

# ***Shhh hearing in a farming environment***



**Prepared for the Department of Health and Ageing**  
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## PREFACE

### *Chief Investigator Clinical Associate Professor Susan Brumby*

CIA Susan Brumby has conducted research in the area of farmer health, (physical, mental health and safety practices) from a broad range of agricultural industries and communities across Australia since 2003. She is the founding Director for the National Centre for Farmer Health, and is based in Hamilton, Australia. The Centre provides leadership to improve the health, wellbeing and safety of farmers, farm workers and their families across Australia.

Susan has experience in both rural and metropolitan health care and health management at an executive level. With her background as a health professional working in rural and regional Australia and being actively involved in agriculture (running the family beef and wool property for twelve years), she blends both a theoretical and practical understanding of agriculture, health, management and rural communities. Her doctoral thesis was on Farm Work and Family Health: A Study on Farming Family Health across selected Agricultural Industries in Australia and in particular engagement with farming families. This experience has been used extensively in this research.

She has been recognised for her contribution to rural health, awarded a travelling fellowship in 2006 and an overseas study program in 2013 to examine farmer health. A graduate of the Australian Rural Leadership program, Susan has presented and published nationally and internationally.

### *Chief Investigator Dr Anthony Hogan*

Two key themes underpin CIA Hogan's track record, the interface of hearing loss management and prevention services and the translation of research in policy. This work commenced at the Hearing Rehabilitation, Research and Resource Centre at the University of Sydney where CIA Hogan and audiologist Glenn Munnerley piloted an integrated intervention focused on engaging workers with hearing loss, exposed to noise hazards, in noise prevention programs. The work was centred on the insight that a fear of being stigmatised prevented people from taking effective action to manage their hearing loss and to prevent further hearing injury. CIA Hogan subsequently developed and adapted a group-based intervention, which enabled people to find legitimisation in their experience of having hearing loss and to take effective action to manage it. This has been used in this research through the Easier Listening program.

### *Chief Investigator Dr Warwick Williams*

Dr Williams has been involved with the area of noise and noise exposure since 1987 when he commenced work with the National Acoustic Laboratories. Prior to this position he worked in several areas as a research scientist and engineer. Typical work involved materials and testing laboratories, geophysical observatories (seismic, geomagnetic) and basic physics research (cosmic ray telescopes) in Australia and New Zealand, and for several winter seasons in Antarctica. He has been widely published and also active in working with farming communities to identify noise exposures and this expertise has been used in this research through the on- farm noise audit.

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### **Front cover photos:**

From left to right: Wondai QLD Workshop, Casterton Workshop, Livestock Exchange Hamilton, Vasey Farm

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## 1.0 SHHH HEARING IN A FARMING ENVIRONMENT

### 1.1 Background

Compared to their urban counterparts, members of Australian rural communities, particularly farm men and women, are more likely to experience a range of negative health outcomes (Rajkumar 2004, Access Economics 2006). These outcomes are exacerbated by the impact of drought, floods, access and climate change on farming activity. As farmers produce food and fibre for domestic and international consumption they also experience other health, wellbeing and safety challenges. These challenges include increased rates of suicide, workplace death and injuries, poorer health outcomes for lifestyle diseases and shortened life expectancies.

While some gains have been documented in health, wellbeing and safety domains, one area that remains a major problem for farm communities is hearing (prevention, access and treatment) and its associated problems. An estimated 4 million Australians have a form of hearing loss and are reluctant to seek or accept help for their hearing and listening problems. The literature shows that this reluctance is driven by a fear of stigmatisation and serves as a major barrier to the effective delivery of services. Farmers are a population group particularly at risk with two out of three affected by hearing loss (Lower T. Fragar L. Depczynski J. Challinor K. Mills J. Williams W 2010). This does not include the early hearing damage occurring to young farm family members. Additionally health professionals commonly lack the knowledge; confidence and the skills required to work with farmers, their hearing loss and the associated problems in their communities. Research undertaken by Brumby and Smith with rural health professionals discovered that they found interacting with farm men and women difficult and described working with farmers as trying to work with 'a lost tribe' (Brumby S and Smith 2009).

In 2010, following a successful application to the NHMRC the *Shhh hearing in a farming environment* program was commenced through a partnership with the National Centre for Farmer Health, Deakin University, University of Canberra and the National Acoustics Laboratories. This report is about helping these farm men and women prevent further hearing loss and empowering them to become astute and noise-conscious consumers. This story is not about the latest medical or audiological breakthrough. It is about what it is to be human and to hear. It contains lessons for us all (Brumby 2014).

### 1.2 Australian Agriculture

Farming enterprises share many similarities with small businesses. They are often family owned and operated, possess a small number of direct employees and involve long working hours. According to the National Farmers Federation (2012) over 95% of farm businesses were family owned or operated. Australian farm production is a key part of our nation's economy while globally it is the largest exporter of wool, (Department of Primary Industries 2012), second largest exporter of barley (Food and Agriculture Organization of the United Nations 2011), third largest exporter of dairy (Dairy Australia 2012) and beef (Meat and Livestock Australia 2014) and fourth largest for cotton (Cotton Australia 2012). Australia's farmers have been recognised as some of the most efficient agricultural producers in the world and in May 2013, the Commonwealth Government of Australia



launched the first National Food Plan (Department of Agriculture Fisheries and Forestry 2013) outlining its vision for Australian agriculture to feed the rising middle class of our northern neighbours.

