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Brazilian young adults and noise: Attitudes, habits, and audiological characteristics

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Original Article

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Abbreviation
YANS: Youth attitude to noise scale

Brazilian young adults and noise: Attitudes, habits, and audiological characteristics

Abstract
The objective of this study was to examine behaviors and attitudes of Brazilian teenagers towards noise, and determine their audiological characteristics. Participants were 245 young persons (14 to 18 years old) who attended private school. Behaviors and attitudes were measured using the validated Portuguese version of the Youth Attitude to Noise Scale (YANS). Pure-tone audiometry was used to evaluate the hearing of a sub-sample of 24 participants. Music played through personal media players was the most common exposure reported. A substantial percentage of participants reported temporary tinnitus (69%) after attending discos, music concerts, and listening to music through headphones. Tinnitus complaints were more frequent among females (41%) than males (27%). Four participants (1.6%) reported use of a hearing protector. Among a subsample of 24 participants, two (8%) young women had bilateral audiometric notches. YANS scores in the present study were slightly lower than those obtained in Sweden and the US, indicating a more negative attitude towards noise. Gender, age, country, and/or region are variables that will influence exposure to noise or music and possibly hearing outcomes.

Sumario
El objetivo de este estudio fue examinar las conductas y actitudes de los adolescentes brasileños hacia el ruido y determinar sus características audiológicas. Los participantes fueron 245 personas jóvenes (14 a 18 años de edad) que asistían a escuelas privadas. Se midieron las conductas y actitudes usando una versión portuguesa validada de la escala de actitudes en jóvenes hacia el ruido (YANS). Se uso la audiometría de tonos puros para evaluar la audición de una sub-muestra de 24 participantes. La música tocada en dispositivos personales fue la exposición más comúnmente reportada. Un porcentaje sustancial de participantes reportaron acúfeno temporal (69%) después de asistir a discotecas, conciertos de música o de escuchar música a través de auriculares. Las quejas por acúfeno fueron más frecuentes entre mujeres (41%) que en hombres (27%). Cuatro participantes (1.6%) reportaron el uso de protectores auditivos. Entre la sub-muestra de 24 participantes, dos (8%) mujeres jóvenes mostraban nichos audiométricos bilaterales. Los puntajes del YANS en el presente estudio fueron un poco menores que aquellos obtenidos en Suecia y en los EEUU, indicando una actitud más negativa hacia la música. El género, la edad, el país y/o la región son variables que influencian la exposición al ruido o a la música, y posiblemente los resultados auditivos.

During the past two decades, the number of publications on the risk of acquired hearing loss among young adults has increased substantially. Studies have examined teenagers' noise exposures, their attitudes and behaviors towards noise and music, and the consequences of those exposures to their hearing (Clark, 1991; Soares, 2000; Sadhra et al, 2002; Widén & Erlandsson, 2004a, 2004b; Serra et al, 2005; Biassoni et al, 2005). Exposure sources include toys, arcade games, music (from concerts, discos, and Walkman-style and other personal media players) and work. Modern audio equipment can produce peak sound pressure levels of 130–140 dB during pop and rock concerts, in disco clubs, and through car stereos that are harmful for human ears. Teenagers seem to expose themselves to loud levels of sound during their leisure time more than any other age group.

Still, there is some controversy about the seriousness of the risk posed by music exposure among teenagers (Morata, 2007). A study conducted in Brazil by Jorge Júnior (1993) assessed the hearing thresholds of 957 teenagers between the ages of 14 and 26 years and their exposure to amplified electronic music. The participants were all students from private schools. The main source of exposure was through personal amplified music (Walkman or Diskman), reported by 65% of the participants. However, no significant differences in audiometric thresholds were found between those exposed when compared to the non-exposed. A study of 10,000 people conducted in Germany reported that in the 18 to 25-year-old group unexposed to occupational noise, only a minimal difference (not statistically significant) was seen between people who regularly go to discotheques and those who have never been there (Fleisher & Muller, 2005). Similar findings were reported for Walkman users (Mostafapour et al, 1998).

