – for environmental high volume listening.
- Use of volume restricted or noise cancelling headphones for everyday listening.

Care needs to be taken if listening to music is being used to help with the tinnitus. Music volume should be kept as low as possible to avoid triggering tinnitus.

For a large range of technical support for listening / protecting hearing: www.connevans.com

Appendix 10
Further Reading, Resources and Websites

Further reading and resources

Baguley D Andersson G, McFerran D, McKenna L. (2013) Tinnitus and hyperacusis in childhood and adolescence" Chapter 18 in "Tinnitus A Multidisciplinary Approach second edition Wiley-Blackwell.

Faber A and Mazlish E (1980) How to Talk So Kids Will Listen & Listen So Kids Will Talk. Avon Books.

Kabat-Zinn J. (1996) Full Catastrophe Living. London: Piakus Books.

Kentish R, Crocker S. (2006) Scary Monsters and Waterfalls: tinnitus narrative therapy with children. In Tinnitus Treatment. Clinical Protocols. Ed: Tyler, R. Thieme Medical Publishers.

Williams M, Penman D. (2011) Mindfulness: A Practical Guide to Finding Peace in a Frantic World. London: Piatkus.

Stallard P. Think Good, Feel Good. A cognitive-behaviour therapy workbook for children and Young People. (2002) John Wiley and Sons

Stallard P. A Clinician's Guide to Think Good, Feel Good: using cognitive behaviour therapy with children and young people. (2005) Wiley–Blackwell.

Websites

Action On Hearing Loss
www.actiononhearingloss.org.uk

British Tinnitus Association (BTA):
www.bta.org.uk

British Society of Audiology (BSA):
www.thebsa.org.uk

The Mindfulness in Schools Project
www.mindfulnessinschools.org

My World Paediatric Audiology Counselling Tool.
www.idainstitute.com

Narrative therapy:
www.dulwichcentre.com

Relaxation, visualisation and mindfulness techniques for children :
www.relaxkids.com

Strengths and Difficulties Questionnaire:
www.sdqinfo.com

Supporting Success for Children with Hearing Loss
www.successforkidswithhearingloss.com

Sounding Board
www.soundingboard.earfoundation.org.uk

References

Aksoy 2007
Aksoy S, Akdogan O, Gedikli Y, Belgin E. The extent and levels of tinnitus in children of central Ankara. *International Journal of Paediatric Otorhinolaryngology* 2007;**71(2)**: 263-268.

Andersen 2011
Andersen KL, Smaldino JJ, Spangler C. LIFE-R Listening Inventory For Education – R and SIFTER Screening Instrument for Targeting Educational Risk. 1998. http://successforkidswithhearingloss.com

Aust 2002
Aust G. Tinnitus in childhood. *International Tinnitus Journal*, 2002;**8(1)**:20-26.

Baguley 2013a
Baguley D, Barnik G, Kleinjung T, Savastano M, Hough. Troublesome tinnitus in Childhood and adolescence: Data from expert centre. *International Journal of Paediatric Otorhinolaryngology* 2013;**77(2)**:248-251.

Baguley 2013b
Baguley D, Andersson G, McFerran D, McKenna L. Tinnitus: a multidisciplinary approach. Second edition. 2013. Wiley-Blackwell.

Baguley 2013c
Tinnitus and Hyperacusis in Childhood and Adolescence. In Tinnitus – a multidisciplinary approach. Eds: Baguley D, Andersson G, McFerran D, McKenna L. 2013. Wiley-Blackwell.

Bartnik 2012
Bartnik G, Stepien A, Raj-Koziak D Fabiajanska A, Niedzialek I, Skarzynski H. Troublesome Tinnitus in Children: epidemiology, audiological profile, and preliminary results of treatment. *International Journal of Pediatrics* 2012;**2012**:945356

Ben-David 1995
Ben-David J, Podoshin L, Fradis M. Tinnitus in children – still a neglected problem. *International Tinnitus Journal*. 1995;**1(2)**:155–157.

Brunnberg 2008
Brunnberg E, Linden-Bostrom M, Berglund M. Tinnitus and hearing loss in 15 – 16 year old students: mental health symptoms, substance use and exposure in school. *International Journal of Audiology.* 2008;**47**:688-694.

Canning 1998
Canning D. (1998) LIFE – UK IHP http://soundingboard.earfoundation.org.uk/downloads/life-uk_ihp.pdf

Chada 2009
Chadha NK, Gordon KA, James AL, Papsin BC. Tinnitus is prevalent in children with cochlear implants. *International Journal of Pediatric Otorhinolaryngology*. 2009;**73(5)**: 671–675.

Chambers 2002
Chambers C, Rogers C. Developmental Differences in Children's Use of Rating Scales. *Journal Pediatric.Psychology.* 2002:**27(1)**:27-36.

