

# Carpentry Apprentices, Work and Noise

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## Abstract:

Noise-induced hearing loss (NIHL) continues to be a major problem for those employed in the construction industry. Hearing loss has been associated with a range of physical and mental health issues, as well as lowered job satisfaction. The purpose of this study, based in Victoria, Australia, was to examine how carpentry apprentices who work in the construction sector understand their risks at work, with a special focus on noise. The employment preparation process for new workers, including how health and safety messages are delivered and understood by these workers was also examined from the instructors' perspective. Based on data collected from focus groups the research team identified a number of ways to increase apprentice awareness of noise as a hazard and potentially influence noise reduction strategies and use of PPE. These suggestions include informing employers about their responsibilities under the Occupational Health & Safety Act, enforcing induction/training on domestic sites, the provision of safety equipment in the workplace, increased education about ratings of hearing protection and the delivery of safety messages about noise/hearing loss through peers. Audiometric tests at the training college would provide information to apprentices about their level of hearing and could also be ideal opportunities to deliver information about noise at work to apprentices.

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## Introduction

Noise-induced hearing loss (NIHL) continues to be a major problem for those employed in the construction industry and work-related NIHL is among the most common occupational diseases (Timmins & Granger, 2010). The rate of workers' compensation claims for NIHL in Victoria, Australia increased by 50% between 1995 and 2008 (Radi et al., 2014). The highest claim industries were construction and manufacturing, with the construction industry and trades constituting about 40% of claims. These changes in claim rates may be due to a number of factors including greater exposure; increases to awareness and reporting; and a growth in small business employment.

Besides hearing loss, exposure to loud, persistent noise has been linked to the development of Tinnitus (Axelsson & Prasher, 2000) and is also associated with a range of mental health issues and lowered job satisfaction (Timmins & Granger, 2010). Both occupational noise exposure and hearing impairment can increase the probability of other work-related injuries (Moll van Charante & Mulder, 1990). This means that reducing noise exposure and hearing loss can help contribute to the reduction of other work injuries. There are a number approaches to reducing noise exposure but research has indicated a heavy reliance on personal protective equipment (PPE). Unfortunately, a recent Cochrane review found that there is very low quality evidence that the better use of hearing protection devices as part of Hearing Loss Protection Programs reduces the risk of hearing loss (Verbeek et al., 2012).

In this manuscript we examine the experiences and perceptions of a group of carpentry apprentices in Melbourne, Australia who were in the early stages of their career and training. We focus specifically on the issue of noise at work, apprentices' perceptions of noise as a hazard and their views toward noise control and hearing

protection at work. We end with a discussion about steps that can be taken by institutions training apprentices, health and safety authorities, employers and workers' themselves to help prevent NIHL.

### **Noise & Hearing Loss in Construction**

The Construction industry is a major employer in Australia. In 2011-12 over 9% of the Australian workforce worked in construction. Building and construction is also one of the most important small business sectors; ninety-five percent of all businesses in the building and construction industry employ fewer than five people, while less than one per cent employ 20 or more (Master Builders Australia, 2014).

The building and construction industry is Australia's largest employer of trade apprentices. Apprenticeships remain the main entry point into the industry for people wanting to progress to be qualified trades workers, trade subcontractors, licensed builders or other industry professionals (Master Builders Australia, 2014).

In Australia, qualification as a carpenter within the building/construction industry is achieved through completion of a nationally recognised apprenticeship, which combines onsite work experience with formal education in the form of an accredited Certificate III in Carpentry (Master Builders Australia, 2014). In the state of Victoria, the program is offered by several Technical and Further Education (TAFE) Colleges. Each college has a similar course structure and outline.

An apprenticeship is generally 4 years in length, with schooling taking place part-time, typically within the first 2-3 years, either as "block training", with eight one-week blocks of classes or a similar part-time arrangement. The units within the course cover practical and theoretical components of tool use, planning in construction, reading plans, safe work practises and Occupational Health & Safety (OHS) requirements in construction. The program may be preceded by the Certificate II in Carpentry commonly known as a "pre-apprenticeship". This is a short introductory program, (delivered as a six month full time or two years part time program) typically offered to senior secondary school students. The completion of the program decreases the length of time required to complete the Certificate III apprenticeship (Master Builders Australia, 2014).

Apprentice carpenters are employed in the residential, industrial and commercial sectors of the building industry and have the same rights and responsibilities as other workers. Typically, apprentices find employment with one company and are contracted to the same employer for the duration of their apprenticeship, however, it is not uncommon for apprentices to change employers during their apprenticeship.

