

CHANGING BELIEFS ABOUT LEISURE NOISE: USING HEALTH PROMOTION
MODELS TO INVESTIGATE YOUNG PEOPLE'S ENGAGEMENT WITH, AND
ATTITUDES TOWARDS, HEARING HEALTH

Megan Gilliver^{1,2}; Elizabeth Beach¹; Warwick Williams^{1,2}

¹National Acoustic Laboratories, Australian Hearing, New South Wales, Australia

²The Hearing Cooperative Research Centre, Victoria, Australia

Key words: young adults; hearing health; health promotion; health belief model;
Stage of Change; leisure; noise-induced hearing loss

Abbreviations

SoC: Stage of Change

HBM: Health Belief Model

Corresponding Author: Dr Megan Gilliver
National Acoustic Laboratories
Australian Hearing Hub
16 University Avenue
Macquarie University
NSW Australia
Ph: +61 2 9412 6944
Fax: +61 2 9411 8273
Email: megan.gilliver@nal.gov.au

Abstract

Objective: To investigate factors influencing young people's motivation to reduce their leisure noise exposure, and protect their hearing health

Design: Questionnaires were conducted online to investigate young people's hearing health attitudes and behaviour. Items were developed using an integrated health promotion approach. The Stage of Change model was used to group participants in relation to their engagement with noise reduction behaviour. The Health Belief Model was used to compare each group's perceptions of susceptibility and severity of hearing loss, as well as the benefits and barriers to noise reduction.

Study Sample: Results are presented for 1,196 young Australians aged between 18 and 35 years.

Results: Participants' engagement with noise reduction behaviour was used to assign them to Stage of Change groupings - Maintenance (11%), Action (28%), Contemplation (14%) or Pre-Contemplation (43%). Each group's responses to Health Belief Model items highlighted key differences across the different stages of engagement.

Conclusions: Future hearing health promotion may benefit from tailoring intervention activities to best suit the stage of change of individuals. Different information may be useful at each stage to best support and motivate young people to look after their hearing health.

An ongoing aim and, sometimes, challenge for hearing health is promoting positive noise reduction behaviour in individuals and groups. This is particularly true for noise exposure locations outside the workplace, such as entertainment venues, where the enjoyment of high-volume sound can minimise perceptions of any potential hearing threat. Arguably the largest group at risk of hearing damage from entertainment venues are young people, who generally have a higher proportion of leisure time available and are often the most frequent patrons.

High volumes at entertainment venues and high involvement by adolescents and young adults has increased professional and community concern they may be at particular risk of hearing loss. Despite questions about the veracity of several alarmist reports of increasing leisure noise damage rates for young people (see Carter et al, 2014), there is evidence that young people are attending potentially high-risk venues, and many also report experiencing early symptoms of hearing damage following high-volume exposures (Beach et al, 2013b; Smith et al, 2000). This group needs evidence-based information about hearing health and advice on how best to protect their hearing.

Young people have some awareness of the link between noise and hearing damage (Gilles et al, 2013; Bogoch et al, 2005; Australian Hearing, 2010). This knowledge however, doesn't necessarily result in motivation to reduce leisure noise exposure, a response not helped by the low levels of engagement with hearing health in the general population (Addison & Gilliver, 2012). Overcoming these issues and motivating young people to protect their hearing will require more than just knowledge of the facts of noise-induced hearing loss. Other factors which impact specifically on hearing health motivation should be considered.

A potential source of assistance may come from the broader field of health promotion and education. Research in this area investigates how people feel about their health and seeks ways to encourage appropriate preventive behaviours. The application of this knowledge to the problem of hearing health promotion, particularly for young people, has potential advantages for improving motivational barriers (Sobel & Meikle, 2008). This study aims to make use of two prominent health promotion theories to better understand what motivates young people to engage with noise reduction behaviour.

Firstly, participants' engagement with hearing health is defined in relation to their engagement with noise reduction according to the Stage of Change model (SoC; Prochaska et al, 1994a; Prochaska & Velicer, 1997). The SoC model describes behavioural change as a series of distinct stages – from pre-contemplation, to contemplation, preparation, action and finally maintenance. Understanding the beliefs and behaviour of individuals at each stage can assist in uncovering cues which may help people to move from pre-contemplation all the way through to maintenance.

Secondly, participants' underlying behaviour and perceptions will be investigated in relation to the constructs of the Health Belief Model (HBM; Janz & Becker, 1984; Rosenstock, 1974). These constructs cover perceptions of behaviour and health that have an impact on a person's willingness to undertake healthy behaviours. Included are perceptions related to the consequence of not undertaking action (e.g., perceived susceptibility and severity of hearing damage – how likely is it, and how much impact would it have?) and attitudes towards the particular harm-minimisation behaviour (e.g., perceived benefits and barriers to undertaking noise reduction).

Knowledge of individuals' beliefs in relation to these constructs can be used to identify strategies that may increase motivation to engage in the target behaviour.

Integration of the two theories allows the identification of hearing health beliefs associated with each stage. A similar approach has been used successfully in other areas of health education research (e.g., Juniper et al, 2004; Rhodes & Hergenrather, 2003; Strecher et al, 2002) to provide insight into how best to support individuals in moving towards a higher SoC. Previous investigation of Australian young people also supports the use of this approach. In an earlier study, we found higher behavioural engagement for those who reported stronger feelings of personal susceptibility and acknowledged the potential severity of hearing loss (Gilliver et al, 2013). This study, therefore, aims to investigate young people's engagement with, and attitudes towards, hearing health and noise reduction to identify areas of likely benefit for future hearing loss prevention programs.

