

**Music to whose ears? The effect of social norms on young people's risk perceptions of hearing damage resulting from their music listening behaviour.**

Abbreviations:

PSP - Personal stereo player

NIHL - Noise induced hearing loss

Key words:

Hearing

Social norms

Adolescents

Music Listening

Noise Induced Hearing Loss

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## **Abstract**

Professional and community concerns about the potentially dangerous noise levels for common leisure activities has led to increased interest on providing hearing health information to participants. However, noise reduction programmes aimed at leisure activities (such as music listening), face a unique difficulty. The noise source that is earmarked for reduction by hearing health professionals is often the same one which is viewed as pleasurable by participants. Furthermore, these activities often exist within a social setting, with additional peer influences which may influence behaviour.

The current study aimed to gain a better understanding of social-based factors that may influence an individual's motivation to engage in positive hearing health behaviours. 484 participants completed questionnaires examining their perceptions of the hearing risk associated with music listening, and asking for estimates of their own and their peer's music listening behaviours.

Participants were generally aware of the potential risk posed by listening to personal stereo players (PSPs) and the volumes likely to be most dangerous. Approximately one in five participants reporting using listening volumes at levels perceived to be dangerous, an incidence rate in keeping with other studies measuring actual PSP use. However, participants showed less awareness of peers' behaviour, consistently overestimating the volumes at which they believed their friends listened.

Misperceptions of social norms relating to listening behaviour may decrease individuals' perceptions of susceptibility to hearing damage. The consequences for hearing health promotion are discussed, along with suggestions relating to the development of new programs.

## Introduction

There is increasing concern that many everyday leisure activities have the potential to expose individuals to unsafe noise levels. Attendance at concerts, clubs, live bands, and listening to personal stereos have all been identified as potentially damaging to hearing, and have become the focus for prevention messages.

Voluntary exposure to such noise sources however, carries inherent difficulties for hearing health promotion. If the leisure activity includes noise as a sought-after objectives (e.g., music listening) rather than a mere by-product (e.g., recreational shooting), noise exposure reduction is not just viewed as a low priority, but as something that many may perceive as actually incompatible with leisure enjoyment. Reducing noise exposure in leisure activities, therefore, often relies on the choices made by individuals in relation to their own noise exposure behaviours. This behaviour is in turn motivated by individuals' attitudes towards noise reduction exposure and noise reduction.

The use of Personal Stereo Players (PSPs; e.g., MP3 players, iPods etc.) provides a relevant example. When using a PSP, it is up to the individual to decide how loud they set the volume, and the length of time they will spend listening.<sup>1</sup> The maximum output from PSPs has been reported from 96-107dB (Keith, Michaud, & Chiu, 2008; Portnuff & Fligor, 2006; Williams & Purnell, 2010) depending on the make/model and the accessories (e.g., speakers, earbuds, headphones) used. At a volume of 101dB, noise exposure guidelines recommend a maximum of 15 mins of exposure, a

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<sup>1</sup> It should be noted that external measures such as volume limiting software on PSPs can only have limited success in reducing the risk of NIHL, as they generally do not limit the duration at which an individual uses the device.

duration easily exceeded by listening only to four to five modern music tracks. Consequently, PSP use has come under serious scrutiny in relation to its potential to result in hearing damage. As the actual volume and exact duration levels will vary based on individual preferences, quantifying the threat posed by PSPs can be difficult, and estimates of those at risk vary. Although few individuals would listen at the maximum levels reported above, a study by Vogel et al. (2009) found that nearly half of the adolescents surveyed listened at volumes higher than 75% of the available player range. Furthermore, a third of PSP users also reported experiencing symptoms of hearing damage including needing to increase the volume over time (Vogel, et al., 2009). These figures are supported by measurements of actual listening levels and self report durations that suggest 17-25% of PSP users may be listening to PSPs at potentially harmful levels (Williams, 2005, 2009). Although only a minority of PSP users may actually be at risk for hearing damage, when the increasingly widespread popularity of PSPs are considered, this can equate to a relatively large population who are at risk for NIHL (Fligor, 2009).

Promoting healthy listening habits to PSP users relies on motivating the individual to not only monitor their own behaviour, but also modify it as required. Research surveys have found that young people generally appear to be aware of the theoretical risk posed by high-level listening. However, few report taking or planning to take personal action to reduce their exposure (Australian Hearing, 2010), with a suggestion that many may not perceive themselves to be personally at risk, and thus find it unnecessary to change their behaviour. Further information, is therefore required regarding young people's personal beliefs about their susceptibility to

hearing damage from leisure activities, in particular their attitudes regarding the risk to their hearing from PSPs.