The construction industry is commonly classified as having highly variable and complex noise exposures, even within the same trade, role or job title (Neitzel et al., 2009; Neitzel et al., 2008). Workers are often exposed to high levels of noise that varies based on the stage of construction, job title and task (Neitzel et al., 2009; Neitzel et al., 2008; Leensen et al., 2011). Noise dosimetry is commonly used to assess 8 hour Time Weighted Average (TWA) exposure levels. The noise exposure standard is  $85\text{dB(A)}L_{\text{Aeq},8\text{h}}$  while the recommended noise exposure level is below  $80\text{dB(A)}$  (Suter, 2002; Edelson et al., 2009). Many studies have shown workers in the construction industry commonly exceed this level (see for example Kerr et al., 2002). As a result, the high prevalence of NIHL among construction workers is not surprising.

Several studies have noted that within the construction industry there is a heavy reliance on PPE (e.g. ear muffs) to decrease noise exposure rather than implementing noise controls that do not depend on individual worker behaviour or workers' access to equipment. Reliance on PPE may be due to the mobile and variable nature of the industry and the relatively low cost of PPE (Neitzel et al., 2008; Suter, 2002; Neitzel & Seixas, 2005). Reliance on PPE to reduce noise exposure comes with a number of shortcomings. Some studies have found that use of hearing protection devices among construction workers is low and imperfect. Seixas (2012) found that workers who self-reported always using hearing protection in high noise environment actually only used hearing protection one third of the time that noise levels exceeded  $85\text{dB(A)}$ . Similarly, El Dib (2012) found that even on construction sites where noise levels were assessed as being well above the level at which hearing protection devices are required, usage was low. Neitzel et al. (2009) compared construction worksites, where noise was variable, to other workplaces where noise was continuous (for example, warehouses) and found that variation in noise exposure was associated with a lower use of PPE, even in circumstances where the mean noise exposure was high ( $90.6\text{dB(A)}$ ). Other studies have found that perceived discomfort, inconvenience and interference with communication negatively influence the use of PPE (Stephenson et al., 2011). Some research has also indicated that workplace culture and relationships among workers can influence decisions about the use of PPE (Robertson et al., 2007).

The perception of noise in the workplace and subjective assessment of risk of hearing loss is an essential issue in the design and implementation of hearing conservation programs (Arezes & Miguel, 2005). Several studies have shown that NIHL starts early in the career for construction workers (Seixas et al., 2012), which is why it is

important that young and new workers understand how noise can affect their hearing and what can be done to prevent life-long consequences.

Our study investigated construction apprentices' perceptions of noise at work and how the hazard of noise was dealt with at their worksites. Our aim was to understand their perceptions of risk with regards to hearing loss, their views about noise exposure control and their knowledge about and self-reported use of hearing protection. We also wanted to investigate the role that training colleges have or could have in providing apprentices with information and resources that might lead to better protection of hearing.

## Methods

The research focussed on carpentry apprentices enrolled at a TAFE college in Melbourne, Australia. The apprentices were working in either the domestic or commercial construction sectors. Commercial sector companies are typically large, unionised organisations involved in large projects such as hospitals, shopping malls, etc. Domestic sector companies tend to be smaller. They are not unionised and the work involves smaller building projects such as private residences, and renovations. Apprentices participating in the study had been employed for at least one year and were attending the college. Details about the apprentice sample can be found in table one.

Fifty-one (51) people were recruited to participate in nine (9) focus groups. Participants self-nominated following presentations by the researchers to classes at the college. Focus groups were conducted at the TAFE college during lunch breaks

The first focus group comprised instructors at the college and the other eight focus groups were with apprentices in the carpentry program. The instructor focus group explored apprenticeship pathways and training programs at the college and enabled the development of the questions used in the subsequent apprentice focus groups. Sampling and the questions posed in the apprentice focus groups were, in part, guided by emergent findings. For example, the first apprentice focus group included carpenters employed by domestic and commercial firms but later we conducted separate focus group with those in domestic and commercial sectors to tease out some of the differences between these groups of workers. Similarly, based on discussions in the first focus groups, we included specific questions about audiometry ("hearing tests") in the last two focus groups.

**TABLE 1: DEMOGRAPHICS OF APPRENTICES**

	Apprentice age group		Total
	18-24 (n=32)	25-38 (n=12)	
Level			
1st year	14	8	22
2nd year	11	2	13
3rd year	7	2	9
Total	32	12	44
Sector			
Domestic	25	7	32
Commercial	1	3	4
Domestic/commercial	6	2	8
Total	32	12	44
Number of different employers during apprenticeship			
0 employers*	1	0	1
1 employer	23	9	32
2 employers	5	1	6
3 employers	0	1	1
4 employers	0	1	1
Total	29**	12	41

\* One apprentice had been laid off

\*\*Three apprentices did not report number of employers.