Method

Participants

A survey was distributed by a commercial research company to a panel¹ of young Australian adults. A total of 1,595 participants commenced the survey, although 13% failed to complete more than a single question. Of the remaining 1,389 participants, results are presented for 1,196 (75% of the original 1,595) after data screening removed participants who had a majority of incomplete or invalid responses.

Participants were recruited to provide a representative sample of all Australian states

(2015) *International Journal of Audiology*, 54(4), 211–219.

¹ A panel is a previously recruited group of individuals who meet a researcher's demographic requirements and have agreed to participate in research for a limited time period.

and territories and were aged between 18 and 35 years (M = 28 years, SD = 4.7 years), with a gender imbalance of female (76%) to male participants.

Materials

The online survey, created by the authors, was made available for seven days. Survey questions (shown in Tables 1; 4; & 6) were designed to probe the beliefs and behaviour of young people and extended previous work looking at Australians' participation patterns and engagement with hearing health behaviour (Gilliver et al, 2012; Australian Hearing, 2010; Gilliver et al, 2013; Beach et al, 2013a; 2013b).

Part I: Attendance at Noisy Venues and Related Symptoms

Participants were asked to provide an estimate of their rate of attendance and their average visit duration at several common leisure activities including two types of known noisy venues: nightclubs and pubs/bars (henceforth referred to as 'pubs'; Q1 & Q2).

To examine hearing health, participants were asked whether they believed they had a hearing loss; whether family/friends commented about a loss; and any difficulties they encountered when conversing in noise (Q3 a-c). Participants were also asked about their experience of tinnitus (Q4). Engagement with noise reduction behaviour was also examined by asking whether participants had recently taken steps to reduce their noise exposure (Q5), and the frequency of any such undertaking (Q6).

The second part of the survey focussed on a more detailed examination of engagement in noise reduction behaviours and beliefs and attitudes around hearing health issues.

Participants were asked about their perceptions of the hearing health risk posed by leisure noise (Q7) in general terms (a), for themselves personally (b), and for people their age (c).

<insert Table 1 around here>

Twenty-six items were used to investigate participants' beliefs about susceptibility, severity, benefits, and barriers (Tables 4-7), as defined within the HBM (Rosenstock, 1974). Items were presented in random order, but have been categorised and re-numbered for ease of presentation. Four questions were used to investigate participants' current engagement with noise reduction activities, including earplug use and plans to engage in relevant behaviours in the future (Q8a-d). These four items, although moderately correlated, each signify (in decreasing order from a-d) a different stage in the continuum of engagement in noise reduction behaviour. Items in Q7 and Q8 used the same Likert scale with response options from 'strongly disagree' to 'strongly agree'.

Classification of participants' SoC: Responses to Q8 were used to define participants' current SoC, from 'pre-contemplation' (i.e., no active thought or action) through to 'maintenance' (i.e., ongoing participation in noise reduction behaviour).

(2015) This process is represented in Figure 1.

<Insert figure 1 around here>

Firstly, the 58 participants (5%) who gave a 'neutral' response to all four items in Q8 were examined. These participants also gave neutral responses to the majority of hearing health items in the survey and were therefore classified as 'ambivalent' and removed from further analyses.

Maintenance – Behavioural change has occurred and is ongoing. Participants were classified as being in this stage if they agreed or strongly agreed with Q8a that they used hearing protection at all times when they went out (11%). The vast majority of these participants generally also agreed with the remaining statements in Q8, showing a strong commitment to noise reduction behaviour.

Action – The individual is taking some steps to change their behaviour. Participants were classified as belonging to this stage if they indicated that they took some steps to reduce their noise exposure, agreeing or strongly agreeing with Q8b (28%). Incidentally, 77% of these participants also agreed with items 8c and/or 8d.

Contemplation - The individual is showing interest in reducing noise exposure prior to action being taken. Participants were classified as being in this stage if they agreed or strongly agreed with either item Q8c or Q8d (14%).

Pre-Contemplation – The individual's behaviour indicates no engagement or interest in reducing noise exposure. Participants who disagreed with both Q8c and Q8d were classified as being in this stage (43%).

Statistical analysis: Descriptive statistics and *t*-tests were used in the analysis of (2015) *International Journal of Audiology*, 54(4), 211–219. responses to Q1-Q8. For Q9-Q12, one-way ANOVAs and Tukey post-hoc analyses were conducted. All analyses were conducted using IBM SPSS (version 21.0.0.0) for Windows.

Results

Part I: Attendance at Noisy Venues and Related Symptoms

Most participants reported visiting each of the leisure venues at least once a year with more people attending pubs (87%) than nightclubs (63%). Frequency of visits to the venues varied (see Table 2) with participants attending pubs more regularly than nightclubs.

<Insert Table 2 about here>

Participants' frequency of attendance at both venues was compared to examine the overlapping attendance patterns (see Table 3). High-frequency pub attendees (who attended the venue at least monthly) were much more likely than low-frequency attendees (attending less than monthly) to also be high-frequency nightclub attendees. Participants who never attended nightclubs showed some attendance at pubs but were rarely high-frequency pub attendees. In contrast, those who reported never visiting pubs, also very rarely visited nightclubs.