On the other hand, studies have reported tinnitus and temporary threshold shifts in teenagers following music concerts and after attending disco clubs, as well as among those who were/are heavy users of personal audio devices (Widén & Erlandsson, 2004a).

Three studies were conducted in Sweden recently (Widén & Erlandsson, 2004a, 2004b; Widén et al, 2006) using a scale specifically designed to evaluate youth attitude towards noise. The first study examined the prevalence of self-reported hearing problems, such as tinnitus and noise sensitivity, and hearing protective behaviors among teenagers. The study population was composed of 1,285 young adults aged 13 to 19 years residing in two Swedish cities and of diverse socio-economic status. The study found a prevalence of permanent tinnitus to be 8.7% among participants. Permanent tinnitus was not significantly related to socio-economic status, but age-related differences in the prevalence rates of experienced tinnitus and noise sensitivity were significant. Hearing protective behaviors were highest among those who reported tinnitus and other hearing-related

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symptoms. The second study investigated attitudes towards noise and identified factors associated with the use of hearing protection at rock concerts and disco clubs across different ages and socio-economic groups in the same sample (1,285 young adults). Several trends were noted. Older students had more negative attitudes towards noise. A negative or anti-noise attitude refers to the individual's perception of noise as something 'bad' and something to 'keep away from', while a positive or pro-noise attitude refers to an attitude towards noise where noise is seen as something 'unproblematic.' Regardless of their age, individuals with higher socio-economic status expressed more negative attitudes towards noise and used ear protection to a greater extent than those with lower socio-economic status. Widén & Erlandsson (2004b) indicated also that noise exposure can be rather different between genders, since gender influences leisure activity choices, as described by Jokitulppo et al (1997). Young men tend to choose activities with higher noise exposure from music or sports. The third study (Widén et al, 2006) compared attitudes towards noise and hearing protection use in Sweden (n = 179) and in the US (n = 203). The age of the study population ranged from 17 to 21 years. Multivariate analysis of variance revealed that attitudes towards noise differed significantly across gender and country. Pro-noise attitudes were slightly more common among males than among females, and more common in men from the USA than in men from Sweden. The results indicated that attitudes and country explained 50% of the variance in the use of hearing protection.

Borja et al (2002) investigated the knowledge and behaviors regarding the hearing risks from noise and music exposure in 700 young (14 to 20 years old) Brazilians from different socio-economic groups. The participants from both public and private schools were aware of the potential risks, but that knowledge did not prompt them to avoid such risks. These findings are unsurprising in view of the fact that neither public nor private schools in Brazil have effective hearing promotion initiatives, if any.

An interdisciplinary longitudinal investigation of the hearing status and noise exposure of teenagers was conducted in Argentina (Serra et al, 2005). The study found that the teenagers' hearing thresholds worsened during a four-year period. Authors also indicated that attending discos seemed more harmful than the use of media players, and that while the habit of attending music concerts had increased during the study, it did not increase as much as visits to disco clubs.

The aim of the present study was to evaluate the attitudes and behaviors of Brazilian teenagers regarding noise and music exposure and hearing risks, to describe their habits regarding noise exposure and the use of hearing protection, and to identify any audiologic sequelae that may be associated with their attitudes and habits regarding noise.

Methods

A private school in Blumenau, Brazil to which the first author had access was contacted about the study and agreed to participate. A short letter was sent to the teachers explaining the study, along with a copy of the surveys and the consent form to be signed by the parents of the participants. Two hundred and seventy-seven students were invited to participate in the study. All the students who were present on the day the surveys were administered agreed to participate (n = 248). Three surveys were excluded from the dataset due to incomplete information; therefore 245 surveys were used in the data analysis. Participating students ranged in age from 14 to 18 years (mean age = 15.7 years); 49% were boys and 51% were girls. The study was approved by the Ethics Committee of the Universidade Tuiuti do Paraná (process # 062/2006).
The entire study sample completed the following:

1. Demographic questions (participants' age, gender, brief medical history)
2. Survey on hearing health (based on the questionnaire used by Olsen (2004))
3. Brazilian version of the youth attitude to noise scale or YANS (nineteen items, Widén et al, 2006).

