Original Article

Awareness of Noise-Induced Hearing Loss among Residents in a Metropolitan City in South-South Nigeria

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Abstract

Background: Exposure to loud noise and its attendant health and social effects is a public health problem. Its significance has not been adequately determined in developing countries. Noise-induced hearing loss is permanent and can be acquired at home, schools, concerts, churches, mosques, sporting events, and at workplaces. The objective of this study is to assess respondents' awareness of noise-induced hearing loss, experiential symptoms and sources of noise pollution in a Metropolitan City in South-South, Nigeria. **Methods:** A cross-sectional descriptive study using interviewee questionnaire was employed. The respondents comprising of secondary school pupils, undergraduates, tricycle riders, and staff of the tertiary institution who participated at awareness campaign programs on World Hearing Day, World Family Day, and at a religious crusade ground in a tertiary institutions. Data were analyzed using IBM statistical product and service solution version 26.0. **Results:** There were 274 respondents, age range from 10 to 74 years, 73.7% ($n = 202$) were male and 26.3% ($n = 72$) female, male:female = 2.8:1. The overall level of noise-induced hearing loss (NIHL) awareness was 69.34% ($n = 190$). The greater proportion of respondents 236 (86.13%) knew that excessive noise could cause hearing loss. The common symptoms experienced by the respondents were 147 (53.6%) hyperacusis and tinnitus 142 (51.8%). **Conclusion/Recommendation:** Awareness it NIHL was greater among male, undergraduates between the ages of 20 and 29 years. Children's toys were poorly reported as a source of noise. There was poor awareness of the incurable nature of NIHL. A continuous public health education on sources and prevention of NIHL is advocated for early evaluation and intervention.

Keywords: Awareness, hearing loss, noise-induced, sources, symptoms

Introduction

Hearing loss is a common chronic medical condition that can affect the quality of life and the ability to function in all ages. It is reported to be the third most common chronic physical condition in the United States and twice as prevalent as diabetes or cancer.[1] Noise-induced hearing loss (NIHL) is a permanent sensorineural hearing loss (SNHL). It results from prolonged exposure to loud noise or short-time exposure to extremely loud sounds such as gunshots or explosions. NIHL is often said to be an occupational disease among copper workers, blacksmiths, shipbuilders, miners, wood product manufacturers, construction builders, real estate and rental leasers.[2] However, it can result from nonoccupational exposure to noise in places such as recreational centers, playing in a band; attending loud concerts or by listening to MP3 players at high volume through ear buds or headphones. Lawnmowers, leaf blowers and woodworking tools have also being implicated.[3] In the United States, the prevalence of NIHL among noise-exposed workers, is 23% and 7% in those not exposed to noise at the workplaces.[2] Hearing loss is more prevalent among men than women probably due to increase number of men that work in a noisy environment.[2]

Twelve percent or more of the global population is at risk for hearing loss from noise.[3] The World Health Organization (WHO) estimated that one-third of all the cases of hearing loss was attributed to NIHL.[4] It is the most common modifiable environmental cause of SNHL among young- and middle-aged adults and most common self-reported cause of hearing among men.[5] The WHO estimated in 2015 that 1.1 billion young people

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are at risk for hearing loss caused by unsafe listening practices.[6] The prevalence of hearing loss among teenagers (12–19 year) between 1994 and 2006, rose from 3.5% to 5.3% based on the analysis of data from National Health and Nutrition Examination Survey in the United States.[7] The individuals listening to music through headphones and earphones increased by 75% between 1990 and 2005, according to another study done in the USA.[8] The European Commission reported in 2008 an increasing proportion of the population using personal audio devices; from 2004 to 2007, unit sales within the European Union were estimated to have been between 184 and 246 million.[9]

The negative consequences of NIHL among all age groups can be socially and psychologically devastating, leading to decreased self-esteem, anxiety, depressions, shame, annoyance, tinnitus, hyperacusis, and loneliness,[10-12] with attendant social isolation, with subsequent deterioration of quality of life.[13-16] Apart from interpersonal and social loss, hearing loss can also lead to an inability to enjoy nature such as birds chirping and water which have a positive effect on an individual's ability to recover after being stressed or increase cognitive focus.[17,18] Worldwide, studies have been conducted on awareness of NIHL, but results vary from one country to another.[19] The study done in Limpopo province, South Africa by Joubert *et al*. reported 89% of participants' awareness about NHIL[16,20] Chung *et al*. conducted studies on awareness of hearing loss using a web-based survey and 8% of participants considered hearing loss to be a big problem.[21] They conducted another study 5 years later and the percentage of participants who viewed hearing loss as a big problem increase to 30%. They concluded that education on hearing loss could lead to increased opportunities for protecting the hearing of adults.[22]