Each focus group was facilitated by two researchers. One researcher led the group discussion based on a set of open-ended questions about work, training at the college and in the workplace, attitudes toward noise, hearing protection and noise control and exposure reduction. The second researcher took notes and asked follow up questions where necessary. The focus group discussions were audio-taped and subsequently transcribed. Participants received a \$20 gift voucher at the conclusion of the focus group.

Field notes were transcribed and entered into Nvivo10, a program for the management of qualitative data. Transcripts were reviewed and a preliminary list of codes was developed and then refined through discussions with the research team. An initial selection of transcripts was independently coded by all members of the research team to ensure the codes were being used correctly and consistently. Then, each subsequent transcript was coded by two researchers. Once the coding was complete, a thematic analysis was done for each code to identify key themes, contradictions and similarities/differences in the data and between focus groups. The thematic analysis of the data, along with the field notes forms the basis of our findings.

The project was approved by the Human Research Ethics Committees of Monash University and the college.

## Findings

Apprentices reported working at a variety of different worksites and carrying out a wide range of tasks. They described many differences between work on domestic and commercial sites. Those working in the domestic sector reported working on individual house builds or multiple dwellings on the same estate. Work involved building a house from the ground up or undertaking renovation work within an existing dwelling. Early stages of building (such as framing) involved working outdoors, while renovations tended to be indoor work. Domestic sector jobs were usually short – lasting only a few weeks or months. Those working within the commercial sector reported working in office buildings, shopping centres, factories or on public buildings such as swimming pools or community centres. Commercial work tended to take place indoors. Commercial apprentices could expect to work at the same site for many months or sometimes years. Those in the commercial sector reported working in large teams, whose members were constantly changing with the needs of the job. In the domestic sector, work teams were much smaller, often only two or three workers and they typically stayed together for the duration of the project. Some domestic sector apprentices reported working alone for extended periods.

Apprentices in both sectors reported working with a large range of power tools including routers, planers, drop saws, grinders, nail guns, drills and jack hammers. They described doing many different types of tasks such as framing, roofing, decking, cutting timber and steel, grinding, constructing form work for concrete, pouring concrete and fixing internal features (e.g. coving/mouldings, skirtings/baseboards etc). Those in the commercial sector said they tended to do work that involved “a lot of steel and minimal timber” (FG#4). Working with metal was viewed as being particularly noisy:

*“Using power actuated tools, they’re very harsh on the ears, especially, like, [working on] schools and stuff. It’s mainly steel frames, so a lot of your work is getting nailed straight into the steel so you have to wear ear protection and stuff and even with that you still hear it”* (commercial sector apprentice; FG#5).

Commercial sector work tended to be more repetitive, where an apprentice or qualified carpenter might work just on one single type of task throughout the whole build. One commercial sector apprentice said “all he ever did was form work” (FG#5), and another said he knew of “some guys who were solely doing skirting for three years” (FG#4). This differed from the domestic sector, where there was greater day-to-day variety in the tasks. Domestic apprentices said that they “did everything” except work they were not legally licensed to do (FG#7), for example, electrical work.

## Education and Training

Instructors and apprentices were asked about the education and training provided by the college, particularly related to OHS and noise. Curriculum materials related to OHS provided by TAFE college staff were also reviewed. Instructors noted that it was difficult to get apprentices interested and engaged in OHS and this was a barrier to teaching:

*“I know that I’ve had a couple of groups, the last couple of weeks, and just trying to keep them interested in that two or three days when you run through the OHS, it’s pretty hard work.”* (FG#1)

One way that instructors attempted to overcome this problem and attract the attention of apprentices was to personalise health and safety messages, for example, not relying on statistics but rather inviting an apprentice who had previously suffered a work injury to present OHS information. A number of apprentices mentioned that information presented in this manner resonated with them. Instructors reported that they discussed noise and hearing with apprentices because they themselves suffered from NIHL.

Both instructors and apprentices said that while a health and safety course was part of the pre-apprenticeship program, OHS information was integrated throughout the training in a “hands on” manner. This involved showing the apprentices how to correctly undertake a task, reminding them to wear safety equipment and talking to them about tool use. Most apprentices working in the domestic sector said that this was the only formal training they received.

