

# MP3 Players and Hearing Loss: Adolescents' Perceptions of Loud Music and Hearing Conservation

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**Objective** To explore adolescents' behaviors and opinions about exposure to loud music from MP3 players.

**Study design** We conducted a qualitative analysis of focus-group discussions with adolescents aged 12 to 18 years from 2 large secondary schools (1 urban and 1 rural) for pre-vocational and pre-university education. The semi-structured question route was theoretically framed within the protection motivation theory.

**Results** Most adolescents—especially male students and students from pre-vocational schools—indicated that they often played their MP3 players at maximum volume. Although they appeared to be generally aware of the risks of exposure to loud music, they expressed low personal vulnerability to music-induced hearing loss. Most adolescents said that they would not accept any interference with their music-exposure habits.

**Conclusions** Interventions should target students from pre-vocational schools and should focus on increasing adolescents' knowledge of the risks of loud music and how to protect themselves. Besides hearing education for adolescents and technical modifications of MP3 players, volume-level regulations for MP3 players may be warranted. (*J Pediatr* 2008;152:400-4)

With the massive spread in the popularity of portable MP3 players, exposure to high sound levels has increased dramatically, and millions of adolescents and young adults are potentially at risk of permanent hearing loss through listening to their favorite music.<sup>1</sup> Music-induced hearing loss may be evolving into a significant social and public health problem: increasing numbers of adolescents and young adults already show related symptoms, such as distortion, tinnitus, hyperacusis, or threshold shifts.<sup>2-4</sup>

Although studies investigating the hazardous effects of headphone-listening have yielded equivocal results, the output levels from the headphones of commercially available portable music players are high enough to cause music-induced hearing loss when the phones are used at high volumes for long periods.<sup>5,6</sup>

The rapid development of digital technology has resulted in new kinds of portable music players, such as MP3 players, in which sound quality is no longer distorted at higher volumes. Because they are equipped with improved headphones, sound-leakage is minimal, allowing them to be used at high volume levels in most environments without disturbing others.<sup>7</sup> Especially in noisy environments, listeners often choose high volumes.<sup>8</sup> As a result, they create the conditions for higher sound levels and longer exposure times, both of which are known to increase the risk of hearing damage. MP3 players thus may be the most important risk factor for music-induced hearing loss in young people.

To prevent such music-induced hearing loss, adolescents using MP3 players should take precautionary measures or external measures, such as introduction of legal sound limits,<sup>9,10</sup> should be considered. Either way, useful inputs on possible prevention strategies and interventions would be provided if modifiable determinants of behavior related to sound-exposure were explored.<sup>11</sup>

Because of the absence of studies on the behavioral determinants of hearing conservation in adolescents,<sup>12</sup> we conducted focus group interviews<sup>13,14</sup> with adolescents to explore their behaviors and opinions about exposure to loud music from MP3 players.

## METHODS

### Participants

Students from 2 secondary school communities, 1 urban and 1 rural, were invited to participate in 8 focus-group discussions. Because a summary of the literature on correlates

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PMT Protection motivation theory

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**Table. Structure of the eight focus groups**

	Rural environment		Urban environment	
	Vocational preparatory Males/Females	University preparatory Males/Females	Vocational preparatory Males	Vocational preparatory Females
Age group				
12-14 years	Group 1 6 M, 4 F	Group 2 5 M, 5 F	Group 3 9 M	Group 4 10 F
15-18 years	Group 5 9 M, 1 F	Group 6 8 M, 1 F	Group 7 7 M	Group 8 8 F

M, males; F, females.

of young people's exposure to loud music<sup>12</sup> identified 3 main sociodemographic correlates of risk and protective behaviors (age, educational level, and sex) we chose these selection criteria: 1) age 12 to 14 years and 15 to 18 years; 2) level of education, consisting of pre-university education and pre-vocational education; and 3) sex.

Each group was selected on the basis of 2 of these 3 criteria. On the basis of educational level and age category, 4 groups were first composed in the rural area. Then, on the basis of age category and sex, 4 groups were composed at pre-vocational school level in the urban area. In total, 73 adolescents (44 male and 29 female) participated in the 8 focus groups (Table).

### Procedure

Approval for the focus-group interviews was obtained from the Medical Ethics Committee, Erasmus MC, University Medical Center Rotterdam. Schools, parents, and students provided full collaboration. Students who intended to participate received a letter for their parents explaining the study and how, if applicable, they could object to their children's participation. None did so.

