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Complaints of People with Hyperacusis

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Abstract

Background Hyperacusis is a prevalent auditory disorder that causes significant distress and negatively affects quality of life for many patients. Patients with hyperacusis often have different complaints about the sounds and situations that they experience. Audiologists may have few patients with hyperacusis, and a limited understanding of the sounds and situations that are reported to be challenging by their patients.

Purpose To investigate the common complaints reported by hyperacusis patients.

Research design A qualitative study was conducted with 11 hyperacusis patients who participated in a group session.

Results All 11 hyperacusis patients experienced negative reactions to specific sounds. In addition, many patients reported physical symptoms such as headaches, balance problems, dysosmia (strong smell problems), and light sensitivity. Sounds that induced discomfort were wide ranging and included low-frequency sounds, high-frequency sounds, wide-band noise, and sudden, high-intensity sounds. Most patients (9/11, 81.8%) reported negative reactions to music in loud rock concerts. Patients reported that stress/tension (90.9%) worsened their hyperacusis, while removing themselves from noise (90.9%) relieved their hyperacusis.

Conclusion Loudness is only one of the many factors related to the discomfort of patients with hyperacusis. Across patients, we observed that there were different complaints about the sounds and situations that produced difficulty due to hyperacusis. Physical symptoms following sound exposure were also reported by the patients, suggesting that hyperacusis is a complex disorder and requires intervention that often involves multiple members of the medical team.

Keywords
- complaint
- hyperacusis
- tinnitus

Hyperacusis is a prevalent auditory disorder defined as experiencing severe loudness, annoyance, fear, or pain from moderately intense sounds.[1] It has been estimated that the prevalence of hyperacusis is approximately 8 to 9% of the general population,[2] though these figures in children vary considerably from 3.2 to 17.1%.[3] Moreover, hyperacusis can result in negative psychological, social, and emotional reactions for many patients, such as causing anxiety and depression.[4–6] Recent research shows that education about hyperacusis and counseling can effectively manage symptoms of hyperacusis for many patients.[7–10]

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Despite these positive outcomes, many audiologists and health care providers have limited exposure to hyperacusis patients and may not be familiar with the disorder. It is our clinical experience that most hyperacusis patients seek help from their primary care physician and may be referred later to otologists, while children are often seen initially by a pediatrician. Recognizing the symptoms of hyperacusis and providing appropriate consultation for adults and children is a big challenge for all health care providers. Indeed, some patients seek help from a psychologist or psychiatrist due to the impact of hyperacusis on thoughts and emotions and the associated problems. Therefore, there is a need to report the complaints of patients with hyperacusis for better visibility of the concerns of our patients and to provide the best course of intervention.

The complaints about sounds and situations causing distress vary significantly among patients with hyperacusis. Fortunately, several questionnaires have been developed to document the complaints of patients with hyperacusis and the severity of the disorder. Khalfa et al[11] constructed a 14-item hyperacusis questionnaire (HQ) to assess the severity of one's hyperacusis, and it was recently modified and translated into Japanese[12] and Italian.[13] Factor analysis of the HQ[11] isolated three dimensions: attentional, social, and emotional. Nelting et al[14] introduced a questionnaire with 27 items and tested the sensitivity to therapy effects as well as the consistency and reliability of the questionnaire (Cronbach's α of 0.89). Factor analysis indicated that cognitive reactions to hyperacusis, "actional"/somatic behavior, and emotional reaction to external noises were the three factors explaining about half of variance. Other questionnaires such as the multiple-activity scale for hyperacusis (MASH) have been used to investigate the relationship between hyperacusis and tinnitus.[15] Recently, Greenberg and Carlos[16] introduced an inventory of hyperacusis symptoms (IHS) that consists of 25 items focusing on five dimensional factors, including psychosocial impact, emotional arousal, functional impact, general loudness, and communication. Psychometric validation of the IHS yielded excellent reliability for the questionnaire (Cronbach's α of 0.93) and strong convergent validity when compared with other scales of quality of life, depression, and anxiety. Further, the IHS provides a means of differentiation between subtypes of loudness, annoyance, fear, and pain based on responses to clusters of specific items within the dimensional factor structure of the scale, and thus IHS may be useful in clinical practice and research.