The TAFE college safety curriculum reviewed at the time of the study was mainly focussed on acute hazards (e.g. falls risk associated with working at heights, structural collapse etc). Health consequences of long-term exposures to hazards such as crystalline silica and solar radiation were mentioned but were not the main focus of the curriculum.

Protecting oneself from hazards was often discussed in the apprentice training materials, with a specific reference to use of personal protective equipment (PPE). A review of the safety training materials revealed an underlying assumption that responsibility with regard to PPE seemed to lie mainly with employees. Statements found in the training materials such as “you should always wear PPE and clothing that has been given to you” and “you should check with your supervisor or other industry person or authority to make sure that you know what you need to have to be able to carry out your work” underscore this approach.

A brief section on noise was included in the training, under the broader topic of risk management. It included an overview of the types of noise exposures that are harmful, when to wear hearing protection, appropriate types of hearing protection and duration of exposure to reach the maximum acceptable daily dose. While the training directed apprentices to use hearing and eye protection with all power tools, this statement was only reiterated under some of the power tool summaries (reciprocating saw, explosives, power tools etc). There was limited information about the type of hearing protection to be used with each type of power tool. From the focus groups, it emerged that apprentices had very little knowledge about different types of hearing protection or noise exposure (for example, when it was acceptable to use ear plugs versus ear muffs and the different levels of protection offered by both). Little information was provided in the training materials about noise elimination, engineering or administrative controls.

The health consequences (e.g potential hearing loss) of not wearing hearing protection were also not addressed in the curriculum reviewed, nor was there any information about claiming workers’ compensation in the event of work-related hearing loss.

Many participants reported that apprentices who worked in the commercial sector received extensive on-site OHS training on safe tool use, injury reporting procedures and general worksite safety. Most commercial workplaces were unionised and apprentices reported that workplace safety representatives enforced compliance with safety regulations and site rules. Those who worked in the domestic sector said they rarely received any on-site safety training or general site induction. Further, the approach to compliance and safety rules was described as quite *laissez-faire*:

*“[No training], that’s pretty much every site for me. There’s never been an induction or anything. We just go there, do what we got to do and go home.” (FG#2)*

*“On a domestic site some guy will look at you and go, ‘Do you feel safe doing that?’ And if you nod your head he’ll go, ‘Yeah, carry on’. Rather than, ‘No, you need a safety harness; put it on’ “(FG#3)*

*“...At the end of the day it’s all on you. If you don’t want to wear safety glasses, you don’t wear safety glasses. If you don’t want to wear earplugs, you don’t wear earplugs; it’s up to you at the end of the day. I’ve seen guys cut concrete with nothing on their face ...that’s just shooting out concrete everywhere.” (FG #4)*

In a few instances, apprentices working on domestic sites said that older carpenters or their employer would show them how to do a task or give them eye or ear protection to wear. However, a vast majority of domestic sector apprentices noted that they received no formal safety education in the workplace and often their employer was not present on the job site to provide them with even informal guidance.

A number of apprentices, in both sectors, viewed OHS training with some scepticism, wondering if the training was there to protect the employer from litigation or the client from property damage rather than to protect the apprentice from injury.

*Participant 5: “There are probably walks onsite and we’ve got to sign in where we work. And on that it says – it’s got a list of the daily activities - everything that’s happening and then it goes: safety equipment, hearing protection must be worn when using such and such – danger – so it’s all covered in there. And then everyone to actually start working onsite has to sign in. So, if something does happen to them, through, say hearing protection, or they haven’t been wearing glasses, we’re all covered completely...”*

*Participant 3: It’s not you being covered; it’s their company being covered.*

*Participant 5: It’s the company saying “we’ve warned them”.*

## Hazards at work

During the focus groups participants were asked to discuss the types of hazards they encountered in the course of their jobs. The hazards most often mentioned were those that could lead to acute and potentially career-ending injuries such as a loss of a limb, spinal cord injury or blindness. Generally, focus group participants said they did not spend a great deal of time worrying about what could cause them harm at work. Many noted that hazards could be found everywhere and it was best to simply focus on the job at hand:

*“You try not to think about that stuff. You just try and concentrate on what you got to do, otherwise you’d be worrying too much all day” (FG#5)*

Participants were asked how hazards were avoided in the course of their job and what helped them stay safe at work. Apprentices tended to emphasize using “common sense”, doing only what felt safe and stopping a task when they felt physical pain. Their navigation of the workplace and safety behaviour seemed to be based on learning from mistakes and changing behaviour based on previous negative events (e.g. an accident or near miss). Apprentices also said they sometimes considered possible outcomes when doing a task. The perceived seriousness of a hazard, judged by the severity of a possible outcome, seemed to dictate behaviour to a certain extent. For example, one participant described cutting metal without eye protection; a shard of steel became lodged in his eye resulting in attendance at hospital and time off while he recovered. This incident changed both his and his employer’s behaviour. The worker said that after the accident he was fastidious about using eye protection, knowing that cutting without eye protection could lead to serious injury and possibly end his career as a carpenter. After the accident his employer also became insistent that he use safety equipment while cutting wood or steel. The participant felt that one reason for this was that the employer’s insurance premium increased after the accident.