All focus-group interviews were held at the school during teaching hours by a psychologist author (I.V.), assisted by a physician author (H.R.) or a health scientist author (Tinneke Beirens). At the beginning of the interview, the students were informed that their names would remain confidential. Interviews followed a semi-structured question route (Appendix; available at [www.jpeds.com](http://www.jpeds.com)) that was developed on the basis of the findings of a literature review<sup>12</sup> and of discussions with experts and was theoretically framed within the protection motivation theory (PMT).<sup>15,16</sup> Each interview lasted 33 to 61 minutes (mean, 48 minutes).

### Theoretical Framework

Interpretation of results was framed within the PMT,<sup>15,16</sup> according to which health-protective behavior (ie, the "adaptive response" in which a person engages) is the result of an evaluation of environmental and personal factors. The likelihood that an adaptive response will take place (in this case, hearing-conservation behavior) is increased by 4 beliefs: 1) the threat is perceived as severe (severity); 2) the threat has a high personal relevance (vulnerability); 3) the

adaptive response is perceived as effective for warding off the threat (response efficacy); and 4) the personal abilities and self-confidence to engage in the adaptive response is perceived as high (self-efficacy). However, the likelihood of an adaptive response is decreased by the perceived rewards of a maladaptive response (ie, exposure to loud sounds) and by the perceived costs or barriers of the adaptive response.<sup>15</sup>

### Analysis

The recorded interviews were transcribed verbatim. As suggested by Greenhalgh and Taylor,<sup>17</sup> content analysis (systematic coding of categories) was applied by using a topic-by-group grid that systematically summarized what each group said about a topic.<sup>13</sup> This showed that 6 main themes had arisen during the discussions: 1) adolescents' possession and use of MP3 players; 2) their preferred listening level; 3) the consequences they perceived of exposure to loud music; 4) the possible problems they perceived to be caused by hearing loss; 5) the action they could take to conserve their hearing; and 6) their parental influences.

Themes were examined across groups and for all groups combined. To illustrate the results, representative quotations for each theme were selected. The findings reported are descriptive and provide information that should be further evaluated in quantitative research in representative samples.<sup>17,18</sup>

## RESULTS

### Possession and Use of MP3

All adolescents in the 3 15-to-18-year-old groups at the pre-vocational schools had an MP3 player, which they normally set at maximum volume: "My earphones have already exploded," "So have mine—4 of them." Unlike most of the girls in the female group in the urban area, most adolescents in the other 2 groups (male students from the urban area and students of both sexes from the rural area) said they used their players very often: "I always listen, all kinds of music at maximum volume," "All day, every day," "Until the batteries are flat."

The pre-university group of 15- to 18-year-old students was the only group in this age category in which not all participants had an MP3 player. Those students who had an

MP3 player said that they did not use it very often and not at high volume: "I've got one too; I play it about once a fortnight, when I happen to find it again," "I don't use it very often or play it very loud."

Of the 4 12-to-14-year-old groups, the 2 groups from the urban area indicated that they used their player "day and night," but not at maximum volume. Not everyone in the 2 groups in this age category and from the rural background had an MP3 player, used it very often, or played it at high volume, especially in the pre-university group: "I have a Discman, which is really old. I hardly use it—about once a year," "Me too; it's in a drawer somewhere."

### Preferred Listening Level

Participants expressed various motives for playing music at maximum volume: to reduce background noise (wind, traffic, other people talking), or when they wanted to be able to hear it well, especially when a favorite song was being played or when they wanted to sing along without hearing themselves.

They also expressed various rationales for playing at lower volumes. Adolescents from the pre-vocational groups mainly gave reasons such as: "When the batteries are flat," "When I go to sleep," or "When the sound quality gets bad." Respondents gave 3 other reasons for playing music at lower volumes: when they needed to participate in social activities (mainly in the rural groups); when they needed to concentrate on other things, such as homework; or when they needed to hear traffic, and thus avoid accidents (mainly in the pre-university groups): "I always put in only 1 earphone and play the music very softly, such that I can hear just something, and also the noises around me, like cars going past. Otherwise it's a bit scary."