Leisure activities are strongly linked to social behaviour, As a result, attitudes about associated risk are accordingly influenced by social-based factors, including peer influences. Social factors are well recognised generally as influencing health behaviours, and are particularly important in relation to behaviour in young adults and adolescents. Specifically, perceptions of social norms (i.e., judgements about what is “normal” behaviour within the social group) can be used as a guideline of what is acceptable or approved, and can work to directly influence an individual’s behaviour (e.g., Theory of planned behaviour; Ajzen, 1985; Ajzen, 1991). That is, individuals judge behaviour against the social norm of their peers, and/or modify their own behaviour to match that which is perceived to be “normal” or even further, as desirable (or, “cool”). Even when the reality of target behaviour is difficult to accurately observe, individuals still carry beliefs about how they think others behave, social norm beliefs which may or may not match with reality. An examination of how individuals perceive peers’ behaviour may therefore provide better insight into individuals’ understanding of their own behaviour.

To date, social factors such as social norms have generally received relatively little attention in hearing health research. This study aimed to investigate perceived social norms in relation to individuals’ perceptions of risk relating to their PSP listening behaviour. Participants’ perception of risk, their perceptions of their own behaviour and that of their peers was examined.

## **Method**

## *Participants*

The data presented was collected from 486 participants recruited for a large-scale study examining audiological data, along with knowledge of, and attitudes towards, hearing and noise exposure. (iHEAR; Carter, 2010). Participants were mainly recruited through high schools, and higher educational colleges/universities in rural and metropolitan areas of NSW, Australia.

Participants were classified into age categories based on their current educational status: Early High School (grades 7-9), Senior High School (grades 10-12) and Young Adulthood (18+ no longer at school). There were equivalent numbers of males and females in each group, (shown in table 1, along with age breakdown)

<insert table 1 around here>

## *Ethics*

The project received ethics approval from the Australian Hearing Human Research Ethics Committee and approval was given through the NSW Department of Education and Training to conduct testing within schools. All participants were required to provide informed consent prior to participation in the project.

Parents/guardians of participants under the age of 18 were additionally required to provide written consent for their child to participate in the project.

## *Materials*

The overall study involved collection of audiological data, demographic information and a survey of participant' knowledge of, and attitudes towards, hearing and noise exposure.(iHEAR; Carter, 2010). Results for the current study are drawn from a select sample of items within the large-scale questionnaires used as part of the study's testing protocol. To minimise potential confound by parents/peers, these items were presented by the audiologist as a semi-structured interview with the participant, on the day of testing.

The questionnaire was developed with the aim of gaining a better understanding of the knowledge and attitudes of young people regarding hearing and noise.

Questions related to the participants' beliefs about the risk posed to hearing by music listening in general, estimates of their own listening behaviour, and their peers' listening behaviours. A number of questions focussed on personal music listening behaviours (e.g. using PSPs and car/home stereos) as this was identified as an activity common to the majority of participants (regardless of age).

The focus of this report is on participants' responses to five specific questions relating to perceptions of their own, and their peers,' listening behaviours.

Participants were asked if they believed using a PSP could be a risk to people's hearing (No; Maybe/Yes). Those answering maybe/yes to this item were then asked to use a 10-point scale (shown in figure 1) to estimate the volume at which they believed music volumes may pose a risk to hearing (Q1b).

<Figure 1 around here>

If participants reported using PSPs, they were asked to use this scale to indicate the volume they generally listened to music , (Q2, Q3) and the volume at which they

believed their friends generally listened to music (Q4,Q5). Responses on the 10-point scale were converted to equivalent percentages for ease of reporting (i.e. a score of 6 on the response scale is reported here as 60%).

Question Items:

Q1b. At what volume do you think people might put themselves at risk of hearing problems if they use a PSP regularly?

Q2. How loud do you usually listen to music through earphones or headphones?

Q3. How loud do you usually listen to music through speakers?

Q4. How loud do most of your friends usually listen to music through earphones or headphones?

Q5. How loud do most of your friends usually listen to music through speakers?

The questions were distributed throughout the questionnaire so as to minimise the likelihood of repeat effects from use of the scale.

## **Results**

The vast majority of participants (90%) reported using a PSP, and believed that PSP use may have the potential to pose a risk to hearing (97%). Of these, the mean volume level which participants believed to pose a risk to hearing was 79% (SD=16%, n=434). A one-way anova showed that perceived risk volumes varied across the three age groups,  $F(2,427)= 13.63, p<0.001$ . Tukey post-hoc comparisons of the three groups showed significant differences between all three groups with Early High School students (M=84%, 95%CI [81,86]) reporting higher



perceived risk volumes than the Senior High School group (M=78%, 95%CI [76,80]), and both reporting higher perceived risk volumes than the Young Adulthood group (M=72%, 95% CI [69,76]).