## Noise at work

As with some of the other hazards on the job, noise was viewed as being ubiquitous, constant and a normal part of work. Apprentices identified many sources of noise, with power tools, machinery and trucks being the most common. Many noted that high noise levels were associated with working in enclosed spaces and working alongside others:

*“All the machinery, the power tools, all the trucks that come past: the concrete trucks, the delivery trucks. Yeah, all around you is noise 24/7” (FG4).*

*“You have up to 100 people on the floor and you’ve got the plant moving around, all the bells and whistles going from that. You’ve got Ramset guns, the plasterers cutting...the drop cut offs, which is unbearable. And you’re cutting aluminium, then you’ve got a concrete pump running next to it.” (FG8)*

The majority of focus group participants reported experiencing temporary ringing in the ears, with a smaller number reporting persistent ringing and headaches they attributed to noise:

*“Occasionally I have ringing of the ears. It tends to go normally on the weekend when you haven’t heard it [noise] in a couple of days” (FG#5).*

*“I had ringing noises. If it’s like dead quiet, I just hear ringing, no good with that - turn the telly up louder! ([Laughs])” (FG#3).*

*“I think your first year, or first couple of weeks you get home and your ears might be ringing a bit just because you’re not used to it. I don’t think about it anymore though” (FG#8).*

Despite the ubiquity of noise and the ringing in the ears that was reported, noise at work was viewed with a degree of complacency.

*“You kind of get used to it, you stop noticing it. It just gets normal.” (FG#5)*

*“Mine have rung for days, but I had the mentality that it’s what I signed up for. So I just cop it.” (FG#6)*

*“There’s no way around it. The job requires you to make lots of noise, like, there’s no part of the job that doesn’t make noise. There’s nothing [that can be done]. I can’t think of one thing” (FG#8).*

## Noise reduction at work

Focus group participants were asked to consider how their work might be made less noisy but, as indicated above, there was a general feeling that little could be done. Participants identified a number of barriers to reducing noise. First, noise was viewed as largely out of their control. So while some said they would alert other workers before starting a noisy task or try to move themselves away from other workers, often other noise-reduction solutions, such as moving machinery or isolating groups of workers were seen as being up to the employer. Apprentices felt that noise reduction was not always a priority for employers and some believed that employers were unaware of noise levels on the worksite because:

*“they’re literally running from site-to-site...they might not get a sense of how much noise there is” (FG#2).*

Second, noise reduction strategies such as purchasing newer and better quality (quieter) tools, reconfiguring the worksite to make it quieter or using quieter materials often resulted in higher costs. Apprentices felt that employers working in a competitive market were not eager to bare these costs. Third, some participants believed that the distal consequences of hearing loss were a disincentive to noise reduction at work. One participant from the instructor focus group noted the following:

*“With hearing, employers almost have the opinion of ‘oh he’ll be gone out of the work, I don’t have to worry about him, we’re not going to pay any fines for him’” (FG1)*

According to some participants, even employers who were concerned about health and safety tended to focus on acute and significant risks that could have immediate consequences on their insurance premiums.

Finally, many apprentices did not think that the type of work they did was easily amenable to changes that would help reduce noise. Many tasks, such as digging or fixing mouldings had to be done in a specified spot and could not be relocated to avoid noise exposure. Similarly, moving workers was not viewed as a feasible means to manage noise exposure given the production and time pressures of construction work.

### **Hearing protection**

Typically when the issue of noise and its impact on hearing was discussed, apprentices focused almost entirely on hearing protection (as opposed to noise reduction). Most apprentices reported using hearing protection at least in some instances at work. However, use was not consistent and the type of protection was varied. The type of hearing protection apprentices used depended on a number of factors. Not surprisingly, convenience was often mentioned. Apprentices were more likely to use hearing protection that was nearby and easily accessible.