### Possible Consequences of Exposure to Loud Music

Most participants said they knew it was possible for loud music to cause hearing loss. However, most expressed the opinion that this could happen only when the exposure was very frequent, very long, and very loud, which they said was not the case with them. Some adolescents asked the definition of "too loud": "What's loud? Is it loud when it starts to hurt? Because you don't know when it's too loud."

Most adolescents reported that after listening to loud music they sometimes heard a high-frequency sound in their head with no external source of sound being present (ie, what experts refer to as tinnitus).<sup>19</sup> Most participants said that, with the exception of the first time, this experience of tinnitus was no problem for them because it disappeared after awhile without leaving any noticeable damage. One subject responded, "The first time was a bit scary, but now it doesn't worry me anymore"; another said, "I don't worry, I just go to sleep and the next morning it's gone."

Students from the pre-vocational groups who indicated that they were exposed to longer periods of loud music were particularly liable to express the belief that they would not

sustain hearing loss and to say that they hardly ever thought about it: "People often tell me this kind of fairytale, just like there's life after death," "You only live once, so I just enjoy it while I can," "I just put on my music and cycle to school."

### Possible Problems Caused by Hearing Loss

Participants expressed belief that when one suffered hearing loss, daily life could be disturbed: "You're less likely to be able to do the job you wanted," "You have to get people to repeat themselves all the time, which is annoying for everyone," "You might also have an accident more easily because you can't hear the traffic and other people's warnings." Most of the participants said that it would be terrible to have to wear a hearing aid.

### Actions for Hearing Conservation

**BEHAVIOR CHANGE.** Most participants from the pre-vocational groups said that they, personally, did not intend to change their behavior: "No, I don't think the idea will ever really get through to me. First I'd have to notice that I was losing my hearing," "I'd really have to be sure that it would affect my hearing, because now I think, 'Oh, that won't be a problem for me later on.'" Although some adolescents might be affected by the knowledge that somebody close to them had incurred music-induced hearing loss, others may not: "If it happened to somebody else, it might not have been caused by loud music. I'd only believe it if you had somebody listen to very loud music, all day, every day, and if you could prove a few months later that he was deaf."

Most adolescents in the 15-to-18-year-old pre-university group said that they could be convinced to change their behavior if it was officially established and acknowledged that loud music was a cause of hearing loss.

**SOUND LIMITS.** Most participants said that if a person could incur hearing loss from loud music, it would probably be good for their hearing if sound output from MP3 players were limited. But it would not be good for business: "The shops would then be left with a big stock of them, as fewer of them would be sold," "I wouldn't buy one," "I'd throw away my MP3 immediately, or try to take the limiter off." In the 6 pre-vocational groups, only 1 female student in the 15-to-18-year-old urban area group said she wanted to have a sound limit on MP3 players: "If an MP3 was really good and really couldn't damage your hearing, that's what they should print on it. Then, if you bought that one, you'd know you'd bought a good one."

In the pre-university groups, some adolescents also thought it would be a good idea to set sound limits on MP3 players: "Like that, you could put it as loud as possible without having to think all the time 'Oh, now I've got to turn it down, or I'll get hearing problems.'" However, almost all participants said they wanted to decide for themselves how they should use it: "It would be strange if you were a person who liked it a bit loud just now and then, and then couldn't

turn it up despite the fact that you'd spent a few hundred Euros on it," "Because I always put the earphones above my ears rather than on them, it should be very loud."

All participants said that a warning on the MP3 would be acceptable, although few expected that to have any effect: "I never look at my MP3," "It's like with smoking: it says 'Smoking Kills' on a packet of cigarettes, but look how many people still smoke." The pre-university groups indicated that they would think more consciously about it and take it into account when setting the volume: "Like that you'd have to think about and would be aware you were exceeding the safety limit."

**PARENTAL INFLUENCES.** Although some respondents reported that their parents did warn them about the dangers of loud music, any warnings about possible hearing damage were infrequent: "My parents warned me that it's dangerous to use on a bike," "My parents don't bother," and "My father did warn me about loud music, but he listens to loud music himself."

Participants from the pre-university schools stated they would listen to and believe their parents if warned that loud music could cause hearing loss. Conversely, some older adolescents from the pre-vocational schools indicated that they turned up the volume of their MP3 players to cut out their parents' voices.

## DISCUSSION

This study, which is the first to explore adolescents' behaviors and opinions about exposure to loud music from MP3 players, suggests that interventions to prevent hearing loss should be targeted at all adolescent groups. Extra attention should be given to older male students and students from pre-vocational education, because they reported greater exposure to music at maximum volumes.