All three questionnaires were individually administered (pen-and-paper format was used for the YANS, interview for the other instruments). The demographics and hearing health questionnaire was comprised of four open-ended questions and 45 closed-response questions on demographic information (gender and age), hearing health, and medical history, noise/music exposure habits and hearing protection use. Information on the teenagers' attitudes towards noise was gathered through the Brazilian version of the Youth Attitude to Noise Scale (YANS), developed by Widén & Erlandsson in 2004 and modified by Widén et al in 2006. The modified instrument was translated into Brazilian Portuguese and validated as reported previously (Zocoli et al, 2009). Development of the Portuguese scale followed these steps: (1) translation from English into Brazilian Portuguese, (2) pre-test with a group comparable to the target population, (3) linguistic adaptation, (4) review of the grammatical and idiomatic equivalence, and (5) reverse translation into English to verify that the instrument remained true to its original version. Following this, the Portuguese instrument was validated with the group of 245 teenagers alluded to earlier. A sub-sample of 50 participants repeated the questionnaire within 30 to 90 days. Test-retest analysis in the sub-sample of 50 participants indicated reproducible results using the Portuguese translation. The questions were constructed using a 5-point Likert scale in which 1 meant 'disagree completely' and 5 meant 'agree completely.' A factorial analysis was conducted to verify construct validity of correlated questionnaire items. The higher score on the scale, the more positive the attitude towards noise. The analysis resulted in the same four factors as identified in the original instrument, attitudes towards: (1) noise associated with elements of youth culture (Cronbach's Alpha 0.805); (2) the ability to concentrate in noisy environments (Cronbach's Alpha 0.537); (3) daily noises (Cronbach's Alpha 0.497); and (4) influencing the sound environment (Cronbach's Alpha 0.505). The validity of the entire instrument was demonstrated by a Cronbach's Alpha of 0.75, indicating significant correlations among related questionnaire items.

A sub-sample of participants underwent audiometric testing as well. To assess the participants' hearing status, otoscopy, pure-tone audiometry, and immittance audiometry were performed. Fifty participants were randomly selected from the sample and invited to have their hearing tested; twenty-four of them accepted, of those, nine were boys. No significant differences were found between the 24 who accepted and the

Table 1. Level of participation in noisy activities reported by male and female respondents. Results are reported in percentage by gender.

Activity	*Percentage of females (n = 124)*				*Percentage of males (n = 121)*			
	Never	*Rarely*	*Often*	*Daily*	*Never*	*Rarely*	*Often*	*Daily*
1. Attends disco or night clubs	1.6	46.5	2.4	0	4.1	41.6	3.7	0
2. Attends pop rock music concerts	7.8	42	0.8	0	15.1	33.5	0.8	0
3. Attends fitness clubs	20.4	12.2	14.3	3.7	21.2	11.8	9.8	6.5
4. Attends movie theaters	0	37.1	11.8	1.6	0.4	38.8	9.4	0.8
5. Attends sport events	35.5	7.8	4.9	2.4	25.3	16.3	5.3	2.4
6. Attends folk festivals	18.8	31.4	0.4	0	15.1	32.2	2.0	0
7. Scuba diving, undersea hunting	40.4	9.8	0.4	0	37.1	12.2	0	0
8. Practices hunting or target-shooting	49	1.2	0	0	40.4	6.9	0.8	1.2
9. Plays musical instruments (band or orchestra)	42.4	4.1	2.4	1.6	30.2	7.8	7.3	4.1
10. Listens to music through headphones	1.6	11.4	13.9	23.7	5.7	9.8	14.7	18.8
11. Listens to music in the home at high sound pressure levels	3.7	16.3	15.5	15.1	3.3	10.6	15.9	19.6
12. Listens to music in the car at high sound pressure levels	9.4	21.6	12.2	7.3	9.8	18.0	11.8	9.8
13. Uses noisy tools or power machines	35.9	13.5	1.2	0	26.9	18.8	1.7	2.0
14. Considers his or her home a noisy place	26.5	20	1.2	2.9	30.2	15.5	2.4	1.2