*“Having those banded earplugs with you, it takes no time to put them in, take them out....if it was a matter of having to go and look for your earmuffs every time there was noise then there would be times when you wouldn’t bother.” (FG#6)*

Apprentices discussed getting into the habit of wearing hearing protection – bringing it to work, taking it out of their car and having it on their body ready for use. These sorts of practices reinforced and normalized hearing protection use, at least in certain circumstances. Most apprentices noted that they wore hearing protection only when working with tools or doing jobs that produced intense noise, for example jack hammering, working near an air compressor or cutting steel.

Workplace factors also had an impact on the use of hearing protection. In workplaces where there was direct enforcement of hearing protection use – for example, a safety representative or an employer who insisted workers wear hearing protection – apprentices reported using hearing protection consistently. Seeing that co-workers wore hearing protection also seemed to have an impact on some apprentices, as one participant described below:

*“I started seeing the other boys wearing them, over stupid little things, and then I thought ‘I might as well put the show up’, and your day goes so much smoother because it’s quieter and it seems more laidback...so less stress.”(FG#7)*

Hearing personal stories of hearing loss and tinnitus also had an effect on apprentices. A number of the apprentices described witnessing firsthand how hearing loss affected their teachers and, in some instances, employers. Those apprentices who described learning about the psychological effects of tinnitus from older carpenters often said that this glimpse into the potential effects of hearing loss made them more likely to wear hearing protection consistently:

*“Some of them can’t hear properly. I think ‘I don’t want to be like them’ All the teachers say...’Wear your earmuffs because you get tinnitus’ It’s always in the back of your mind. So that influences your decision to put them on. You don’t want to become like them.” (FG#7)*

A similar perspective was offered by an instructor:

*“The thing that triggers me to wear ear protection was I met a guy and he said, ‘I’ve got tinnitus.’ He aged about 10 years in 6 months...it really affected him psychologically and I thought, crikey, I better put them on.” (FG#1)*

### **Barriers to hearing protection use**

The focus group discussions revealed a number of barriers to using hearing protection. One raised consistently by apprentices was the view that wearing hearing protection decreased their ability to communicate on the worksite. Communication was vital to their safety and the safety of others. Further, as new workers, apprentices had to be able to hear instructions from their employer – this was both a safety and job performance issue:

*“You sort of just need to be alert all the time because even if there’s no dangers around, you might have a delivery coming or something and your boss will shout at you to come and unpack it...so if you don’t hear him he won’t be too happy with you.” (FG#9)*

*“If you don’t have earmuffs or glasses and your boss wants something cut or something done really fast, you don’t want to go out of your way to your car and go get it” (FG#6)*

Many apprentices noted that if they were doing a quick but noisy job, they typically would not bother with hearing protection. For some, the perceived risk of hearing loss was not sufficiently great to outweigh the inconvenience associated with hearing protection use. The effects of NIHL seemed distant and intangible to some and the effort of wearing hearing protection “not worth it” (FG#3).

*“It’s not happening to you now...it’s 6:30 in the morning, like, I can’t be bothered [to bring ear muffs]...that’s pretty much it.” (FG#8)*

Peer influence also led to some apprentices not using hearing protection. When no one used hearing protection, it was sometimes difficult for new workers to go out on their own and wear it. Several participants argued that the wearing of protective equipment is seen to signify “weakness”:

*Participant 3: “There’s a bit of a cultural thing, that it’s sort of gung-ho, that you don’t get too worked up about being really fastidious about your hearing, and if you haven’t got your earmuffs, don’t worry...”*

*Participant 2: “I still think it’s un-cool on a building site...it’s seen as a weakness.” (FG#1)*

Finally, having ready access to hearing protection seemed to influence its use. With a few exceptions, domestic sector apprentices noted that deciding on types of hearing protection and purchasing it was up to them. Their employer did not provide PPE as part of the job. As such, it was up to the individual worker to decide what sort of protection was needed and purchase it. Apprentices noted that this period of their career (the apprenticeship) was one where they built up their tool kit and decisions about their PPE purchases had to be considered alongside other expenses. Since many apprentices did not have an in-depth knowledge of the sort of hearing protection they needed, cost often seemed to drive their purchasing decisions and they would buy “whatever’s cheap” (FG#9). Instructors also noted that if hearing protection was not supplied by the employer it would be unlikely that an apprentice would buy it due to the cost:

*“They’re expensive. You might have one out of 100 [apprentices] that would buy them. Because of the cost factor...” (FG#1)*

### **Hearing and hearing loss**

The focus groups concluded with a discussion about apprentices’ hearing. As discussed earlier, most apprentices did not worry a great deal about hearing loss, except perhaps when they experienced prolonged ringing in the ears or encountered another carpenter who had severe hearing loss or tinnitus. However, there was a lot of interest in getting audiometric tests. Most apprentices did not know whether they had suffered hearing loss already, although a number reported having to increase the volume on the television and having persistent ringing in the ears. Workers were keen to find out if their hearing was in fact being damaged and how it compared to the general population. Almost all apprentices responded positively when asked whether they would undergo an audiometric test if it were provided as part of the training program.