<Table 3 about here>

Visit durations for the two venues were similar, with participants spending an average visit of 3.1 hours in pubs, and 3.6 hours in nightclubs (SD=1.5, 1.6 respectively). Average L_{Aeq} exposure levels for pubs and nightclubs (84 dB and 96 dB) were extracted from the NOISE database (<http://noisedb.nal.gov.au>; Beach et al, 2013b). This information was used to calculate the average noise dose for visits to each venue through conversion to ADEs (Acceptable Daily Exposure) - a unit based on the workplace noise exposure limits of $L_{Aeq,8h} = 85$ dB (further detail in Williams et

al, 2010). The noise dose for average visits to pubs was 0.30 ADE, and for nightclubs, 5.7 ADE.

When asked about their hearing health (Q3a), 22% of participants reported they felt they had a hearing loss. Half of all participants responded yes to at least one question about hearing loss symptoms (Q3b & Q3c), with 16% reporting experience with both symptoms. Responses to Q4 showed the majority of participants had experienced tinnitus at least sometimes (61%), with a small proportion (2%) experiencing constant tinnitus.

In relation to hearing health behaviour, 29% of participants reported actively trying to reduce their noise exposure at entertainment venues (Q5). Over half of the participants (58%) who reported that they had reduced their noise exposure, reported some use of hearing protection, with 6% indicating that they used it “most of the time”(Q6a). Most participants reported that, at least “sometimes”, they limited the time spent in noisy environments (85.6%); decided to sit/stand in quieter areas (92.4%); or decided not to attend a venue/attend a quieter venue (79.5%).

Part II: Noise Reduction Behaviours and Underlying Beliefs and Attitudes

Participants' beliefs about their relative susceptibility to noise damage from entertainment venues was examined by comparing participants' ratings in relation to people in general, themselves, and people their own age (Q7). Participants' risk ratings for people their own age (M=6.7, SD=2.4) was significantly higher than their risk rating for people in general (M=6.0,SD=2.1); $t(1185) = -10.203, p < 0.001$. Ratings of general risk were, in turn, significantly higher than ratings of personal risk for hearing damage (M=5.1, SD=2.6); $t(1188) = -10.049, p < 0.001$.

(2015) *International Journal of Audiology*, 54(4), 211–219.

We hypothesised that a participant's personal SoC would be characterised by their underlying health beliefs. Responses to the 26 HBM items (Tables 4-7), were analysed to see whether SoC group membership (as described earlier) reflected consistent differences in beliefs regarding susceptibility, severity, barriers and benefits of noise reduction.

The pattern of results for each item within the HBM constructs varied. Although mean differences between groups were small (due to the limited range of the 5-point Likert scale), for 17 of the 26 items, the scores for each group represented a steady continuum of increasing agreement (or disagreement) from the Pre-Contemplation stage through to the Maintenance/Action stages. Thus, even when all four groups were in agreement on a particular item, the strength of this varied systematically according to the SoC. Twenty-six one-way ANOVAs (and Tukey post-hoc tests) comparing differences between groups were conducted. Significant differences ($p < 0.05$) are shown in tables 4-7. Overall trends and notable deviations in the continuum (in strength and/or direction) are discussed below.

Susceptibility

Mean responses for the six items examining participants' beliefs regarding susceptibility to hearing loss from entertainment venue noise are shown in Table 4.

<Insert Table 4 about here>

Participants were generally neutral with respect to their beliefs about noise levels in the venues they attended (Q9a). Despite this, all groups agreed entertainment venue levels had the potential to damage hearing (Q9b), and that they knew when they were exposed to too much noise (Q9c).

The Maintenance and Action groups held similar beliefs about their ability to judge noise exposure (Q9c), the potential for music levels in venues to damage hearing (Q9b), and their own likelihood of sustaining damage in these venues (Q9d). For all three items, they reported significantly higher levels of agreement about their susceptibility than the other groups.

The Pre-Contemplation group's responses to Q9b and Q9d showed that this group were the least likely of all groups to feel susceptible, with the majority of participants actually denying the likelihood of any damage.

The Pre-Contemplation and Maintenance groups both reported little to no concern about personal hearing damage from attending venues (Q9e,f), compared to significantly higher concern reported by the Action and Contemplation groups.

Severity

Participants' beliefs about the severity of hearing loss were examined through six items with mean responses shown in Table 5.

<Insert Table 5 around here>

All groups agreed that hearing loss was permanent (Q10b) and hearing could not be returned to its original state once damaged (Q10a), with the Action group showing higher levels of agreement than the other three groups.

All groups agreed that hearing loss had the potential to negatively impact their lives and education/employment (Q10c,e), but were less sure of the impact on socialising (Q10d). The Pre-Contemplation group were less concerned than other groups about hearing loss (Q10f), its impact on socialising (10d), and were

significantly less likely to agree hearing loss would impact employment/education (10e).

Benefits

Seven items addressed participants' beliefs regarding the benefits of noise reduction, with mean responses shown in Table 6.

<Insert Table 6 around here>

For most items, the Action group showed significantly higher agreement than the Maintenance and Contemplation groups, who in turn were significantly more likely than the Pre-Contemplation group, to agree that there were benefits for noise reduction. The Pre-Contemplation group were more positive (and more similar to the other groups), about the *theoretical* benefits of noise reduction and hearing protection (Q11a, e, g) than the *personal* benefits from such activities. The largest group differences were found for Q11f, where they were the only group to disagree that they had "a lot to gain" from wearing hearing protection in pubs and nightclubs. The Pre-Contemplation group was consistently less convinced than other groups about the benefits of reducing exposure in leisure venues (Q11b,c)

Barriers

Seven items were used to investigate participants' beliefs about barriers to noise reduction in entertainment venues, with mean group responses shown in Table 7.