26 who refused in terms of demographics or key responses on the hearing status questionnaire or YANS. None of the 24 volunteers indicated previous or current occupational noise exposure, and only one girl had a hearing complaint (earache). The tests were conducted by a certified audiologist in a sound-proof booth at an audiology clinic that met the requirements of ANSI S3.1.-1991 for audiometric testing environments. Tests were conducted within a month of the questionnaire administration.

Immittance testing was conducted using an AZ-7 InterAcoustics immittance audiometer. Pure-tone audiometry was performed for all subjects at the frequencies of 0.5, 1, 2, 3, 4, 6, and 8 kHz. Thresholds were considered as normal if they were equal to or less than 25 dBHL. Bone conduction testing was performed for the frequencies with abnormal thresholds in the range of 0.5 to 4 kHz. The Audiotest audiometer, model AD-259-2, was calibrated according to the ISO R389 -1964 standard prior to the data collection. Daily biological calibration checks were also performed immediately before testing subjects.

Results

Hearing status and habits survey

Forty-two percent of the participants indicated listening to personal media players daily, 29% reported listening several days a week, and 21% used them periodically.

Seventy-nine percent of the participants did not report any auditory complaint. Twelve percent of the participants reported having experienced a temporary threshold shift in one ear, while 3% reported experiencing such shifts in both ears. Some participants reported temporary tinnitus after leaving a disco club (45%) or a music concert (28%), listening to music through personal sound devices (11%), or watching a movie in a theatre (1%). More young women (41% of the female participants) complained about tinnitus than young men (28% of the male participants). Only one individual (0.4%) reported permanent tinnitus. Table 1 displays hearing habits and frequency of exposure of participants by gender.

Seventy-one percent of the participants reported daily or weekly usage of personal media players; 38% were girls and 33% were boys. Only four (1.6%) participants reported using hearing protection. Of these four, two indicated using them when target shooting or scuba diving, and the other two did not report the circumstances of their use.

YANS

The nature of the factors, the mean scores for each factor, and their standard deviations, as well as for the entire YANS are presented in Table 2, for the total group and by gender. Once again, the higher the score on the scale, the more positive the attitude towards noise (pro-noise i.e. noise seen as something 'unproblematic').

The average scores of each of the YANS factors were analysed by gender. The results are displayed in Table 3 and indicate a significant difference in three of the factors, when the score for the females was lower than for males, meaning that females had a more negative attitude towards noise in two of the factors (2 and 3). The reverse was true for Factor 4.

The responses to individual questions were also analysed by gender. The results are displayed in Table 4 and indicate a significant difference in at least one question ($F = 1.9541$ and $p = 0.0117$).

MANOVA results indicated significant differences between the genders in responses to one of the nineteen YANS questions (#17, 'It is easy for me to ignore traffic noise'). The score for the females was lower than for males. In this specific question females had a more negative attitude towards noise, or a harder time to ignore traffic noise.

Audiometric test results

We examined mean thresholds by gender and they were not significantly different. Among the 24 participants who agreed to

Table 2. Mean scores and standard deviation for each YANS factor (attitudes towards: (1) noise associated with elements of youth culture; (2) the ability to concentrate in noisy environments; (3) daily noises; (4) influencing the sound environment), and the YANS as a whole for the total group (n = 245) and by gender.