In recent times, with the advent of smartphones in developed countries, many people make use of earbuds and headphones to receive phone calls and listen to music at high volume for long hours. Many people also get exposed to loud noise in music concerts, night club and worship centers such as churches and mosques. Sound levels differ from one source to another; 120 dB–dB have been reported in rock concerts[23] and average noise levels >100 dB in nightclubs and pop concerts.[24] While there are laws that regulate noise exposure at workplaces, these regulations and guidelines are either lacking or not enforced in nonoccupational conditions.[19]

There is a paucity of data on awareness of NIHL in our region. Our study aimed to evaluate the respondent' awareness of NIHL, sources of noise, and symptoms-related noise exposure. Therefore, data generated from this study will serve as a baseline for community awareness on NIHL and public health education on the dangers associated with it.

Methods

The study was conducted in Calabar, the capital of Cross River state in South-South, Nigeria. It is a large metropolis with several towns, with a population of 317,022 as of 2006 census. Administratively the city is divided into Calabar municipality and Calabar South Local Government Area.

This study was a cross-sectional descriptive study using interviewee questionnaire. The respondents were recruited at three different awareness programs in a metropolitan city. The consented respondents' include secondary school pupils, undergraduates, and staff of teaching hospital that were invited to awareness program at University teaching hospital conference hall for World Hearing Day, tricycle riders that attended awareness rally during World Family Week at a district in urban city and congregations at a crusade ground in a tertiary institution. The total of 400 interviewee questionnaires was distributed. Three hundred and sixteen consenting participants' returned their questionnaire but only 274 correctly completed the questionnaire and hence they were included in this study. Interviewee questionnaire was developed to assess respondents' demographic data, lifestyle or social history, awareness of NIHL, knowledge of sources of unsafe noise, experiential symptoms of NIHL and risk factors for NIHL. Quantitative data were analyzed using IBM statistical product and service solution version 26, Chi-square at 5% significance level was used to test for association between respondents' demographic data and level of awareness on NIHL, its sources and experiential symptoms.

Results

A total of 316 copies of the interviewee questionnaire out of 400 were recalled from participants during awareness programs in a Metropolitan city, but only 274 copies were correctly completed and therefore included in this study, giving a response rate of 86.7%.

The greater proportion of respondents 223 (81.38%) were single; majority, 202 (73.7%) were male, while 72 (26.3%) were female (male:female = 2.8:1). Most, 190 (69.34%) were aged between 20 and 29 years [Table 1].

The respondents were of varying educational background; 226 (82.5%) had tertiary, 35 (12.8%) secondary, and 13 (4.7%) primary education [Table 2].

The overall level of NIHL awareness was 69.34% (n = 190) based on the answer to the question on sources of noise, nature of noise, and experiential symptoms of the respondents. A total of 236 (86.13%) were aware that repeated and prolonged exposure to noise could cause hearing loss; 238 (86.86%) reported that individuals across all age brackets could be affected by NIHL. Whereas 223 (81.39%) respondents were aware that NIHL is preventable, only 175 (63.87%) were aware that noise exposure could lead to permanent hearing loss [Appendix 1]. Data analysis showed that undergraduate students; 143 (75.26%) among all of the respondents, had good level of awareness on NIHL.