Participants' perceptions of listening levels (Qs 2-5) are shown in table 2 below, broken down by age.

<Insert table 2 around here>

The listening condition (speakers or earphones/headphones) did not have a significant effect on volume rating for either condition for any of the three groups.

Responses for both conditions were then averaged within each group to provide two single "Combination" scores, for both self report volume levels and estimated peer volume levels (shown in table 3). A one-way anova showed no significant difference in self reported listening volumes across the three groups,  $F(2,470) = 1.336$ ,  $p=.264$ .

However, estimations of peers' listening volumes varied across the three age groups,  $F(2,460)= 3.387$ ,  $p=0.035$ . Tukey post-hoc comparisons of the three groups showed a small, but significant difference between Early High School students (M=73%, 95%CI [70,75]) reporting lower peer estimates than the Senior High School group (M=76%, 95%CI [75,78]).

<insert table 3 around here>

Of specific interest to the current study was how participants within each group defined risky volume levels, their perceptions of their own listening volumes, and the perceived social norms, (beliefs about their friends' listening volumes). Paired

sample t-tests were conducted to examine the comparisons between risk volumes, combination self report volume levels, and estimated peer volume levels within each group.

Combination self report (Q2&3) and estimation of peer listening volume levels (Q4&5) were significantly lower than the levels perceived to carry a potential risk to hearing (Q1) for all groups: Early High school  $t(136)=36.85$ ,  $p<.001$ , and  $t(138)=49.44$ ,  $p<0.001$ ; Senior High School  $t(211)=48.8$ ,  $p<0.001$ ,  $t(204) = 77.55$ ,  $p<0.001$ ; Young Adulthood  $t(77)=31.24$ ,  $p<0.001$ ,  $t(77)=53.87$ ,  $p<0.001$ , respectively. Furthermore, participants' estimation of peer listening levels were significantly higher than their self-reported listening levels for the early high school group  $t(145)=9.2$ ,  $p<0.001$ ; the senior high school group  $t(229) = 11.76$ ,  $p<0.001$ ; and the young adulthood group  $t(84) = 8.519$ ,  $p<0.001$ .

## **Discussion**

Overall, participants showed an awareness of the potential risk to hearing from PSP use, and indicated that they believed that this risk may be present at less than the maximum volume (specifically, 79%). Based on previous research estimates of maximum output of PSPs at 107dB, a rating of 79% would represent a level of around 85dB. This is a level that is potentially dangerous to hearing, and although the scale used was a relatively simple one, which did not include duration information, or music genre preferences, it suggests that participants' estimate of risk can be considered reasonable.

One in five participants reported that they listened at volumes of 80% or more. This figure is in keeping with previous research examining measurements of users' actual PSP levels (Williams, 2005, 2009), suggesting that the self-reported listening levels

reported in this study are likely to be reasonably accurate estimations of personal listening habits. This finding is likely to be of interest to developers of hearing health promotion activities relating to PSP use as it suggests that a small proportion of users are likely to be at risk of hearing damage from their PSP listening behaviour and, furthermore, self reports may provide a reliable method of identifying those at risk.

For all groups, there was a significant difference between self- report and estimation of peers' listening levels, with nearly half the participants (46%) holding the belief that their friends listened at risky levels (i.e., 80% or more).

These findings are particularly interesting when considering that recruitment occurred within school environments where many participants' friends were also participants, and therefore actually provided self report estimates of their own behaviour. Although a large proportion of participants suggested that their peers engaged in potentially risky behaviour, only a small proportion of participants actually reported doing so. Participants therefore, appear to hold inaccurate social norm beliefs, namely their misperceptions about the volume level at which their peers listen to music.

Overestimating peers' listening behaviours is likely to result in a corresponding overestimation of the "safety" of personal habits. This has the potential to reduce perceptions of personal susceptibility, and decrease motivation to change personal listening behaviours. Individuals who believe that they are unlikely to be damaging their hearing by their current PSP listening behaviour are unlikely to implement, or even take notice of suggestions to reduce their risk. Furthermore, there is a chance that overestimation of peers' listening levels may lead individuals to attempt to

emulate the behaviour, increasing their own listening levels in order to meet the perceived social norm.