<Insert Table 7 around here>

(2015) *International Journal of Audiology*, 54(4), 211–219.

All groups generally agreed that impaired conversation (Q12a), embarrassment (Q12b), and discomfort (Q12c), were barriers to earplug use with few substantial

differences across groups. Similarly the groups agreed that it was difficult to remember earplugs when going out (Q12d). In contrast, participants' responses about the difficulty of acquiring earplugs prior to going out (Q12e) were more equivocal ranging from disagreement for the Pre-Contemplation group through to agreement for the Maintenance group. The Maintenance group was more likely than the other groups to report friends preferring noisy venues (Q12f) and having difficulty requesting a change in venue (Q12g).

Discussion

The results from this study support and add to much of what is known about leisure noise exposure and hearing health of young people. They have particular relevance to those attempting to motivate individuals to look after their hearing health. Implications are now discussed.

Part I: Attendance at Noisy Venues and Related Symptoms

The majority of participants reported attending pubs and/or nightclubs during the year, with participation patterns similar to those from another large-scale Australian study for the same age range. The Beach et al (2013a) study reported weekly attendance of 14% for pubs and 8% for nightclubs, remarkably similar to the respective rates of 15% and 8% for the current study. Beach et al also reported higher average attendance durations for nightclubs (3.3 hours) than pubs (2.7 hours) which is slightly lower, but in the same direction as, the results of the current study (3.6 and 3.1 hours respectively). Such similar results support the robustness of these data and suggest that the current study's results are generalizable to other young people.

For the 18% of participants who visited nightclubs more than once a month their cumulative exposure from this single activity likely exceeds workplace limits sufficient to pose a risk to their hearing. Although exposure levels were lower at under 1 ADE per visit for pubs, those who attend frequently have little room for noise exposure from other activities before daily or weekly thresholds are reached (Gilliver et al, 2014). This is of particular importance considering the findings of this and other studies that participation in different high-noise activities shows overlap (Beach et al, 2013a). Knowledge of this overlap could be advantageous for hearing health professionals. Targeting messages towards the large groups of participants of so-called “low-risk” activities like pubs is likely to have the added benefit of reaching a large proportion of individuals who are also exposed to high levels of noise in other leisure activities.

Results show that young people are aware of the potential risks - considering themselves at higher risk than the general population. However the results also suggest that participants (perhaps inaccurately) view their behaviour as generally safer than their peers. Social norm misperceptions have been investigated in other health promotion research, including hearing health (Gilliver et al, 2012), with suggestions that they may present a barrier to change. Health promotion interventions for activities like alcohol and drug use have sought to remove the potential “safety net” of misperceptions by providing accurate information about peer behaviour (e.g., Martens et al, 2006; Schultz et al, 2007). The use of similar intervention strategies targetting hearing health perceptions may be beneficial.

(2015) *International Journal of Audiology*, 54(4), 211–219.

Self-report data cannot provide a true estimate of the incidence of the hearing loss. However, the proportion of young people who reported experiencing hearing

difficulties (including tinnitus) is not insignificant and mirrors findings of similar studies (e.g., Chung et al, 2005; Bohlin et al, 2011; Beach et al, 2013b; Gilles et al, 2013). The relationship between experiences of early (and often temporary) hearing difficulties and attitudes to hearing health have previously been noted (Holmes et al 2007), with suggestions they may act as useful action triggers (Widen et al, 2009). Messages alerting young people to the relationships between symptoms and long-term damage can provide a tangible reference point, giving hearing health messages greater relevance and meaning.

Encouragingly, our results do show a reasonable proportion of young people already engaging in noise reduction behaviours. Nearly a third reported actively trying to reduce their noise exposure, often moving away or avoiding noisy areas. This finding confirms an important message to proprietors of entertainment venues - patrons are not always content with consistently high levels of noise, and are seeking out quieter areas on a regular basis (Johnson et al, 2014; Beach, 2013).

Part II: Noise Reduction Behaviours and Underlying Beliefs and Attitudes.

Using the SoC model as the basis of our analysis, we examined whether different stages were characterised by different beliefs with an aim of identifying factors most relevant in helping individuals move towards higher levels of hearing health engagement. . Group beliefs are now discussed in relation to the type of information/support that may be most beneficial in improving participants' engagement at different stages.

(2015) *International Journal of Audiology*, 54(4), 211–219.

Participants in the Maintenance and Action stages generally showed higher hearing health awareness than those at Contemplation and Pre-Contemplation.

They showed good awareness of their susceptibility to noise injury, recognised the severity of hearing loss, and acknowledged benefits to reducing noise exposure.

Although generally comfortable with the use of earplugs, the Maintenance group acknowledged more difficulties than other groups in implementing noise reduction practices such as changing venues. This may be due to the fact this group are the group most likely to have noticed friend's noisy venue choices, and to have actually experienced having suggestions to choose different, quieter, venues refused. This is in contrast to those in the Pre-Contemplation group who considered such barriers were minimal, probably as a result of having never experienced them. Thus, the Maintenance group is most likely to benefit from support that provides them with ways to balance the needs of their social group with their desire to minimise their noise exposure. For example, music venues that provide patrons with greater variety and choice in terms of volume levels and entertainment spaces would meet this need.