The most common sources of noise pollution as reported by the respondents were generator 234 (85.4%), music 231 (84.3%), and music concerts 210 (76.6%). Furthermore, 144 (52.55%)

Table 1: The association between respondents' sociodemographic data and awareness of noise-induced hearing loss

	Awareness		Total	χ^2	*P*
	Good (%)	Poor (%)			
Sex					
Male	139 (73.16)	63 (75.00)	202	12.134	0.002
Female	51 (26.84)	21 (25.00)	72		
Total	190 (69.34)	84 (30.66)	274		
Age range					
10-19	11 (5.79)	4 (4.76)	17	54.117	<0.0001
20-29	154 (81.05)	36 (42.86)	190		
30-39	17 (8.95)	18 (21.43)	35		
49-49	6 (3.16)	10 (11.90)	16		
50-59	1 (0.53)	5 (5.95)	6		
≥60	1 (0.53)	9 (10.71)	10		
Total	190 (69.34)	84 (29.20)	274		
Marital status					
Single	177 (93.16)	46 (54.76)	223	59.771	<0.0001
Married	13 (6.84)	37 (44.05)	50		
Widowed	0 (0.00)	1 (1.19)	1		
Total	190 (69.34)	84 (30.66)	274		

Statistically association between sex, age, marital status, and awareness of noise induced hearing loss was statically significant (*P*<0.0001)

and 162 (59.12%) identified sport events and fitness activity respectively as sources of noise pollution. Only 95 (34.7%) respondents identified children toys as source of noise pollution. Tables 3 and 4, Figure 1, and Appendix 2 show data on sources of noise pollution.

Of the respondents, 172 (62.8%) experienced muffled familiar sound, 186 (67.9%) had difficulty understanding sound in noisy environments, 178 (64.9%) ask others to speak out and 181 (66.1%) turned up the volume of radio or television, 142 (51.8%) and 147 (53.6%) experienced tinnitus and hyperacusis respectively. Figure 2 and Appendix 3 illustrate experiential symptoms of NIH.

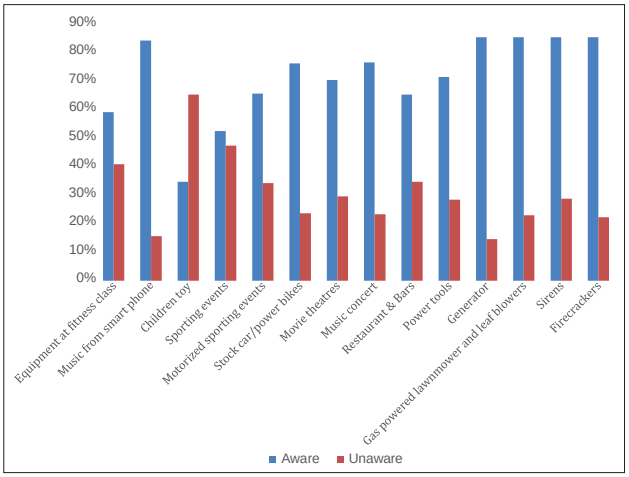

Figure 1: Awareness of sources of noise pollution

Discussion

Our survey revealed that about 80% of respondents were aware that repeated and prolonged exposure to loud noise could cause hearing loss. This study corroborates the work done by DelGiacco and Serpanos who reported that 96% of their respondents knew that repeated and prolonged exposure to loud noise could result in irreversible hearing loss.[25] Alzahrani *et al*.[26] and Crandell *et al*.[27] in their studies reported that 85% and 19% of respondents knew that there is no cure for NIHL, respectively; however, in our study, 63.87% acknowledged that NIHL could be permanent.

The greater proportion; 139 (73.16%) of our respondents were male and had more awareness of NIHL, this is probably because there were more males than females in our tertiary institutions, and also more males engaged in occupations that predispose to unsafe noise exposure. This is in line with the study of Le TN *et al*. that stated that hearing loss is more prevalent among men than women probably due to an increased number of men that work in a noisy environment.[2]

Adults and children alike are being affected by negative consequences of NIHL.[10,11] A significant number of respondents 86.86% acknowledged that NIHL could affect all age groups. This in line with the findings in the study by Crandell *et al*.[27] who reported 95% but contrary to the study by Alzahrani *et al*.[26] reported 53%. The National Institute for Deaf and Other Communication Disorders reported about 15% of adult Americans with NIHL, and one in eight children presented with NIHL as documented by the American Academy of Audiology.[28,29] In this study, the age bracket of 20–29 years formed the greater percentage; 154 (81.05%) of respondents that knew noise exposure and its consequences.