Chorpita 1998
Chorpita B, Ebesutani C. Revised Children's Anxiety and Depression Scale (1998). www.childfirst.ucla.edu

Coelho 2007a
Coelho C, Sanchez T, Tyler R. Tinnitus in children and associated risk factors. *Progress in Brain Research*. 2007;**166**:179– 191.

Coelho 2007b
Coelho CB, Sanchez TG, Tyler RS. Hyperacusis, sound annoyance, and loudness hypersensitivity in children. *Progress in Brain Res*earch. 2007;**166**:169-78.

Davis 1998
Davis AC, Lovell EA, Smith PA, Ferguson MA. The contribution of social noise to tinnitus in young people; a preliminary report. *Noise Health*. 1998;**1(1)**:40-6.

Davis 2011
Davis TE, Whiting SE. Evidence-based treatment of anxiety and phobia in children and adolescents: Current statue and effects on the emotional response. *Clinical Psychology Review.* 2011;**31**:592-602.

DoH 2008
Transforming Audiology Services for Children with Hearing Difficulty and their families: a good practice guide. Department of Health 2008.

DoH 2009
Provision of Services for Adults with Tinnitus: a Good Practice Guide. Department of Health 2009. www.webarchive.nationalarchives.gov.uk

Eccleston 2002
Eccleston C, Morley S, Williams A, Yorke L, Mastroyannopoulou K. Systematic review of randomised controlled trials of psychological theriapy for chronic painin children and adolescents, with a subset meta-analysis of pain relief. *Pain* 2002;**99**:157–165.

Emond 2013
Emond A, Kentish R. Tinnitus Counselling with Children. Audacity. 2013;(2):26-29.

Evans 2009
Evans DG. Neurofibromatosis type 2 (NF2): a clinical and molecular review. *Orphanet Journal of Rare Diseases*. 2009;4:16.

Gabriels 1996
Gabriels P. (1996). Children with Tinnitus. In Proceedings of the Fifth international Seminar 1996 (eds G.Reich and J. Vernon) Portland, OR, The American Tinnitus Association

Gans 2014
Gans JJ, O'Sullivan P, Bircheff V. Mindfulness based tinnitus stress reduction pilot study: a symptom perception-shift programme. *Mindfulness*. 2014;5:322-333.

Goodman 1991
Goodman R. Strengths and Difficulties Questionnaire (1991). www.sdqinfo.com

Graham 1987
Graham, J. (1987) Tinnitus in Children with hearing loss. In: J Hazell, ed Tinnitus. London: Churchill Livingstone, 1987; 131-43

Halford 1991
Halford JBS, Anderson SD. Anxiety and depression in tinnitus sufferers. *Journal of Psychosometric Research*. 1991;35:383-390

Hodgetts 2007
Hodgetts WE, Rieger JM, Szarko RA. The effects of listening environment and earphone style on preferred listening levels of normal hearing adults using an MP3 player. *Ear and Hearing*. 2007;28:290 – 297.

Holgers 2005
Holgers KM, Petterson B. Noise exposure and subjective hearing symptoms among school children in Sweden. *Noise Health*. 2005;7:27–37.

Holgers 2006
Holgers KM, Juul J. The suffering of tinnitus in childhood and adolescence. *International Journal of Audiology*. 2006;45(5):267-272.

Huguet 2008
Huguet A, Miro J. The severity of chronic pediatric pain: an epidemiological study. *Journal of Pain*. 2008;9:226–36.

Juul 2012
Juul J, Barrenas ML, Holgers KM. Tinnitus and hearing in 7-year-old children. *Archives of Disease in Childhood*. 2012;97:28-30.

Kentish 2000
Kentish RC, Crocker SR, McKenna L. Children's experience of tinnitus: a preliminary survey of children presenting to Psychology department. *British Journal of Audiology*. 2000;34:335-40.

Kentish 2014
Kentish R. Drawing pictures and telling stories: treating tinnitus in childhood. *ENT and audiology news* 2014;22(6):95 -96.

Kim 2012
Kim Y, Jung HJ, Kang SI, Park KT, Choi JS, Oh SH, Chang SO. Tinnitus in Children: association with stress and trait anxiety. *Laryngoscope*. 2012;122(10):2279–2284.

Kuyken 2013
Kuyken W, Weare K, Ukoumunne O, Lewis R, Motton N, Burnett R, Cullen C, Hennelly S, Huppert F. (2013) "Effectiveness of the .b mindfulness in schools program: non-randomized controlled feasibility study". http://mindfulnessinschools.org/research/research=evidence-mindfulness-schools-project/

Lamontagne 1985
Lamontagne L, Mason KR, Hepworth JT. Effects of relaxation on anxiety in children: implications for coping with stress. *Nursing Research*. 1985;34(5):289–92.