		Mean	*SD*
F1: Attitudes towards noise associated with elements of youth culture (e.g. attending discos)	Total	2.94	1.33
	Men	2.90	1.36
	Women	2.98	1.30
F2: Attitudes towards the ability to concentrate in noisy environments	Total	2.69	1.33
	Men	2.79	1.34
	Women	2.60	1.31
F3: Attitudes to daily noises (e.g. traffic noise)	Total	3.26	1.31
	Men	3.37	1.31
	Women	3.16	1.30
F4: Attitudes towards influencing the sound environment (e.g. in school)	Total	3.41	1.17
	Men	3.27	1.31
	Women	3.55	1.12
Overall YANS score	Total	3.07	1.32
	Men	3.06	1.33
	Women	3.08	1.30

Table 3. Mean scores, standard deviations, and ANOVA results for differences between genders by YANS Factors (attitudes towards: (1) noise associated with elements of youth culture; (2) the ability to concentrate in noisy environments; (3) daily noises; (4) influencing the sound environment). Values shown in bold are statistically significant (*indicates $p \leq 0.05$).

Factor	*Females (n = 124)*		*Males (n = 121)*		*p*
	Mean	*SD*	*Mean*	*SD*	
F1	2.98	1.30	2.90	1.36	0.1830
F2	2.60	1.31	2.79	1.34	**0.0478***
F3	3.16	1.30	3.37	1.31	**0.0126***
F4	3.55	1.12	3.27	1.31	**0.0002***

have their hearing tested, one reported middle-ear problems which were confirmed by audiometric thresholds of 25–35 dB at all tested frequencies, type C tympanograms, and absent acoustic reflexes bilaterally. Two other participants had audiometric notches (a notch was defined as a recovery of 5 dB or more at the higher frequency adjacent to the poorest threshold at 3, 4, or 6 kHz) equal to or greater than 25 dB at 6 kHz, with thresholds of 60 dB (right ear, subject A), 35 dB (left ear, subject A), and 40 dB (right ear, subject B), and 25 dB (left ear, subject B). Both young females, aged 17 and 15 years old, indicated listening to media players for 6–10 hours daily. The remaining subjects had normal otoscopy, tympanometry, acoustic reflexes, and pure-tone thresholds of 20 dB or better at all frequencies bilaterally. Median, minimum, and maximum thresholds of the sub-sample of participants can be found in Figure 1.

We investigated the potential relationship between hearing thresholds and YANS scores using the Spearman correlation test. A few correlations between a specific question or factor and the threshold in a specific test frequency were significant, but no statistically significant correlation was observed for mean scores (see Table 5; a positive R indicates that as scores values increase, thresholds increase, while a negative R indicates that as score values increase, thresholds decrease).

Discussion

This study described the hearing habits, attitudes, behaviors and audiological characteristics of young persons from Brazil, a developing country, in a manner comparable to similar studies conducted in Sweden and the United States. In addition, this study evaluated the hearing status of a subsample of the participants.

Attitudes

Significant differences in attitude towards noise or music exposure between the genders have been reported previously among Swedish and American teenagers (Widén et al, 2006; Bohlin and Erlandsson, 2007). The present study revealed statistically significant differences between genders in the overall YANS score and average scores in three of the YANS factors, with young women having lower scores or more anti-noise attitudes than boys when it comes to environmental noise associated with the ability to concentrate, and to daily noises. Young men, however, seem to be more negative when it comes to attitudes associated with the ability to influence the sound environment.

When we used responses to individual questions in the analysis, boys had significantly more positive attitudes towards noise than girls in only one question, regarding the ability to ignore traffic noise. When Bohlin and Erlandsson (2007) and Widén et al (2006) compared teenagers' attitudes towards noise

Table 4. Mean scores, standard deviations, and MANOVA results for differences between genders by YANS question (wording simplified for insertion in the Table). Values in bold are statistically significant (* indicates $p = 0.05$).