Our study respondents were exposed to both recreational and occupational sources of noise. Tricycle riders 16.42%, geologists 2%, and music producers 2% were exposed to

Table 2: Association between education, occupation, and awareness of noise-induced hearing loss

	Awareness		Total	χ^2	*P*
	Good	Poor			
Education					
Primary	9 (4.74)	4 (4.76)	13	21.407	0.045
Secondary	27 (14.21)	8 (9.52)	35		
Tertiary	154 (81.05)	72 (16.38)	226		
Total	190 (69.34)	84 (30.66)	274		
Occupation					
Business	11 (5.79)	2 (2.38)	13	14.742	0.396
Civil servant	11 (5.79)	3 (3.57)	14		
Geologist	2 (1.05)	0 (0.00)	2		
ICT professional	2 (1.05)	1 (1.19)	3		
Music producer	2 (1.05)	0 (0.00)	2		
Tricycle rider	5 (2.63)	40 (47.62)	45		
Physiologist	2 (1.05)	0 (0.00)	2		
Student	143 (75.26)	34 (40.48)	177		
Unemployed	12 (6.32)	4 (4.76)	16		
Total	190 (69.34)	84 (30.66)	274		

*Statistically, association between level of education and awareness of noise-induced hearing loss was statically significant (P<0.045). The association between education and awareness of NIHL was statistically significant because majority of the participants had above primary education. Increase in educational qualification brings about a significant increase in awareness.

Table 3: Awareness of sources of noise pollution

Source of noise	Aware	Unaware
Equipment at fitness class	162 (59.12)	112 (40.88)
Music from smart phone	231 (84.31)	43 (15.69)
Children toy	95 (34.67)	179 (65.33)
Sporting events, for example, football, hockey and soccer games	144 (52.55)	130 (47.45)
Motorized sporting events	180 (65.69)	94 (34.31)
Stock car/power bikes	209 (76.28)	65 (23.72)
Road race and snowmobiling	169 (61.68)	105 (38.32)
Movie theatres	193 (70.44)	81 (29.56)
Music concert	210 (76.64)	64 (23.36)
Restaurant and bars	179 (65.33)	95 (34.67)
Power tools	196 (71.53)	78 (28.47)
Generator	234 (85.40)	40 (14.60)
Gas powered lawnmower and leaf blowers	204 (74.45)	63 (22.99)
Sirens	195 (71.17)	79 (28.83)
Firecrackers	213 (77.74)	61 (22.26)

noise at the work places. The most common nonoccupational sources of noise pollution identified in our study were generator 234 (85.4%), musical appliance 231 (84.3%), and music concerts 210 (76.6%). Our finding was similar to the work of Alzahrani who reported 13% in the military and motorcycles riders each. Another study reported road traffic (73%) as source of noise follow by music and home noise (26%).[30]

In this survey, only 144 (52.55%) and 162 (59.12%) identified sports events and fitness activity respectively as sources

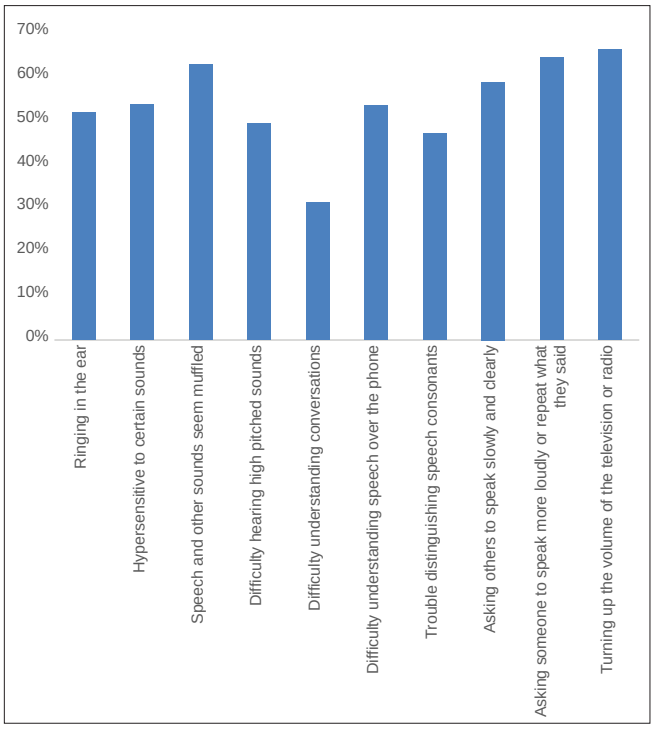

Figure 2: Frequency of the experiential symptoms of noise-induced hearing loss

of noise pollution. It is likely that many will engage in these activities without preventive measures. Furthermore, 95 (34.7%) respondents identified children toys as a source of unsafe noise, thereby exposing children to unsafe noise and future hearing impairment.