For most items, the Action group (like the Maintenance group) also showed strong awareness of noise reduction issues. In quite a few cases their awareness was either at equivalent or higher levels than the Maintenance group. This kind of attitude "spike" at or around the action stage have been noted in other research (for example, see Prochaska et al, 1994). Those in the Action group could be regarded as hyper-aware of many aspects of hearing health, and it may actually be this heightened sensitivity which serves as a "call to action" to overcome the inertia of non-engagement with noise reduction behaviours.

Although members of the Action group are taking steps to reduce their noise exposure, they remain less convinced than the Maintenance group of the benefits of

wearing earplugs in nightclubs and pubs, perhaps due to lack of experience. Support and reassurance that their early steps will yield positive outcomes may provide the necessary motivation to increase hearing health engagement to reach the Maintenance stage.

In contrast, participants in the Contemplation and Pre-Contemplation stages consistently demonstrated significantly lower awareness about hearing health than those already undertaking action. Both groups showed significantly lower perceptions of susceptibility - with many in the Pre-Contemplation group perceiving no personal risk from excessive noise. Both groups would benefit from messages designed to raise awareness of the real risks posed to hearing from noise exposure. However the Contemplation group is likely to benefit most from such messages. Education that builds on existing experiences of hearing loss (e.g., temporary threshold shift and tinnitus) and focuses on raising perceptions of personal susceptibility (e.g. real life exposure estimates) may assist these individuals to begin to reduce their exposure.

The Pre-Contemplation group generally had the lowest hearing health awareness, and were particularly distinctive in their lower levels of concern about the severity of hearing loss. The Pre-Contemplation group showed much less concern about the potential impact to social and working life than either of the groups already undertaking action. They also were generally less convinced of the benefits of noise reduction than those taking action (or in some cases, those contemplating action).

(2015) *International Journal of Audiology*, 54(4), 1-12

These results suggest that the Pre-Contemplation group is most likely to benefit from messages that make real to them the potential impact of hearing loss. Raising severity awareness has previously been suggested (Vogel, Brug, Van der Ploeg, &

Raat, 2010), and may be particularly beneficial for this group, which represents the majority of young people. Increased motivation to engage with noise reduction may develop from helping this group better understand *why* preventing hearing loss is worthwhile.

Pre-Contemplators, by definition, are not likely to seek out information about noise reduction. Therefore information for this group needs to be delivered directly to participants by placing messages (either virtually or physically) where they are likely to find them. The messages must attract attention and provide the necessary motivation to contemplate and begin preparing to reduce their noise exposure.

Conclusion

These results confirm that many young people continue to engage in leisure activities that have potential to damage their hearing. Although 39% were either actively pursuing or maintaining noise reduction behaviours, the majority of young people surveyed here had low levels of engagement in noise reduction. Thus, there is a need to educate them about hearing health appropriately by targeting their specific needs for support.

This study has shown that the four SoCs relating to engagement with noise reduction activities are characterised by different beliefs, knowledge, and, therefore, informational needs. It is hoped that the insights provided here will inspire the development of more appropriate and therefore more effective hearing health messages for young people and the wider community.

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Acknowledgements and Declaration of Interest

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Table 1. Questions 1-8 and response options.

Item No.	Question	Response Options
Q 1	How often do you attend the following entertainment venues: Pub/club Nightclubs	More than once a week; once a week; 2-3 times a month; once a month; once every 2-3 months; once every 4-6 months; once or twice a year; Never
Q 2	How long do you normally spend at the pubs you attend (to the nearest hour) Pub/club Nightclubs	<i>Open response in hours</i>
Q 3	Do you feel you have a hearing loss? Does an immediate family member of friends feel that you have a hearing loss? Do you find it difficult to follow a conversation at home if there is background noise e.g., TV, radio, children playing?	Yes; No
Q 4	How frequently do you experience tinnitus or ringing in your ears?	Never; sometimes; frequently; always
Q 5	In the past 6 months have you actively tried to reduce your exposure to noise at entertainment venues?	Yes; No
Q 6	Please Indicate how often (if at all) you have done the following: Worn hearing protection (i.e., earplugs) Limited the time spent out in a noisy environment (e.g., taken breaks in a quieter area) Decided to sit/stand in a quieter area in a venue that is away from the speakers Decided not to attend a noisy venue or chosen to attend a quieter venue	Never; Rarely; Sometimes; Most of the time
Q 7	How do you rate people's general risk of sustaining hearing damage from attending entertainment venues (on a scale of 1-10)? How do you rate <u>your</u> risk of hearing damage sustained from entertainment venues (on a scale of 1-10)?	10 point scale where: 10= "Venues pose a serious risk" and 1 = "Venues pose no risk" 1= I am not really at risk 10= I am at risk

	How do you rate the risk that <u>people your age</u> will sustain hearing damage from attending entertainment venues?	1= They are not at risk 10= They are at risk
Q 8	<p>a I got sick of having ringing in my ears after a night out so now I always take my earplugs with me when I go out.</p> <p>b I have started to limit the amount of noise I am exposed to at entertainment venues</p> <p>c I have done some research/spoken to friends about using hearing protection in entertainment venues</p> <p>d I am thinking of trying to limit my exposure to noise in entertainment venues in the future</p>	Five point scale where 1 = strongly disagree and 5 = strongly agree

Table 2. Percentage Participation Frequency, by venue .(n=1194, 2 participants removed due to incomplete data)

Venue	> once/ week	Once/ week	2-3 visits /month	Once/ month	Once every 2-3 months	Once every 4-6 months	Once-twice/ year	Never
Pub/Bar	3	10	15	16	15	11	18	13
Nightclub	1	4	7	8	10	8	26	37