*Participant 5: “If you ladies came today and said ‘We’re offering a free hearing test’ I would go. No worries.”*

*Participant 3: “I would have gone.”*

*Participant 6: “You’d have a line I reckon. A line of chippies [carpenters] coming outside.” (FG#2)*

A number of participants noted that if an audiometric test demonstrated that their hearing was diminished, this would have an impact on their work practices and use of PPE:

*“If I knew I was going deaf I would definitely wear them – every day. But not seeing any effects or anything, or feeling it, then it doesn’t really come first thing to your mind.” (FG#8)*

*“If you knew you were going deaf, like losing your hearing, you’d probably start to think about it a lot more. You’d start putting [on] either earmuffs or plugs, or something like that.” (FG#9)*

### **Discussion**

Through focus groups, we examined the views and experiences of carpentry apprentices who were enrolled in a training program and also working in the construction sector. Our purpose was to understand how they viewed the hazards of their jobs, focussing specifically on the issue of noise.

#### **The risk of noise**

While noise was reported as being ubiquitous at work, many apprentices were more concerned about avoiding hazards that could lead to dramatic and career-ending injuries. Their general approach to risk management, including learning from past experience and near misses, weighing the potential seriousness of an outcome and using “common sense”, did not serve to protect them from noise in many instances. The outcome of noise

exposure, for example, seemed distant to many participants and its seriousness questionable. A few apprentices joked “Who will I want to hear when I’m 60!?” Further, “common sense” was not easily applied to preventing noise exposure. Apprentices themselves recognised that their assessment of noise levels was imperfect and many reported getting “used to noise” over time. It is important that apprentices learn about the consequences, both psychological and physical, of noise exposure and hearing loss. The training college, peers and older apprentices can be mobilised to teach apprentices about noise and hearing and provide concrete examples of how hearing loss affects quality of life. Audiometric tests can also be used to provide apprentices with benchmarks about changes in their hearing and to raise awareness about hearing loss.

### **Focus is on PPE, not noise reduction**

Very few apprentices had any knowledge about how noise could be reduced in the workplace and many felt that little could be done to make their work quieter. This may be due to their perception that, as workers, they have little control over high level controls, such as engineering or administrative measures. Further, it was reported that some employers did not view noise as a problem on the worksite, eschewing hearing protection even for themselves. Finally, given that workers reported the absence of even basic measures such as scaffolding when they were working at heights on some worksites, the view that their employer would not invest in quieter machinery or engineering processes, is understandable. The notion that PPE is the key way of preventing NIHL was also re-iterated implicitly in apprentice training at the college. As we noted above, many of the materials on the OHS curriculum we reviewed focussed on the use of PPE to protect oneself against injury or illness. Health and safety regulators should emphasise the hierarchy of controls when it comes to noise reduction and hearing protection, particularly when interacting with employers. Similarly, education programs should provide examples of what can be done to *reduce noise* in the workplace. Of note is the expressed interest of some participants in eventually starting their own businesses and the importance of the education of these individuals as potential employers.

### **Little understanding or training in choosing hearing protection**

Since PPE was viewed by participants as one of the only ways to prevent hearing loss, it is particularly troubling that apprentices knew very little about classes of hearing protection, how to choose hearing protection appropriate to specific tasks and how to fit hearing protection correctly. On domestic sites in particular, there seemed to be little formal oversight in terms of safety practices and little formal induction/training. As such, it is unlikely that workers were given instructions about how to use hearing protection correctly. Further, it was reported that many domestic-sector businesses did not provide PPE at all. Therefore, if workers chose to purchase PPE, they would be the ones who chose the quality and class of protection. It is important that training institutions and Health and Safety authorities provide clear guidance to these new workers so that cost and comfort are not the only drivers of purchasing decisions.