However, these questionnaires have not been routinely implemented in clinical practice and more research is needed on clinical patients to understand the experiences and problems reported by hyperacusis patients. For example, Tyler et al[1] proposed a categorization for the symptoms associated with hyperacusis into four subtypes: loudness, annoyance, fear, and pain. Loudness hyperacusis is indicated when moderately loud sounds are very loud to the patient, whereas annoyance hyperacusis would involve a negative emotional reaction to sounds, such as irritation, anxiety, and tension. Fear hyperacusis occurs when patients anticipate a given situation involving a significant sound exposure, and pain hyperacusis occurs when patients experience pain in their ears for moderately intense sounds. This categorization provides a framework to understand the problems reported by patients with hyperacusis that hopefully will be utilized in the management of patient symptoms.

Therefore, the purpose of this project was to document the complaints of a group of patients with hyperacusis, including the sounds that cause hyperacusis as they relate to these four categories of hyperacusis, the association of hyperacusis with tinnitus, and the physical symptoms that result from hyperacusis.

Methods

Eleven hyperacusis patients participated in a group educational session on hyperacusis at the University of Iowa Hospitals and Clinics in 2018. The session was led by an audiologist and lasted approximately 1.5 hours. This study was approved by the University of Iowa Institutional Review Board, and all participants consented to participate in this study prior to the session. All 11 participants were adults and one participant was a parent of a child with hyperacusis. The hyperacusis intake questionnaire was used to collect demographic information from the participants (refer to ►**Supplementary Appendix A**). The patients were asked about whether a sound or situation could cause loudness, annoyance, fear, or pain to determine their reactions to sound. Sixteen sounds that would be experienced in everyday life were listed in the questionnaire (e.g., baby crying, crowd and restaurant noise, clanging dishes, dog barking, screaming, lawnmower, music, power tools, sporting events, telephone ringing, TV, vacuum cleaner, and sirens). Some sounds were differentiated further to highlight specific situations for patients. For example, music was subdivided into loud rock concerts, religious service, symphony, etc. Physical symptoms related to the sounds and situations were also collected. Patients were asked about sensitivity to bright lights, smell, taste, and other sensory problems. Lastly, the patients were asked about any factors that could exacerbate or relieve their hyperacusis.

Results

For these hyperacusis patients, eight were bilaterally affected and three were unilaterally affected. The duration of the symptoms varied from 5 months to 30 years with an average of 7.7 years. ►**Fig. 1** shows the reactions reported by the patients for each sound as it is related to loudness, annoyance, fear, and pain hyperacusis. Five patients identified more than 10 sounds. Nine patients (9/11) reported negative reaction to music in loud rock concerts, 8 were bothered by high-pitch voices, or screaming, or whistle/horn/siren. Baby crying/children squealing and crowds/large gatherings also caused discomfort in more than half of the patients; however, the sound of the telephone ringing was reportedly less problematic for these patients.

We tried to determine whether each sound had a tendency to cause a specific subtype of hyperacusis response (e.g., loudness, annoyance, fear, or pain). The data revealed that one patient could have one or multiple negative reactions to a

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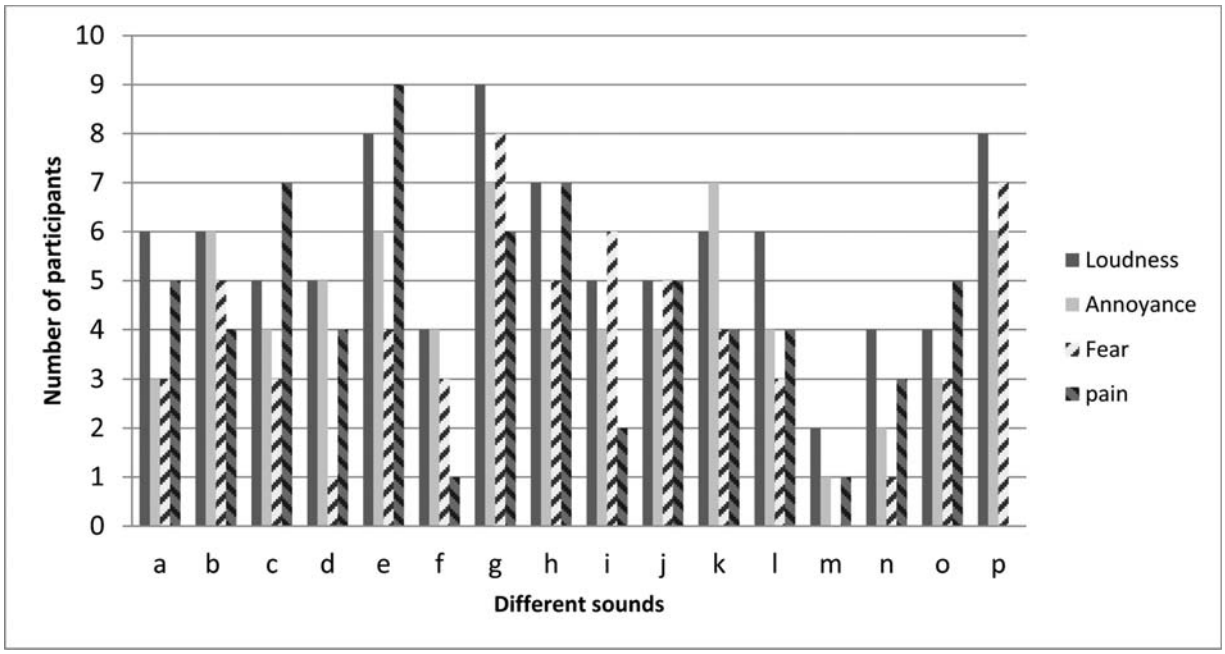