Our finding that male students reported greater exposure than female students confirms the results of earlier quantitative studies.<sup>12</sup> We also observed a marked difference between the exposure of adolescents at pre-vocational schools, who entered the interview room with their earphones in their ears, music from their MP3 players clearly audible, and adolescents from the pre-university schools, who were wearing no visible or audible MP3 player. These differences in not only the possession of MP3 players and the frequency with which they were used, but also to exposure to maximum volumes, were confirmed in the focus-group discussions, and support earlier findings.<sup>12</sup>

Although the adolescents in our focus groups appeared to be aware of the overall risks of exposure to loud music, they said that their own use of their own MP3 players made it very unlikely that they themselves would be affected. This can be explained by applying the PMT.<sup>15,16</sup> Although they perceived that severe problems were related to hearing loss—"severity" being high—they tended to underestimate their own "vulnerability" to it, not perceiving that the threat was of high personal relevance.

A plausible explanation for this underestimation might lie in the gradual development of hearing loss and because

most people with mild high-frequency hearing loss are unaware of their impairment.<sup>20,21</sup> Indeed, participants who had experienced tinnitus did not consider this as a warning that their hearing was susceptible to damage from loud music,<sup>22</sup> because the tinnitus later disappeared without leaving any noticeable damage. Furthermore, adolescents showed no true understanding of how to determine which volume was too loud; although volumes  $\geq 90$  dB are assumed to be dangerous, only those of approximately 120 to 140 dB are experienced as unpleasant and painful. The danger of hearing loss is thus easily underestimated.<sup>23</sup>

To promote a proper sense of perceived "vulnerability," specific information on dangerous decibel levels should be provided. This information should be related to suitable exposure times. Furthermore, MP3 players should be equipped with an indicator of current volume output level (expressed in decibels) and a signal (such as a flashing light) that warns when potentially harmful volumes are reached. Real examples of people who had lost hearing through listening to loud music also should be provided.

The results of this study suggest that manufacturers should, as previously recommended,<sup>9,10</sup> be constrained by law to install a sound limit on MP3 players. Most adolescents in this study felt no apparent need to conserve their hearing and reported low levels of "protection motivation"; in other words, they seemed disinclined to change their behavior voluntarily.

It was particularly striking that such a high number of adolescents from pre-vocational groups said they had no intention of changing their behavior to prevent future hearing problems. The way in which adolescents in these schools perceive and evaluate risk-taking and its future consequences seems to be different than that of students at pre-university schools.<sup>24</sup> In the former group, the "rewards of the maladaptive response" (advantages of exposure to very loud music, such as bodily pleasure<sup>12</sup>) and "costs of the adaptive response" (ie, barriers for lowering the volume, such as level of background noise<sup>12</sup>) are higher than in the latter group. The need for these students to conserve their hearing may compete with needs that are perceived to be more powerful, such as the desire to cut oneself off from one's surroundings while traveling or performing other daily activities.<sup>25</sup>

Because adolescents in the pre-vocational groups also reported a lower level of parental influence than their counterparts in the pre-university groups, parental monitoring may be another factor contributing to the difference in "protection motivation." Parental monitoring is widely recognized to play an important role in reducing adolescent health-risk behavior; even in high-risk populations, it is a skill that can be improved through parent-training programs.<sup>26</sup> Therefore, in further quantitative studies, its role should be investigated in greater depth.

This study may have had limitations. The ratio of pre-university participants to pre-vocational participants (19 to 54) was low. These proportions reflect the general population. Two of the 4 mixed groups contained only 1 female respondent. The focus groups may have been dominated by

participants who were more articulate than others. If this was the case, opinions that were considered to be socially unacceptable may not have been expressed fully.<sup>27</sup> Finally, the qualitative nature of our data may have created scope for investigator bias, although we tried to minimize this by using theoretical sampling and a theoretically underpinned question route.<sup>28,29</sup>

Despite the scarcity of evidence on an association between the use of MP3 players and hearing loss, there can be little doubt that such players pose a real health risk. It is essential that not only MP3 producers and retailers, but also schools, health-authorities, and parents should inform adolescents on the potential dangers of exposure to loud music and on how to protect themselves against it.