Conclusion

Although most respondents were aware that repeated and prolonged exposure to loud noise could cause hearing loss, however, the greater percentage of them lacked satisfactory awareness about NIHL. The majority of respondents that showed a high level of awareness were 20–29 years old, male and undergraduate students. This is probably because they have access to the Internet to seek information. There was ignorance that NIHL is permanent and cannot be cured, and children's toys may pose a danger to hearing. This knowledge gap may lead to continuous exposure to unsafe noise with a consequent higher prevalence of NIHL and future consequences. There is, therefore, the need for Public awareness campaign on the dangers of exposure to loud noise. Continuous public health education on prevention of NIHL is advocated because early evaluation, intervention and prevention are best achieved when individuals' level of awareness of risk factors is high.

The limitations of this study include small sample size and majority of the respondents were undergraduate students, because the study field was mainly in a tertiary institution rather than the main city.

Table 4: Association between age and awareness of sources of noise pollution

Sources of noise	10–19	20–29	30–39	40–49	50–59	≥60	χ^2	*P*
Equipment at fitness classes								
Aware	9	115	20	8	3	6	13.01	0.602
Unaware	8	71	15	8	3	4		
Music from smart phones and personal listen devices								
Aware	13	159	52	14	5	8	3.35	0.973
Unaware	4	31	32	2	1	2		
Children's toy								
Aware	6	65	12	5	3	4	6.968	0.728
Unaware	11	125	23	11	3	6		
Sporting events, for example, football, hockey, and soccer games.								
Aware	6	112	15	5	3	3	30.174	0.001*
Unaware	11	78	20	11	3	7		
Motorized sporting events								
Aware	8	126	21	12	5	8	7.11	0.715
Unaware	9	64	14	4	1	2		
Stock car/power bikes								
Aware	14	144	26	13	5	7	23.97	0.008*
Unaware	3	46	9	3	1	3		
Road races and snowmobiling								
Aware	10	119	21	10	4	5	8.95	0.537
Unaware	7	71	14	6	2	5		
Movie theatres								
Aware	9	138	24	13	4	5	7.26	0.701
Unaware	8	52	11	3	2	5		
Music concert								
Aware	12	141	30	14	6	7	7.518	0.942
Unaware	5	49	5	2	0	3		
Restaurants and bars								
Aware	10	129	20	11	5	4	6.97	0.729
Unaware	7	61	15	5	1	6		
Power tools								
Aware	11	139	20	14	6	6	24.87	0.006*
Unaware	6	51	15	2	0	4		
Generator								
Aware	15	158	33	13	6	9	6.00	0.980
Unaware	2	32	2	3	0	1		
Gas powered lawnmowers and leaf blowers								
Aware	10	146	27	9	5	7	11.42	0.326
Unaware	7	44	8	7	1	3		
Sirens								
Aware	11	135	26	13	3	7	7.77	0.651
Unaware	6	55	9	3	3	3		
Firecrackers								
Aware	13	149	27	12	4	8	3.79	0.956
Unaware	4	41	8	4	2	2		

*A statistically significant association was found between age and sources of noise pollution

Recommendations

1. Otorhinolaryngologists and public health scientists should organize regular advocacy campaigns and public health education to create awareness on the adverse effects and of exposure to unsafe occupational and nonoccupational noise
2. Policy makers at the educational sector should review and update the syllabus at all levels of learning to incorporate

ear, nose, and throat health and hygiene practices among school children

3. Future studies on assessment of hearing threshold of the general public are necessary for early identification and treatment of NIHL.

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Conflicts of interest

There are no conflicts of interest.