Fig. 1 The frequency of the 16 sounds reported by the participants that cause loudness, annoyance, fear, and pain hyperacusis. (**a**) Baby crying/children squealing. (**b**) Crowds/large gatherings. (**c**) Dishes being stacked. (**d**) Dog barking. (**e**) High pitch voices/screaming. (**f**) Lawnmower. (**g**) Music (loud rock concerts). (**h**) Music (religious service). (**i**) Music (symphony, quartet, etc.). (**j**) Power tools. (**k**) Restaurants. (**l**) Sporting events. (**m**) Telephone ringing. (**n**) TV/radio. (**o**) Vacuum cleaner. (**p**) Whistle/horn/siren. Average category: loudness = 5.6; annoyance = 4.4; fear = 3.8; pain = 4.2.

specific sound. All four responses, including loudness, annoyance, fear, and pain, could be aroused by five sounds in one participant: (1) music from loud rock concerts, (2) high-pitched voices/screaming, (3) music from a religious service, (4) crowds/large gatherings, and (5) noise from a restaurant. Telephone ringing and TV/radio caused relatively less negative reactions. None of the patients complained of fear of the telephone ringing (►**Fig. 1**).

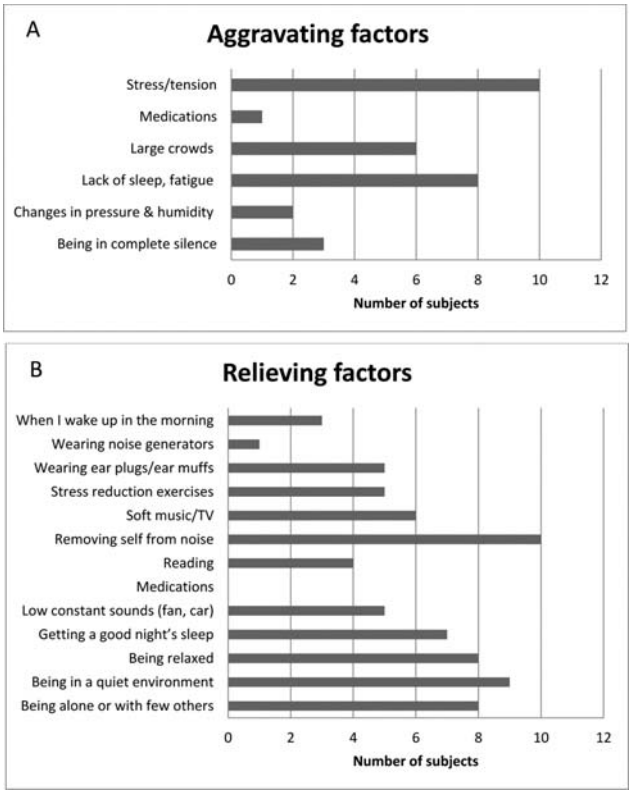

Fig. 2 The number of patients who reported factors that influence hyperacusis. Graph A shows the factors that reportedly aggravate hyperacusis and graph B shows the factors that improve hyperacusis.

Factors that either aggravate or relieve hyperacusis are shown in ►**Fig. 2A,B**. Three main reasons that made their hyperacusis worse were stress/tension (10/11), lack of sleep or fatigue (8/11), and being in large crowds (6/11). By comparison, the four main reasons that make the hyperacusis better were removing self from noise (10/11), being in a quiet environment (9/11), being relaxed (9/11), and being alone or with only a few other people (9/11).

All the patients in our group experienced negative reactions to specific sounds with some additional symptoms: 8 had headaches, 5 experienced balance problems, 3 were bothered by the bright light, and 2 experienced dysosmia (or disorder of olfactory sensations), while 4 patients were bothered by strong smells (bleaches, ammonia, cleaning solvents, cigarette smoke, coffee, farm odors, paint, perfume, pesticides/insecticides, and spices). One patient was bothered by salty foods and one was bothered by touch.