	Females (n = 124)		*Males (n = 121)*		*Simultaneous confidence intervals for treatment effects*
Question (YANS factor)	*Mean*	*SD*	*Mean*	*SD*	
1. Sound levels during leisure often too loud (F1)	2.7	1.1	2.6	1.2	(−0.3362, .5506)
2. Music helps with concentration (F3)	2.4	1.3	2.7	1.4	(−0.8063, .2097)
3. Want to make school environment quieter (F4)	3.3	1.0	3.0	1.1	(−0.0904, .7380)
4. Consider leaving leisure activity if too loud (F1)	2.1	1.1	2.3	1.2	(−0.5996, .3130)
5. Ability to concentrate in noise (F3)	2.3	1.2	2.7	1.3	(−0.8294, .1365)
6. Earplugs unnecessary during leisure (F4)	3.9	1.2	3.7	1.5	(−0.3798, .6833)
7. Important to have comfortable sound environment (F4)	4.2	0.8	3.9	1.0	(−0.0690, .6372)
8. Dislike quiet (F3)	3.1	1.3	3.1	1.3	(−0.4546, .5808)
9. Sound levels during leisure not a problem (F1)	3.7	1.1	3.9	1.0	(−0.5791, .2614)
10. Noise a natural part of society (F1)	3.8	0.9	3.8	0.9	(−0.3693, .3479)
11. Traffic noise is not disturbing (F2)	2.2	1.2	2.5	1.3	(−0.7443, .2219)
12. Sound levels during leisure are not a problem (F1)	2.4	1.1	2.1	1.1	(−0.1971, .6742)
13. Classrooms should be calm and quiet (F3)	3.8	1.0	3.4	1.2	(−0.0329, .8040)
14. Sounds from appliances are not a problem (F2)	4.0	1.0	4.0	1.2	(−0.4114, .4771)
15. I am prepared to quit noisy activities (F1)	2.1	0.9	2.0	1.0	(−0.3352, .4142)
16. The sounds levels in my school are ok (F2)	3.4	1.0	3.6	1.1	(−0.5214, .3011)
17. Easy to ignore traffic noise* (F2)	**3.0**	**1.2**	**3.5**	**1.2**	**(−0.9504, 0.409)**
18. Need more noise rules or regulations (F1)	3.2	1.1	2.8	1.1	(−0.0051, .8534)
19. Feel powerless when cannot escape loud sounds (F2)	2.9	1.2	2.8	1.2	(−0.3629, .5810)

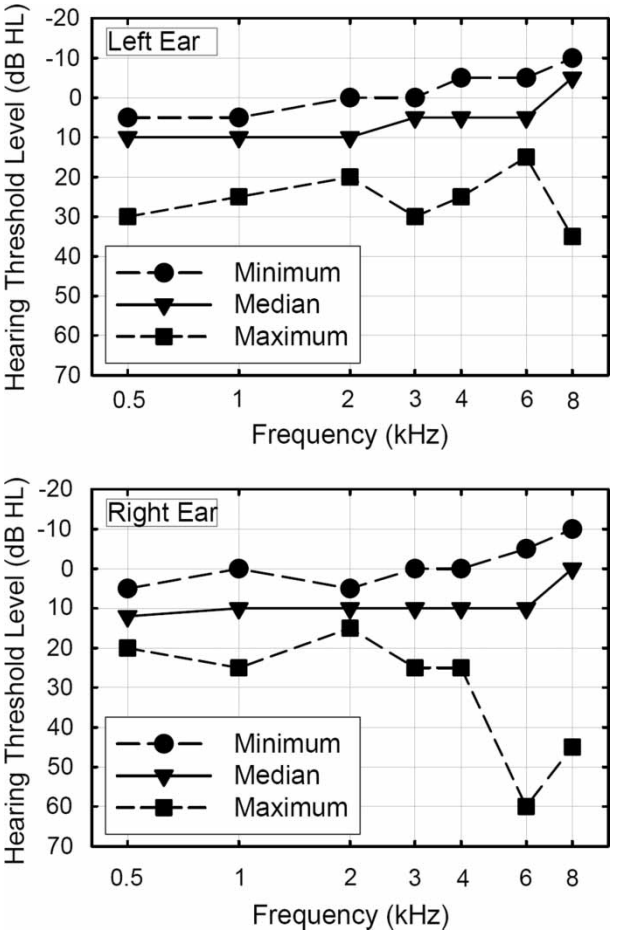

Figure 1. Median, minimum, and maximum audiometric thresholds by ear and frequency of the sub-sample of 24 participants.

in both countries, they also concluded that boys had attitudes slightly more positive or pro-noise towards noise than girls.