Specific evidence-based and theory-based studies, preferably longitudinal studies, should be conducted in the current MP3 generation to develop effective interventions. Such studies should assess useful correlates in greater depth, including the roles of parental monitoring and adolescents' perceptions of risk-taking and its future consequences. This study showed that the PMT can be applied to investigate health protection in this research area and that the concepts of the PMT may be useful as predictors of hearing-protection behavior. Because most adolescents reported feelings of invulnerability to any damage from exposure to very loud music, the concept of "vulnerability" is especially important at this stage.

Medical professionals in general practice, pediatrics, and audiology can contribute to the promotion of hearing conservation by providing health authorities with data on any cases they detect in which hearing loss is related to the use of MP3 player ("MP3 ears"). The results of this theory-based qualitative study should provide pediatric health-care providers with a solid starting point for educating young patients, healthy adolescents, and parents.

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## REFERENCES

1. Kasper CA. The simple guide to optimum hearing health for the MP3 generation. New York: Craig A. Kasper, Au D; 2006.
2. Chung JH, Des Roches CM, Meunier J, Eavey RD. Evaluation of noise-induced hearing loss in young people using a web-based survey technique. *Pediatrics* 2005;115:861-7.
3. Crandell C, Mills TL, Gauthier R. Knowledge, behaviors, and attitudes about

- hearing loss and hearing protection among racial/ethnically diverse young adults. *J Natl Med Assoc* 2004;96:176-86.
4. Niskar AS, Kieszak SM, Holmes AE, Esteban E, Rubin C, Brody DJ. Estimated prevalence of noise-induced hearing threshold shifts among children 6 to 19 years of age: the Third National Health and Nutrition Examination Survey, 1988-1994, United States. *Pediatrics* 2001;108:40-3.
5. Fligor BJ, Cox LC. Output levels of commercially available portable compact disc players and the potential risk to hearing. *Ear Hear* 2004;25:513-27.
6. Portnuff CDF, Fligor BJ. Sound output levels of the iPod and other MP3 players: is there potential risk to hearing? NIHL in Children Conference, Cincinnati, OH; 2006. Available at: <http://www.hearingconservation.org/docs/virtualPressRoom/portnuff.htm>. Accessed February 22, 2007.
7. Hellström PA, Axelsson A. Sound levels, hearing habits and hazards of using portable cassette players. *J Sound Vib* 1988;127:521-8.
8. Fligor BJ, Ives T. Does earphone type affect risk for recreational noise-induced hearing loss? NIHL in Children Conference, Cincinnati, OH; 2006. Available at: <http://www.hearingconservation.org/docs/virtualPressRoom/FligorIves.pdf>. Accessed February 22, 2007.
9. Biassoni EC, Serra MR, Richtert U, Joekes S, Yacci MR, Carignani JA, et al. Recreational noise exposure and its effects on the hearing of adolescents. Part II: development of hearing disorders. *Int J Audiol* 2005;44:74-85.
10. Hellström PA, Axelsson A, Costa O. Temporary threshold shift induced by music. *Scand Audiol Suppl* 1998;48:87-94.
11. Green LW, Kreuter MW. Health promotion planning: an educational and environmental approach. 3rd ed. Mountain View, CA: Mayfield; 1999.
12. Vogel I, Brug J, Van der Ploeg CPB, Raat H. Correlates of young people's exposure to loud music: a summary of the literature. *Am J Prev Med*. In press, 2007.
13. Morgan DL. Focus groups as qualitative research. 2nd ed. Thousand Oaks, CA: Sage Publications; 1997.
14. Morgan DL, Krueger RA, King JA. The focus group kit. Vols 1-6. Thousand Oaks, CA: Sage Publications; 1998.
15. Rogers RW. Cognitive and physiological processes in fear appeals and attitude change: a revised theory of protection motivation. In: Cacioppo J, Petty R, editors. *Social psychophysiology: a sourcebook*. New York: Guilford Press; 1983. p. 153-76.
16. Rogers RW, Prentice-Dunn S. Protection motivation theory. In: Gochman DS, editor. *Handbook of health behavior research 1: personal and social determinants*. New York: Plenum Press; 1997. p. 113-32.
17. Greenhalgh T, Taylor R. How to read a paper: papers that go beyond numbers (qualitative research). *BMJ* 1997;315:740-3.
18. Pope C, Mays N. Qualitative research: reaching the parts other methods cannot reach: an introduction to qualitative methods in health and health services research. *BMJ* 1995;311:42-5.
19. Widen SE, Erlandsson SI. Self-reported tinnitus and noise sensitivity among adolescents in Sweden. *Noise Health* 2004;7:29-40.
20. Lewis D. A hearing conservation program for high-school-level students. *Hear J* 1989;42:19-24.
21. Johnson ED. Sounds of silence for the Walkman generation: rock concerts and noise-induced hearing loss. *Indiana Law J* 1993;68:1011-32.
22. Lusk SL. Preventing noise-induced hearing loss. *Nurs Clin North Am* 2002;37:257-62.
23. Eggemann C, Koester M, Zorowka P. Horschaden durch Freizeitlärm nehmen zu. Auch das Ohr braucht mal Pause. *MMW Fortschr Med* 2002;144:30-3.
24. Widen SE, Erlandsson SI. The influence of socio-economic status on adolescent attitude to social noise and hearing protection. *Noise Health* 2004;7:59-70.
25. Hetu R, Fortin M. Potential risk of hearing damage associated with exposure to highly amplified music. *J Am Acad Audiol* 1995;6:378-86.
26. Steinberg L, Fletcher A, Darling N. Parental monitoring and peer influences on adolescent substance use. *Pediatrics* 1994;93:1060-4.
27. Kisker EE. Teenagers talk about sex, pregnancy and contraception. *Fam Plann Perspect* 1985;17:83-90.
28. Whitley R, Crawford M. Qualitative research in psychiatry. *Can J Psychiatry* 2005;50:108-14.
29. Mays N, Pope C. Qualitative research: rigour and qualitative research. *BMJ* 1995;311:109-12.