### **Differences in domestic and commercial sectors**

Our study highlighted major differences in the experiences of apprentices in the domestic and commercial sectors. Apprentices described how conditions of work, training practices and access to safety equipment differed in the two sectors. Those working in the commercial sector reported being exposed to more noise due to working with a large number of other tradespeople and in enclosed spaces. They tended to work doing the same task and with co-workers who changed frequently depending on the phase of the project. Formal training and safety protocols were in place and often enforced by a safety representative. In the domestic sector, work was more flexible with apprentices doing many different tasks and working with the same team of co-workers. These apprentices tended to learn “on the job” from more experienced carpenters but formal training was rarely provided in the workplace.

While the apprentices in our study working in the domestic and commercial sectors were all doing “carpentry work”, their specific tasks, the social relations of their work and the physical conditions of their job sites varied widely. It is important that hearing protection programs and policies be tailored to the realities of carpentry work in these different sectors.

### **OHS training at the college**

For the domestic apprentices in this study, the education and mentorship they received in school was often the last time they were given formal OHS training. Even commercial sector apprentices, many of whom received formal inductions at their job sites, reported having little knowledge about classes of hearing protection and NIHL. Significantly, apprentices in both groups were sceptical that training in the workplace was there to protect their health, viewing it rather as a mechanism for decreasing employer liability (i.e. protecting employers from costly

finer or insurance premium increases). The college, on the other hand was not viewed as being affiliated with the employer or as having other interests beyond training apprentices. Attendance at training being required for certification means that the college is well-positioned to deliver OHS training that will be viewed by apprentices as being done for the benefit of their well-being and not other motives. It is important for this training to be applicable to the types of worksites and conditions apprentices work in. As identified, the use of apprentices and other carpenters as conveyors of OHS information can make the training more engaging, relevant and memorable.

### **Little information about making a complaint or filing a claim**

Given that noise exposure is a common hazard in the construction industry and a number of studies have confirmed a high prevalence of NIHL among construction workers, it is concerning that apprentices had little information about what to do if they experienced NIHL. For example, we found little evidence that apprentices had clear information about how to file a workers' compensation claim. While one training presentation reviewed had an example of an incident report form, there was no information about how a worker with a gradual-onset work-related illness (such as hearing loss) should proceed. Workers also did not seem to have information about steps they could take if their employer was engaging in practices that contravened the Health and Safety Act. In Victoria, Australia, employers are required to make sure "workers have adequate information, instruction, training and supervision to work in a safe and healthy manner" and "adequately monitor workers' health (such as providing hearing tests for workers exposed to high noise levels)" (*Occupational Health and Safety Act 2004*). While apprentices reported a lack of training (in the domestic sector) and health surveillance, it did not appear that they understood that this was a duty of their employer (and their right as a worker). It is important that new and young workers in particular receive comprehensive information about their OHS rights and responsibilities and that of their employers. Workers should also know what to do in the event of a work-related injury or illness.

### **Audiometric tests**

Possibly due to the ubiquity of noise, apprentices were very interested in getting an audiometric test, especially if it was free and done as part of their apprenticeship program. A number of studies with construction workers have indicated that measurable levels of hearing loss can occur after just a few years of exposure. Audiometric tests at the beginning and toward the end of the apprenticeship program could provide apprentices with some indication of hearing threshold level increases. Even a one-time test could provide apprentices with an indication how their hearing compares to the general population. Importantly, providing tests at the college would be an opportunity to provide apprentices with information about hearing loss and hearing conservation.

### **Strengths and limitations**

This was a small study involving one group of instructors and apprentices at a single college in the state of Victoria (Australia). It is possible that different colleges customize their courses to include different information about noise reduction and hearing loss prevention. A qualitative approach was well-suited for this study since our aim was to understand participants' experiences, beliefs and practices. Through this approach, the researchers were able to probe the motivations, intentions and logic of participants in a way that would not have been possible through closed-ended survey questions. However, there are certain questions that qualitative studies cannot answer. For example, we cannot speak to rates of PPE use or incidence of NIHL. It is also important to note that we tried to engage female carpenters in our focus groups but were unsuccessful. Gender plays a role in shaping the types of jobs workers do (even within a single trade), as well as, disease prevention activities (Messing et al., 1995). It is important that future studies on NIHL include women.

### **Conclusion**

Our study provides insight into the work done by carpentry apprentices and how they view risk in their jobs. The ubiquity of noise and a focus on hazards that can cause career ending injuries means that noise is not always taken seriously by these workers. The findings in this study suggest that construction apprentices require more opportunities to learn about hazards, such as noise, that may have long-term, non-immediate health consequences. The importance of hearing conservation should be reinforced through several avenues such as during apprentice training, at work, via regulation and through health promotion messages. A focus on the correct use of hearing protection must be accompanied by information about strategies to decrease noise in the workplace.

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