American young men had more positive attitudes concerning noise than young Swedish men, and Swedish young women showed the least positive attitude among all the groups for all YANS questions except 'skill to concentrate in noisy environments.' The study data suggested that concerns and attitudes towards noise could be explained by previous experience of temporary hearing problems (such as occasional tinnitus, temporary threshold shift, noise sensitivity) following noise exposure.

The YANS scores in the present study are slightly lower than those reported from Sweden and the USA, which indicates more negative attitudes towards noise. The anti-noise attitude observed among Brazilian young adults, however, did not promote the use of hearing protection. Information and knowledge are associated with attitudes and behavior towards risks, but may not be sufficient to prompt risk avoidance (Widén et al, 2006).

In Sweden, many educational campaigns have been conducted in places where loud music is played, emphasizing the harmful effects of loud music on hearing. In the USA, until recently, most educational efforts have focused on occupational noise rather than on noise from other environmental sources. In Brazil, a national hearing health campaign organized by the Brazilian Otology Society has been in place for the past four years, making educational materials available to the population via the internet (www.saudeauditiva.org.br). However, because of the low rate of internet access among poorer Brazilians, the reach of this campaign is probably quite limited.

Complaints of temporary tinnitus were very common, more so among female participants (41%) than among male participants (28%), even if noise exposure was practically equivalent among genders. This observation contradicts evidence in the literature and in particular the observations of Widén & Erlandsson (2004a) and Bohlin & Erlandsson (2007). It could be that the activities that the female participants in our study engage in greater proportions than the males participants are the main contributors for tinnitus. Another possibility is that the male participants in our study are underreporting tinnitus. Bohlin & Erlandsson (2007) discussed that gender and the local social norms associated with it affect perceptions of risk and judgment of risky behaviors, if not risky behavior per se. They also argued that gender is an important variable in studies with a focus on risk behavior as a means of achieving an awareness of social changes that take place and have an influence on adolescents' lives. Our data does not allow us to know if prevalence for tinnitus actually is higher for women than for men, or if women for some reason report tinnitus to a greater extent than men do. One could speculate that our finding of tinnitus complaints being more common in women could be presumably associated with gender roles, e.g. women being culturally more comfortable discussing hearing problems (or problems in general) than men are.

Only one individual (0.4%) reported permanent tinnitus, a much lower prevalence than the 8.7% reported by Widén & Erlandsson (2004a) and 7.8% reported by Bohlin & Erlandsson (2007). Both Swedish studies reported on slightly older samples (17–21 and 15–20 year-olds respectively) than this study, which might partly explain this discrepancy. In the Widén & Erlandsson 2004a study, tinnitus was more prevalent among

Table 5. Spearman correlation (r) and significance test results (R and p) between the YANS mean scores and mean audiometry thresholds (n = 24).

Ear/test frequency	*Mean scores*	
	R	*p*
R/500	0,0129	0,9523
R/1000	0,1293	0,5470
R/2000	0,3263	0,1197
R/3000	−0,0514	0,8113
R/4000	0,0577	0,7889
R/6000	−0,0265	0,9020
R/8000	−0,2696	0,2026
L/500	−0,2031	0,3412
L/1000	−0,0369	0,8642
L/2000	0,2764	0,1910
L/3000	−0,0326	0,8799
L/4000	0,0687	0,7497
L/6000	−0,0847	0,6938
L/8000	−0,2362	0,2665