## APPENDIX

Prompts for adolescents' focus groups to explore their behaviors and opinions regarding exposure to loud music from MP3 players.

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### Opening question

- Can you give some examples of loud sounds that you have sometimes experienced?

### Exposure

- Do you have a portable music player such as an MP3 player or iPod?
- How loud do you normally play your music? (At under half the maximum volume? About half? Three-quarters? Or at maximum volume?) And does the player have a sound limiter?
- Do you then have to shout to talk to each other?
- On average, how long do you normally listen? And how often do you listen?

### Intrinsic/Extrinsic rewards

- When do you think music has to be played loud?
- Why does (your) music have to be played loud?
- When do you think music has to be played at lower volumes? And Why?
- Is soft music nice? Why? Or why not?

### Vulnerability/Severity

- Do you think there's a risk of hearing impairment?
- What causes it? Who runs a risk of hearing impairment?
- Do you know anyone whose hearing has been impaired?
- Do you know if listening to loud music can impair your hearing?
- Is it possible for young people like you to lose their hearing?
- Do you think that you personally run a risk of losing your hearing?
- Do you ever worry about that? Do you ever talk about it? If so, who with?
- Have you ever gone a bit deaf, or had a ringing sound or kind of echo in your ears? What did you think of that?
- Do you think it is important to be able to hear well? Why?
- Is it a nuisance for someone to lose their hearing? (Imagine you've lost some of yours: what kind of consequences might it have, and in which ways might it be a nuisance?)
- What kind of problems would you have if you could no longer hear so well? How bad is that? (If not mentioned: for example, how bad is it to wear a hearing aid or not to be able to communicate properly?)

### Response efficacy

- Is it possible to protect your hearing? How?
- Do you think such measures are useful?

### Self-efficacy/Response costs

- Which one of you has ever taken protective measures or would like to try some? And When? Why? Or why not?
- Do you think you would be able to stick to such measures?
- What kind protective measure you would never use? What would its disadvantages be? How might such disadvantages be overcome?

### Responsibility/Possible intervention means

- Who is responsible for preventing adolescents from losing their hearing?
- If these other people took measures to prevent hearing loss, which ones would look OK to you? And which would be a nuisance?
- Does your school have any rules on things like the use of MP3 players? If so, what do you think of them?
- Do you think these things should be regulated by law?

### Social influences

- Has anybody ever warned you about the dangers of loud music? Who? And what did you think of it?
- Who would you listen to? Would you listen to your parents?
- If you had to encourage a friend to use earplugs or to lower the volume, how would you do it? What would you say?

### Future

- How can we help adolescents protect their hearing from music that's dangerously loud?
-