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Appendix 1: Awareness of noise induced hearing loss

Awareness	Frequency (*n*=274), *n* (%)
Do you know that loud noise can cause loss of hearing?	
Yes	243 (88.69)
No	31 (11.31)
Do you know that hearing loss can result from a single exposure to loud sound near your ear?	
Yes	190 (69.34)
No	84 (30.66)
Do you know that hearing loss can result over time from repeated exposure to loud sounds?	
Yes	236 (86.13)
No	38 (13.87)
Are you aware that the louder the sound, the shorter the amount of time it takes for hearing loss to occur?	
Yes	190 (69.34)
No	84 (30.66)
Are you aware that the longer the exposure to loud sound, the greater the risk of having hearing loss?	
Yes	226 (82.48)
No	48 (17.52)
Do you know that noise induced hearing can affect people of all ages?	
Yes	238 (86.86)
No	36 (13.14)
Are you aware that noise induced hearing loss is a permanent damage to hearing?	
Yes	175 (63.87)
No	99 (36.13)
Do you know that hearing loss from noise exposure is preventable?	
Yes	223 (81.39)
No	51 (18.61)
At what level of noise can hearing loss occur?	
30 dB	47 (17.15)
60 dB	17 (6.20)
85 dB	29 (10.58)
120 dB	48 (17.52)
Unknown	133 (48.54)
Does the time of exposure to noise matter?	
Yes	199 (72.63)
No	75 (27.37)
Can noise induced hearing loss be termed occupational hazard?	
Yes	219 (79.93)
No	53 (19.34)

Appendix 2: Awareness of sources of noise pollution

Sources of noise	Frequency (*n*=274), *n* (%)
Equipment at fitness classes	
Yes	162 (59.12)
No	104 (37.96)
Not specific	8 (2.92)
Music from smart phones and personal listen devices	
Yes	231 (84.3)
No	41 (15.0)
Not specific	2 (0.7)
Children toys	
Yes	95 (34.7)
No	170 (62.0)
Not specific	9 (3.3)
Sporting events e.g., football, hockey and soccer games	
Yes	144 (52.6)
No	123 (44.9)
Missing system	7 (2.6)
Motorized sporting events	
Yes	180 (65.7)
No	91 (33.2)
Not specific	3 (1.1)
Stock car/power bikes	
Yes	209 (76.3)
No	61 (22.3)
Not specific	4 (1.5)
Road races and snowmobiling	
Yes	169 (61.7)
No	97 (35.4)
Not specific	8 (2.9)
Movies theaters	
Yes	193 (70.4)
No	79 (28.8)
Not specific	2 (0.7)
Music concert	
Yes	210 (76.7)
No	60 (21.9)
Not specific	4 (1.5)
Restaurants and bars	
Yes	179 (65.3)
No	93 (33.9)
Not specific	2 (0.7)
Power tools	
Yes	196 (71.5)
No	66 (24.1)
Not specific	12 (4.4)
Generator	
Yes	234 (85.4)
No	38 (13.9)
Not specific	2 (0.7)

Appendix 3: Symptoms of noise-induced hearing loss experienced by participants

Experiential symptoms	Frequency (%)
Speech and other sounds seem muffled	
Yes	172 (62.8)
No	89 (32.5)
Not specific	13 (4.7)
Difficulty hearing high\pitched sounds (e.g., birds, doorbell, telephone, alarm clock)	
Yes	135 (49.3)
No	127 (46.4)
Not specific	12 (4.4)
Difficulty understanding conversations in a noisy environment	
Yes	186 (67.9)
No	86 (31.4)
Not specific	2 (0.7)
Difficulty understanding speech over the phone	
Yes	146 (53.3)
No	126 (46.0)
Not specific	2 (0.7)
Trouble distinguishing speech consonants (e.g., difficulty distinguishing between s and f)	
Yes	126 (47.1)
No	136 (50.7)
Not specific	6 (2.2)
Asking others to speak more slowly and clear	
Yes	161 (58.8)
No	109 (39.8)
Not specific	4
Asking someone to speak more loudly or repeat what they said	
Yes	178 (64.9)
No	90 (32.8)
Not specific	6 (2.2)
Turning up the volume of the television or radio	
Yes	181 (66.1)
No	87 (31.8)
Missing system	6 (2.2)
Ringing in the ears	
Yes	142 (51.8)
No	124 (45.3)
Missing system	8 (2.9)
Hypersensitivity to certain sounds	
Yes	147 (53.6)
No	116 (42.4)
Not specific	11 (4.0)