Table 3. Cross-tabulated rates of participation for nightclubs and pubs/bars.(n=1193, 3 participants removed due to incomplete data)

		Nightclubs		
		More than once a month	less than once a month	never
Pubs/Bars	More than once a month	220	236	62
	less than once a month	14	274	235
	never	1	7	144

Table 4. Group Means for Susceptibility Items, ranked by agreement level. Superscript denotes significant mean difference ($p < 0.05$), SD range: 0.8-1.4

Question 9	Level of Agreement			
	Group M ^{significant group difference}			
	Lowest			Highest
a. The entertainment venues I attend are not loud enough to damage my hearing.	Cont 2.9	Action 3.0	Pre 3.1	Maint 3.1
b. The music levels in entertainment venues can damage my hearing.	Pre 3.7 ^{C,M,A}	Cont 3.9 ^{A,P}	Maint 4.2 ^P	Action 4.3 ^{C,P}
c. I know when I am being exposed to too much sound/noise.	Pre 3.6 ^{A,M}	Cont 3.7 ^{A,M}	Action 4.0 ^{C,P}	Maint 4.1 ^{C,P}
d. I am likely to sustain hearing damage from attending entertainment venues.	Pre 2.9 ^{C,A,M}	Cont 3.2 ^{P,A,M}	Action 3.6 ^{C,P}	Maint 3.7 ^{C,P}
e. I am not worried about sustaining hearing damage from attending entertainment venues.	Action 2.2 ^{C,P,M}	Cont 2.5 ^{A,P,M}	Pre 3.0 ^{A,C}	Maint 3.1 ^{A,C}
f. I don't worry about my hearing being damaged by loud music at entertainment venues	Action 2.1 ^{M,P}	Cont 2.4 ^{M,P}	Maint 2.7 ^{A,C}	Pre 3.0 ^{A,C}

Table 5. Group means for Severity items, ranked by agreement level. Note: Superscript denotes significant mean difference ($p < 0.05$); SD range: 0.9-1.1

Question 10	Level of Agreement			
	Group M ^{significant group difference}			
	Lowest		Highest	
a. If my hearing was damaged it could not be returned to its original state	Pre 3.8 ^A	Maint 3.9	Cont 4.0	Action 4.1 ^P
b. Hearing damage is permanent	Pre 4.0 ^A	Cont 4.0 ^A	Maint 4.0 ^A	Action 4.3 ^{P,C,M}
c. If I had hearing damage it would change my whole life	Pre 3.9 ^A	Cont 4.0	Maint 4.0	Action 4.2 ^P
d. If my hearing was damaged it would change how I socialise with my friends and family	Pre 3.5 ^{A,M}	Cont 3.7 ^A	Maint 3.8 ^P	Action 4.0 ^{C,P}
e. If my hearing was damaged it would make my employment or studies difficult	Pre 3.7 ^{C,A,M}	Cont 4.0 ^P	Action 4.0 ^P	Maint 4.1 ^P
f. The thought of sustaining hearing damage worries me	Pre- 3.3 ^{A,M}	Cont 3.8 ^A	Maint 4.0 ^P	Action 4.1 ^{P,C}

Table 6. Group means for Benefit items, ranked by agreement level. Note: Superscript denotes significant mean difference ($p < 0.05$); SD range: 0.8-1.0

Question 11	Level of Agreement			
	Group M ^{significant group difference}			
	Lowest			Highest
a. If I look after my hearing now, I will be able to enjoy listening to music for many years to come.	Pre 3.9 ^{A, C}	Maint 4.0 ^A	Cont 4.1 ^{A, P}	Action 4.4 ^{P, M, C}
b. Reducing the time I spend in noisy entertainment venues will reduce the risk of hearing damage for me.	Pre 3.6 ^{C, M, A}	Cont 3.9 ^{P, A}	Maint 4.0 ^P	Action 4.2 ^{P, C}
c. By reducing the time I spend in loud entertainment venues I can reduce my risk of sustaining hearing damage.	Pre 3.7 ^{C, M, A}	Cont 4.0 ^{A, P}	Maint 4.0 ^{A, P}	Action 4.3 ^{P, C, M}
d. Wearing earplugs in entertainment venues can prevent tinnitus and reduce my personal risk of sustaining hearing loss in the future.	Pre 3.5 ^{C, M, A}	Cont 3.8 ^{A, P}	Maint 4.0 ^P	Action 4.1 ^{P, C}
e. Wearing hearing protection at entertainment venues can prevent hearing damage.	Pre 3.7 ^{M, A}	Cont 3.9	Maint 4.0 ^P	Action 4.1 ^P
f. I have a lot to gain by wearing hearing protection in pubs and nightclubs.	Pre 2.9 ^{C, A, M}	Cont 3.4 ^{M, P}	Action 3.6 ^{P, M}	Maint 3.9 ^{P, C, A}
g. Having regular hearing checks can help me to monitor my hearing health.	Pre 3.6 ^A	Cont 3.7	Action 3.8 ^P	Maint 3.8 ^P

Table 7. Group means for Barrier items, ranked by agreement level. Note: Superscript denotes significant mean difference ($p < 0.05$). SD Range: 1.0-1.3