Thus, hearing health promotion activities may be more successful if such misperceptions are identified and addressed prior to the provision of more general preventative advice. These types of techniques have previously been implemented in health promotion campaigns, particularly with teenage audiences. For example, strategies have sought to correct misperceptions by providing individuals with accurate information about peer group behaviours, and peer beliefs (e.g., smoking, drug and alcohol consumption; Hansen, 1997; Hansen & Graham, 1991).

### **Limitations and Future Directions**

This study only measured participants' perceptions of listening levels and did not measure actual PSP volumes or duration of use. It is therefore limited in its ability to determine the actual risk posed to participants by their PSP listening behaviour.

Regardless, it is the beliefs (accurate or otherwise) rather than actual behaviour that are likely to be impacting on perceptions of susceptibility and thus remain a highly relevant area for investigation.

At any one time, a number of factors may influence participants real world listening levels including the model of music player and headphones/earplugs used, environmental background noise levels, music genre preference and even the fit of headphones to the ear canal. Information about these factors was not collected in the current study, and so any subsequent impact they may have cannot be determined.

Due to the voluntary nature of the study, there is a possibility that those who participated were in fact "quiet users" and therefore not representative of the wider

PSP listening population. However, as discussed, the range of self-report of listening volumes is in keeping with results from other random sample studies of PSP use, suggesting that the sample is representative.

Regardless, the results of this study have implications not just for leisure settings, but also for work environments. Many workers in noisy industries are reliant on PPEs to reduce their noise exposure, with the result that successful hearing protection is highly dependent on individuals' choices to engage in the required behaviour.

However, motivating workers to use reduce their noise exposure has traditionally been a difficult task (Waugh, 1993; Westbrook, Hogan, Penny, & Legge, 1992).

Future work about occupational hearing protection behaviour may benefit from closer examination of individuals' beliefs regarding their noise exposure and that of colleagues, to determine if similar misperceptions exist that may be adversely influencing motivation.

## **Conclusions**

This study shows that while many young people seem to be aware of the potential risk to hearing from PSP use they may be overestimating the listening behaviour of their peers. Such a misperception has the potential to decrease feelings of susceptibility, leading to decreased motivation to engage in healthy hearing behaviours. Future hearing loss prevention campaigns (for both leisure and work environments) may benefit from consideration of social norm factors. In particular, campaigns that seek to identify and address inaccurate beliefs about social norm prior to delivery of prevention messages may be more successful in changing listening behaviour and ultimately reducing the incidence of NIHL.

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Table 1 Participants by age and gender.

	<b>Mean Age (SD) (years);</b>		
	Male	Female	Total
<b>Early High School</b>	13 (0.8); n=66	13.3 (1.5); n=84	13.1 (1.2); n=151
<b>Senior High School</b>	16.8 (0.7); n=137	16.4 (0.9); n=106	16.6 (0.8); n=244
<b>Young Adulthood</b>	21.4 (2.9); n=47	20.8 (2.5); n=40	21.1 (2.8); n=91

*NB Gender information was not available for six participants*

Table 2 Participants perceptions of self and peers listening volumes, by age group.

<u>Group</u> Listening Condition	<u>Self Reported volumes</u>		<u>Estimation of Peers</u>	
	Mean (SD) %	n	Mean (SD) %	n
Early High School				
Earphones/headphones	61(19)	130	72 (18)	147
Speakers	62 (20)	141	75 (18)	138
Senior High School				
Earphones/ Headphones	64 (19)	225	77 (14)	230
Speakers	64 (19)	212	76 (16)	220
Young Adulthood				
Earphones/ headphones	62 (17)	76	75 (12)	85
Speakers	62 (19)	82	75 (15)	84
All Groups				
Earphones/headphones	63 (19)	431	75 (15)	462
Speakers	63 (19)	435	75 (16)	442
Combination	63 (17)	473	75 (14)	463

Table 3 Comparison of perceptions of listening volumes for self report and estimation of peer volumes, by group. (*Estimations of potential risk, are repeated here in italics*)

	Q2&3: Combination Self-Report Mean % (SD%)	Q4&5: Combination Estimation of Peers Mean % (SD%)	Q1: Risk Volume Mean% (SD%)
Early High School	61 (17)	73 (16)	84 (16) <sup>a</sup>
Senior High School	64 (17)	76 (13)	78 (16)
Young Adulthood	62 (15)	75(12)	72 (15)

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1	2	3	4	5	6	7	8	9	10
Soft			Medium				Loud		
(Lowest player volume)			(Half volume)				(Full-on player volume)		

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*Figure 1: Volume response scale*