older teenagers, which the authors suggested could be the consequence of a longer exposure. They also indicated that habits and routines vary among teenagers by age, as do other factors such as psychological reactions and physiological factors (e.g. increased blood pressure, physical exhaustion). All of these factors are assumed to change one's susceptibility to auditory disorders. Lastly, Bohlin & Erlandsson (2007) indicated that adolescents reporting permanent tinnitus judged loud music as more risky than adolescents with no symptoms, and they did not listen to loud music as often as those with occasional tinnitus. We were not able to evaluate this association because only one participant reported permanent tinnitus. However, evidence available suggests that the occurrence of tinnitus in this age group merits further investigation.

Hearing habits

This study indicated that the most common sound source of exposure among teenagers was the use of personal media players, followed by listening to music at home. The study was conducted in a private school in Brazil, which is a strong indicator that the students were from the same socio-economic group. Brazil has a highly unequal income distribution and students participating in this study were primarily of a high socio-economic status. Therefore, the present findings cannot be generalized to the Brazilian population as a whole. Participants in the present study did not work and were able to afford a media player, and that constituted their main source of exposure. Not surprisingly, preferences or hearing habits regarding music activities reported by teenagers vary according to age group.

Earlier studies had indicated that attending concerts or going to discos was the most common source of exposure among youth (Paniz, 2005; Jorge Junior, 1993; Borja et al, 2002; Widén & Erlandsson, 2004a; Serra et al, 2005), however the popularity of personal media players is recent. In the four-year study in Argentina, Serra et al (2005) observed that music activities increased as time passed, and that disco club attendance was much more popular than listening to music through personal media devices. Live concert attendance increased during the last year of the study but it was not as significant as attending disco clubs. Musical instrument practice was a more popular activity among boys than girls. Initially we interpreted that the noise exposure levels among boys were likely to be higher than among girls due to the fact they were more involved with music practice and exposed to other non-musical sources, such as sports, noisy tools, gunfire, fireworks, and other noisy hobbies. However, the difference in the proportion of participants who reported temporary tinnitus and that the two cases of hearing loss found were females seems to suggest otherwise.

Only 2% of the participants in the present study reported using hearing protection. Most of the participants were clearly taken by surprise when asked about hearing protection use in night clubs or concerts, a concept completely foreign to them. In contrast, Widén & Erlandsson (2004b) found that 30% of their sample used hearing protection when attending music concerts. Widén et al (2006) also reported higher percentages of young hearing protection users: 61% among Swedish participants and 9.5% among American participants. Attitude towards noise, estimated through the YANS, was a predictor of hearing protection use in the Swedish study, but not in the present study. Swedish subjects with anti-noise attitudes were 12.5 times more likely to report the use of hearing protection, compared to individuals with a pro-noise attitude.

Audiological data

Twenty-four of the 50 students invited to have their hearing tested agreed to participate, and hearing losses were found in three of them. The hearing loss in one participant was conductive and unrelated to noise exposure habits. The remaining two hearing impairments included an audiometric notch at 6 kHz.

Peng et al (2007) compared the audiometric thresholds of 120 personal listening device users and 30 young adults who were non-users. The hearing thresholds in the 3 to 8 kHz frequency range were significantly poorer among the personal listening device listeners. Impaired hearing was detected in 14% of ears. Extended high-frequency thresholds in personal listening device users were poorer than among non-users even when their hearing thresholds in conventional frequency audiometry were normal.

Conclusions

The present findings confirm that gender, age, country, and/or region are variables that will influence exposure to noise or music and hearing outcomes. Young persons from a high socioeconomic stratum in developing countries seem to have similar hearing habits and attitudes to those young persons from developed countries; however, their use of hearing protection is remarkably lower. Comparative studies between countries can elucidate how differences in cultural background, socio-economic status, and educational efforts can impact attitudes and behaviors towards risk. Such knowledge could be instrumental in the proposal of effective hearing conservation initiatives.

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Disclaimer

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