Question 12	Level of Agreement			
	Group M ^{significant group difference}			
	Lowest			Highest
a. Wearing earplugs makes it difficult to chat with friends at entertainment venues.	Cont 3.7 ^A	Maint 3.7	Pre 4.0	Action 4.0 ^C
b. Wearing earplugs is embarrassing.	Maint 3.4 ^P	Cont 3.5	Action 3.6	Pre 3.7 ^M
c. Earplugs are uncomfortable to wear.	Maint 3.5	Cont 3.5	Action 3.6	Pre 3.7
d. Earplugs are difficult to remember on nights out.	Cont 3.4	Action 3.5	Pre 3.5	Maint 3.6
e. It is difficult to get earplugs before a night out.	Pre 2.8 ^M	Cont 2.9	Action 3.0	Maint 3.3 ^P
f. My friends' favourite bars and entertainment venues often also happen to be ones that are noisy.	Pre 2.8 ^{A, M}	Cont 2.9 ^M	Action 3.1 ^{P, M}	Maint 3.6 ^{P, C, A}
g. I find it difficult to ask my friends to move to a quieter venue.	Pre 2.6 ^{C, A, M}	Cont 2.9 ^{P, M}	Action 2.9 ^{P, M}	Maint 3.4 ^{P, C, A}

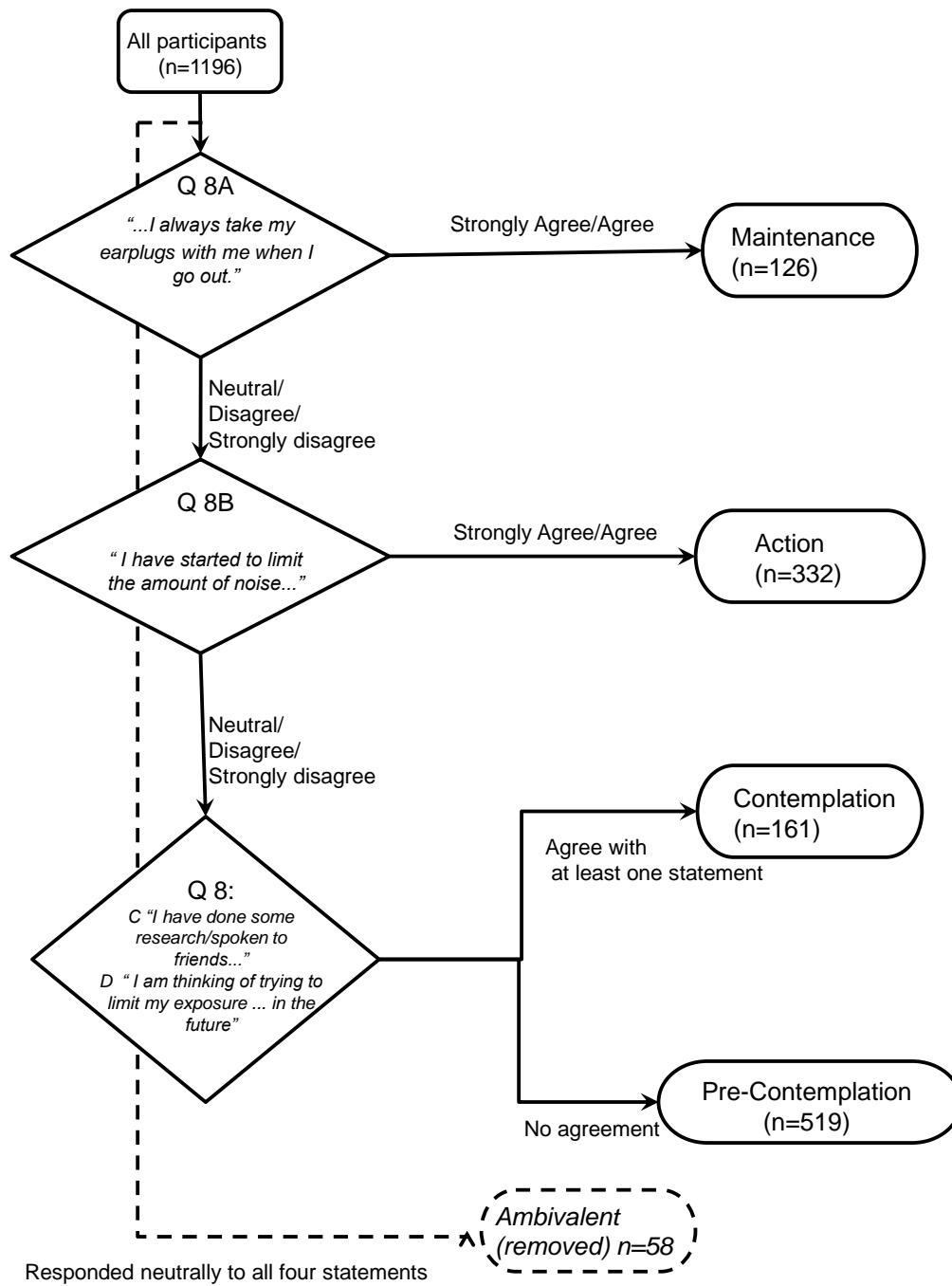


Figure 1. Classification of participants into groups

References

- Addison I. & Gilliver M. 2012. *Hear4Tomorrow: A school curriculum based hearing health programme*. Prepared for the Office of Hearing Services, Department of Health and Ageing, ACT.
- Australian Hearing. 2010. *Binge Listening: Is exposure to leisure noise causing hearing loss in young Australians?* Australian Hearing, Sydney; 2010
- Beach E.F. 2013. Everyone likes it loud, don't they? *ENT Audiol News*, 22, 89–90.
- Beach E.F., Gilliver M. & Williams W. 2013a. Leisure noise exposure: Participation trends, symptoms of hearing damage, and perception of risk. *Int J Audiol*, 52 , S20–5.
- Beach E.F., Williams W, & Gilliver M. 2013b. Estimating young Australian adults' risk of hearing damage from selected leisure activities. *Ear Hear*, 34, 75–82.
- Bogoch I.I., House R.A. & Kudla I. 2005. Perceptions about hearing protection and noise-induced hearing loss of attendees of rock concerts. *Can J Public Heal Rev. Can. santé publique*, 96, 69–72
- Bohlin M., Sorbring E., Widén S. & Erlandsson S. 2011. Risks and music - Patterns among young women and men in Sweden. *Noise Heal*, 13, 310–319.
- Carter L.F., Williams W., Black D. & Bundy A. 2014. The leisure-noise dilemma : hearing loss or hearsay? What does the literature tell us? *Ear Hear*, 35, 491-505
- Chung J.H., Des Roches C.M., Meunier J. & Eavey R.D. 2005. Evaluation of noise-induced hearing loss in young people using a web-based survey technique. *Pediatrics*, 115, 861–867.
- Gilles A., Van Hal G., De Ridder D., Wouters K. & Van de Heyning P. 2013. Epidemiology of noise-induced tinnitus and the attitudes and beliefs towards noise and hearing protection in adolescents. *PLoS One*, 8, e70297.
- Gilliver M., Beach E.F. & Williams W. 2013. Noise with attitude: Influences on young people's decisions to protect their hearing. *Int J Audiol*, 52, S1, S26–32.
- Gilliver M., Carter L., Macoun D., Rosen J. & Williams W. 2012. Music to whose ears? The effect of social norms on young people's risk perceptions of hearing damage resulting from their music listening behavior. *Noise Health*, 14, 47–51.
- (2015) *International Journal of Audiology*, 54(4), 211–219.