The participants were asked to respond to the different statements using a scale from 0 to 100, and during the interview, they described their problems that they experienced because of their hyperacusis (►**Table 1**). The interview results therefore confirmed the survey results. Furthermore, going through the group session enabled these interview participants to gain understanding with each other. This would have a positive effect on their life experiences.

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Table 1 Joint display of quantitative and qualitative findings of hyperacusis participants

Hyperacusis	Question	Quantitative findings (0–100)			Qualitative findings	
		Min	Max	Average	Problems	Other clinical manifestation
Loudness	Q1: Many everyday sounds are unbearably loud to me.	5	100	66.5	ID 2, 3, 4, 9, and 10 felt the sounds were very loud and avoid restaurants, cars, and any place with bass music and so on.	Participation limitation: 6 participants (ID 1, 2, 3, 4, 7, and 9) cannot do certain activities or go to music events or restaurants and so on. Emotion: 5 participants felt different emotions of stress (ID 3), irritability (ID 4 and 7), anxiety and emotional exhaustion (ID 9), and discouraged (ID 11). Sleep problems: 3 participants had sleep problems (ID 3, 7, and 8). Hearing-associated problems: 3 participants had tinnitus, hearing, and balance problems.
	Q2: Sounds that others believe are moderately loud are *very* loud to me.	50	100	77.5		
Annoyance	Q3: Many sounds that others are not annoyed by are very annoying to me.	0	100	79.0	ID 4 and 10 had annoyed/edgy feeling, and thought many everyday noises were annoying.	
Fear	Q4: I am afraid to be around some sounds	0	100	79.0	ID 3 showed fear of being around noise.	
	Q5: Many sounds that others are not afraid, I am very fearful of.	0	95	68.5		
Pain	Q6: Many sounds that I hear each day are painful	5	95	60.5	ID 2, 3, 4, 6, 7, 9, 10, and 11 showed headache, pain, or hurt when they heard special sounds.	

Discussion

Sounds in Hyperacusis

Among these four subtypes, loudness hyperacusis was the most common reported in this group; all the 11 patients had the loudness hyperacusis. The intensity of the sound is not always the main factor that causes the distress. Loudness discomfort levels (LDLs) or the uncomfortable loudness level, defined as the lowest sound level judged by the listener to be uncomfortably loud, was used as early as 1965,[17] in trying to find the relationship of the sound level and their negative reaction.[18–20] But some studies showed that LDL was neither sensitive nor specific enough to serve as a single test for hyperacusis, and there was no strong correlation between the LDLs and hearing thresholds.[21]

The sounds that can induce hyperacusis are various. It is rare for patients to be sensitive to only one particular sound. All the patients in our group session felt hyperacusis induced by two or more kinds of sounds, six of them were even bothered by more than 10 kinds of sound (►**Table 2**). It seemed that crowds/large gatherings, high-pitch voices/screaming, loud rock concerts, religious service, restaurants, and whistle/horn/siren tend to arouse discomfort more easily than telephone ringing, TV/radio, lawnmower, and vacuum cleaner (►**Fig. 1**). Considering that rock music tends to induce more hyperacusis in professional musicians than classical music,[22] we proposed that sounds with higher pitch or stronger intensity than daily life could cause more hyperacusis.

Actually, in cases of annoyance and fear hyperacusis, the culprit sounds were usually not so intense.[1,10] In our group session, one patient complained that eating, slurping, gulping, snapping, clicking, taping, typing, whistling, beeping, and jingling could trigger his annoyance.

Pain hyperacusis indicates the patients feel pain at much lower sound levels than the normal listeners (typically around 110–120 dB sound pressure level). It can be compared with the severity of pain experienced in migraine.[23–25] Suhnan et al[26] reviewed 10 papers and explained that neuroplastic changes in the nervous system caused "central sensitization," thus reducing the threshold for pain activation and increasing the pain perception with supra-threshold stimulation. This may alter activity at sensory convergence regions in the thalamus and brainstem (such as the locus coeruleus) and give rise to hyperacusis in certain pain syndromes.