MCHS 2005
Modernising Children's Hearing Services (2005). Guidelines for the taking of impressions and provision of ear moulds within a children's hearing aid service. Available at: www.psych-sci.manchester.ac.uk/mchas/guidelines

Mahrer 2012
Mahrer NE, Montano Z, Gold J. Relations between anxiety sensitivity, somatization, and health related quality of life in children with chronic pain. *Journal of Pediatric Psychology*. 2012:37(7):808-816.

Martinez-Devesa 2010
Martinez-Devesa P, Perera R, Theodoulou M, Waddell A. 2010 Cognitive Behavioural Therapy for tinnitus. *Cochrane Database of Systematic Reviews*. Issue 9 Art NO:CD005233

Mills 1984
Mills RP, Cherry JR. Subjective tinnitus in children with otological disorders. *International Journal of Paediatric Otorhinolaryngology*. 1984;7:21-27.

Mills 1986
Mills RP, Albert DM, Brain C. Tinnitus in childhood. Clinical Otolaryngology & Allied Sciences. 1986;**11(6)**:431-434

Moller 2000
Moller AR. Similarities between severe tinnitus and chronic pain. *Journal of American Academy of Audiology.* 2000;**11**:115-124.

NDCS 2000
NDCS Quality Standards in Paediatric Audiology. Vol IV (2000) Guidelines for the Early Identification and the Audiological Management of Children with Hearing Loss.

NICE 2005
Depression in children: identification and management of depression in children and young people in primary, community and secondary care. Scope. National Institute of Health and Clinical Excellence (2005) www.nice.org.uk

Nodar 1984
Nodar RH, Lezak MH. Paediatric tinnitus: a thesis revisited. *Journal of Laryngology and Otology.* 1984;**Suppl 9**:234-235.

NSFC 2003
National Service Framework for Children: Getting the right start. Standards for Hospital Services. 2003.

O'Connor 2010
O'Connor. Paediatric Index of Emotional Distress (PI-ED) GL Assessment UK (2010).

Pantell 1987
Pantell RH, Lewis CC. Measuring the impact of medical care on children. *Journal of Chronic Disease.* 1987;**40 Supp 1**:99-1085.

PINCHE 2006
PINCHE PROJECT (2006) Policy Interpretation Network on Children's Health and Environment (PINCHE). Available: http://www.vggm.nl/ggd/milieu_en_gezondheid/projecten/pinche.

Raj-Koziak 2011
Raj-Koziak D, Pilka A, Bartnik G, Fabijanska A, Kochanek K, Skarzynski H. The prevalence of tinnitus in 7 year old children in the eastern of Poland. *Otolaryngologia Polska.* 2011;**65(2)**:106–109.

Savastano 2009
Savastano M, Marioni G, de Filippis C. Tinnitus in children without hearing impairment. *International Journal of Pediatric Otolaryngology.* 2009;**735**:513-515.

Shetye 2010
Shetye A, Kennedy V. Tinnitus in children; an uncommon symptom? *Archives of Disease in Childhood.* 2010;**95(8)**:645–648.

Silverman 1995
Silverman WK, La Greca AM, Wassertein S. What do children worry about? Worries and their relation to anxiety. *Child Development.* 1995;**66(3)**:671–686.

Spencer 2000
Spencer P, Erting C, Marschark M. (2000). The Deaf Child in the Family and at School. Lawrence Erlbaum Associates Publishers, London.

Stallard 2002
Stallard P. Think Good, Feel Good. A cognitive-behaviour therapy workbook for children and Young People. 2002. John Wiley and Sons

Stallard 2009
Stallard P. Anxiety: cognitive behaviour therapy with children and young people. 2009. Routledge.

Stouffer 1991
Stouffer JL, Tyler RS, Booth JC, Buckrell B. (1991) Tinnitus in normal hearing and hearing impaired children. In Aran JM, ed. Proceedings of the Fourth International Tinnitus Seminar. New York: Kugler:255-8.

Sweetow 2010
Sweetow RW, Sabes JH. An overview of common procedures for the management of tinnitus patients. *Hearing Journal.* 2010;**63(11)**:11-15.

Van Laerhoven 2004
Van Laerhoven HJ, Van der Zaag-Loonen, Derkx BHF. A comparison of Likert scale and visual analogue scales as response options in children's questionnaires. *Acta. Paediatrica.* 2004;**93**:830-835.

Varni 2007
Varni, Limbers, Burwinkle (2007). How young can children reliably and validly self- report their health –related quality of life?: An analysis of 8,591 children across age subgroups with the Peds QLTM 4.0 Generic Core Scales. Health and Quality of Life Outcomes. 5:1.

Viani 1989
Viani LG. Tinnitus in children with hearing loss. *Journal of Laryngology and Otology.* 1989;**103(12)**:1142-45.

Weise 2013
Weise C, Hesser H, Andersson A, Nyenhuis N, Zastruski S, Kroner-Herwig B, Jager B. The role of catastrophizing in recent onset tinnitus: its nature and association with tinnitus distress and medical utilization. *International Journal of Audiology.* 2013;**52(3)**: 177-188.

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