- Gilliver M., Williams W. & Beach E.F. 2014. Noise exposure in the balance: Managing occupational and leisure risks to hearing health. *J Heal Saf Enviro.*, 30, 203-208.
- Holmes, A. E., Widen, S. E., Erlandsson, S., Carver, C. L., & White, L. L. 2007.

Perceived hearing status and attitudes towards noise in young adults. *Am J Audiol*, 16, s182–s189.

Janz N.K., & Becker M.H. 1984. The Health Belief Model: A decade later. *Health Educ Q*, 11, 1–47.

Johnson O., Andrew B., Walker D., Morgan S. & Aldren A. 2014. British university students' attitudes towards noise-induced hearing loss caused by nightclub attendance. *J Laryngol Otol*, 128, 29–34.

Juniper K.C., Oman R.F., Hamm R.M. & Kerby D.S. 2004. The Relationships Among Constructs in the Health Belief Model and the Transtheoretical Model Among African-American College Women for Physical Activity. *Am J Heal Promot*, 18, 354–357.

Martens M.P., Page J.C., Mowry E.S., Damann K.M., Taylor K.K., et al. 2006. Differences between actual and perceived student norms: an examination of alcohol use, drug use, and sexual behavior. *J Am Coll Health*, 54, 295–300.

Prochaska J.O., Redding C.A., Harlow L.L., Rossi J.S. & Velicer W.F. 1994a. The Transtheoretical Model of Change and HIV Prevention: A Review. *Heal Educ Behav*, 214, 471–486.

Prochaska J.O. & Velicer W. 1997. The transtheoretical model of health behavior change. *Am J Heal Promot*, 12, 38–48.

Prochaska, J.O., Velicer, W. F., Rossi, J. S., Goldstein, M. G., Marcus, B. H. 1994b. Stages of change and decisional balance for 12 problem behaviors. *Health Psychol*, 13, 39–46.

Rhodes S.D. & Hergenrather, K.C. 2003. Using an integrated approach to understand vaccination behavior among young men who have sex with men: stages of change, the health belief model, and self-efficacy. *J Community Health*, 28, 347–62.

Rosenstock I.M. 1974. Historical origins of the health belief model. *Health Educ Monogr*, 2, 328–335.

Schultz P.W., Nolan J.M., Cialdini R.B., Goldstein N.J. & Griskevicius V. 2007. The Constructive, Destructive, and Reconstructive Power of Social Norms. *Psychol Sci*, 18, 429–434.

Smith P.A., Davis A., Ferguson M. & Lutman M.E. 2000. The prevalence and type of social noise exposure in young adults in England. *Noise Heal*, 6, 41–56.

Sobel J. & Meikle M. 2008. Applying Health Behavior Theory to Hearing-Conservation Interventions. *Semin Hear*, 29, 081–089.

- Strecher V., Wang C., Derry H., Wildenhaus K. & Johnson, C. 2002. Tailored interventions for multiple risk behaviors. *Health Educ Res*, 17, 619–26.
- Vogel, I., Brug, J., Van der Ploeg, C. P. B., & Raat, H. 2010. Discotheques and the risk of hearing loss among youth: risky listening behavior and its psychosocial correlates. *Health Educ Res*, 25, 737–747.
- Widen, S. E., Holmes, A. E., Johnson, T., Bohlin, M., & Erlandsson, S. I. 2009. Hearing, use of hearing protection, and attitudes towards noise among young American adults. *Int J Audiol*, 48(8), 537–545.
- Williams W., Beach E.F. & Gilliver M. 2010. Clubbing: The cumulative effect of noise exposure from attendance at dance clubs and night clubs on whole-of-life noise exposure. *Noise Heal*, 12, 155–158.