Table 2 The number of different sounds in each category of hyperacusis participants

Patient ID	Loudness	Annoyance	Fear	Pain
1	3	0	2	5
2	12	0	8	10
3	13	13	6	0
4	10	1	5	8
5	11	11	10	9
6	5	4	2	3
7	7	6	5	9
8	3	13	14	6
9	11	13	5	7
10	9	4	4	5
11	6	5	0	5

Patients with hyperacusis may feel discomfort, be fretful, anxious, nervous, or irritable when hearing certain sounds. These emotional reactions can also be accompanied by related symptoms such as tinnitus, headache, and imbalance. Beyond sound sensitivity, other sensory stimuli can also cause discomfort in some hyperacusis patients. For example,

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4/11 participants in our group were bothered by bright light, 5/11 bothered by smell, 1/11 bothered by taste, and 1/11 bothered by touch. As reported in the research literature, deficits of inhibitory control of the central nervous system, for example, on the locus coeruleus might have played an important role in hyperacusis.[26] Additionally, other sensory stimulations like vision, smell, taste, and touch have been shown to increase excitation of locus coeruleus neuronal cells, which might be the neurophysiological mechanism of the phenomena mentioned previously.[36]

Hyperacusis and Tinnitus

Stephens indicated that Paul of Aegina was the first person to establish a link between tinnitus and hyperacusis, which occurred in the 7th century AD.[37] The correlation between tinnitus and hyperacusis was later established based on research reported by Tyler and Conrad-Armes.[27] Indeed, the comorbidity between hyperacusis and tinnitus is very high with an estimated 86% of patients with hyperacusis also having tinnitus.[28] Moreover, 27 to 40% of patients with tinnitus also show symptoms of hyperacusis.[21,29] Recent work suggests that tinnitus and hyperacusis are linked to excessive neural activity in a widespread brain network that not only includes the central auditory pathway, but also brain regions involved in arousal, emotion, stress, and motor control.[30] Hyperacusis in tinnitus has been associated with younger age, higher tinnitus-related mental and general distress, and higher rates of pain disorders and vertigo.[4] Further, the degree of annoyance due to tinnitus was shown to have no clear relationship with hyperacusis.[31] In our group session, seven of 11 patients suffered from tinnitus and sought help from an otologist.

Children with Hyperacusis

Among these 11 participants, a child's mother came to the group session on behalf of her son, to share her son's complains and expressed her regret for misunderstanding her son and delaying for doctors. In children, the prevalence of hyperacusis varies from 3.2 to 17.1%.[3] Research also suggests that hyperacusis is a common feature in childhood with learning and developing disorders. For example, as many as 60% of individuals with autistic spectrum disorder have reported symptoms of hyperacusis.[32] It is also more prevalent particularly in children with Williams syndrome (90%).[33] Many children have difficulty expressing their discomfort in hearing sounds because of their hyperacusis that can result in a delay of diagnosis and treatment of the hyperacusis. Amir et al[32] have summarized characteristic behaviors based on 5 years of clinical observation from 412 children. The results indicated that the following behaviors were indicative of hyperacusis: (1) avoiding or escaping from the sound stimuli/source, (2) crying, (3) covering the ears, (4) making statements of dislike of certain sounds or pain to certain sounds, (5) screaming or being verbally angry or irritated, (6) throwing and breaking things, (7) being physical toward self, parents/caregivers/siblings, and (8) being frightened or having a panic attack. Paying attention to those behaviors may help with the early diagnosis of hyperacusis in children.

Severe Reactions

Many hyperacusis patients suffer from physical symptoms such as headaches or balance problems, whereas others suffer more severe reactions and seek help from a psychiatrist. Neuropsychological symptoms included (1) stress/tense/angry/irritation/rage, (2) anxiety/depression, (3) difficult to cope/concentrate/relax, (4) insomnia, (5) feelings of hopelessness/alone or isolated/afraid/frustrated/tired or fatigued, and (6) suicidal and self-harm ideations. Research suggests that 13% of patients with tinnitus and hyperacusis indicated that they had suicidal or self-harm ideations.[34] For depression, estimated mental health disorder comorbidity varied widely between 10 and 69%, and for anxiety, between 10 and 23%.[35] Therefore, it is imperative that patients with suicidal ideations or indications of self-harm be monitored and receive frequent mental health screenings.

Conclusions

In this study, we observed that there were different complaints about the sounds and situations that produced difficulty due to hyperacusis. The most cited sounds that triggered negative reactions to sound included music in loud rock concerts, high-pitch voices or screaming, and whistle/horn/siren. Factors that exacerbate hyperacusis were stress/tension, lack of sleep or fatigue, and large crowds, while being in a quiet environment, relaxed, and alone or with few others usually relieved the symptoms of hyperacusis. Here, we observed that headaches, balance problems, smells, and bright lights were experienced by these patients with hyperacusis. These physical symptoms following sound exposure suggest that hyperacusis is a complex disorder and requires intervention that often involves multiple members of a medical team, including audiologists.

Conflict of Interest
None declared.

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