Surprisingly, the number of farmers in Australia available to support this vision is few. In 2011–12, the ABS reported that approximately 335,000 people were directly employed in agriculture, forestry and fishing, representing less than three per cent of Australia's workforce (Australian Bureau of Statistics 2011). Of these 335,000 people only 121,000 reported agriculture as their main business activity (Australian Bureau of Statistics 2012).

### **1.3 Health, wellbeing and safety**

Those employed in farming are typically shown as being a male, ageing population who work long, hard and irregular hours, often on their own (Australian Bureau of Statistics 2012). However, farmers are more than just an occupational group. Australian farms frequently feature co-located living arrangements, an extended family work force, and unique patriarchal family and social structures (Alston 1986). While women represent less than 25% of full time occupational farmers (Australian Bureau of Statistics 2012), they contribute significantly through support roles both on and off the farm. In some ways this leaves them exposed to insidious harm through irregular assistance, the use of equipment they are not intimately familiar with due to spasmodic involvement and the ongoing burden of the triple shift of family, work, and the farm. Farming community members, particularly men, are frequently described using terms that emphasise physical toughness, self-reliance and stoicism (Hogan, Scarr et al. 2012). These descriptions reflect an often-carefree attitude to health and wellbeing, a reticence to seek help for mental health concerns and a tendency towards high-risk behaviour patterns.

Disturbing research undertaken by Fragar, Depczynski et al. (2011) showed the all causes death rate for male farmers and farm managers was 33% higher than that of the wider Australian male population of the same age. Male farmers displayed higher rates of death from cardiovascular disease, motor vehicle accidents and certain cancers when compared to both rural and urban populations (Fragar and Franklin 2000, Fragar, Depczynski et al. 2011). Farmers, both as an occupational group and as people who reside on farms, also have higher rates of suicide than both rural populations as a whole and the general Australian population (Miller and Burns 2008) and the reasons for this are multifactorial (Caldwell, Jorm et al. 2004, Hogan, Scarr et al. 2012, Kennedy, Maple et al. 2014).

Numerous studies have found that, rather than seek assistance when they recognise personal psychological distress or acute health issues such as chest pain, people in rural communities will conceal their distress and possess a limited capacity and social competence to identify and express their stressors or pain (Fraser, Smith et al. 2005, Baker, McCoombe et al. 2011, Kennedy, Maple et al. 2014). This concealment also applies to farmers with hearing loss.

### **1.4 Noise induced hearing loss**

In the report Listen Hear! (Access Economics 2006) suggested that approximately one in six (17%) of the Australian population is affected by hearing loss. National and international research highlights that hearing deficits are present in farming populations at much higher rates than the general

population (Williams, Forby-Atkinson et al. 2002, Voaklander, Franklin et al. 2006, McCullagh and Robertson 2009, Lower, Fragar et al. 2010, Senate Community Affairs References Committee 2010). Being able to hear effectively is important for farmers to avoid potential accidents and injuries to themselves, work colleagues and bystanders. This is particularly important on farms where the workplace is the home, a place where families live, children play and friends visit, all in close proximity to operating machinery, farm equipment, livestock and motorbikes. Hearing impairments such as hearing asymmetry and fair/poor self-reported hearing loss have been significantly associated with agricultural injuries (Choi, Peek-Asa et al. 2005). In the 2015 Safe Work report the agriculture, forestry and fishing industries had the second highest rate of workplace deaths and this was on top of the previous year of having the highest number and the second highest for the decade (Safe Work Australia 2015). It has also been reported in overseas studies that mild (25dB) hearing loss was independently associated with self-reported falls in a cohort of 40 - 69 year olds in the USA and that for every 10 dB increase in hearing loss, there was a 1.4 fold (95% CI: 1.3–1.5) increased odds of an individual reporting falling over in the preceding 12 months (Lin and Ferrucci 2012). The report highlights that hearing loss is highly prevalent but vastly underrated as a health problem.

The 2010 government inquiry into Hearing Health in Australia identified a large proportion of rural workers and farmers suffered from acquired hearing loss. The inquiry recommended a campaign to target those at highest risk of acquiring hearing loss, raise the level of awareness of hearing health issues, help de-stigmatise hearing loss and promote services for people who are hearing impaired (Senate Community Affairs References Committee 2010). Sustainable Farm Families™ data gathered from 1417 farming families across Australia found hearing difficulties were self-reported in 49.9% of men and 29.1% of women in at least one ear while 31% of participants reported trouble hearing in both ears. In total 36.7% of farmers aged less than 60 years suffered some form of hearing loss while 53.7% aged 60 years or above suffered from hearing difficulties.

### **1.5 Farmers and noise**

Noise at work in agriculture or horticulture can cause hearing loss. There are many different sources of noise on farms, such as tractors, workshop tools, livestock, heavy machinery and guns. Noise can also be a safety hazard at work, interfering with communication and making warnings harder to hear. There is also the insidious noise level that farmers are exposed to without realising, such as cattle mooing, pigs squealing, pumps, shearing and machinery. Damage to hearing can be caused by the prolonged and cumulative effect of exposure to excessive noise over many years, or by instant acoustic trauma associated with peak noise levels over 140dB such as shot guns (FarmsSafe WA Alliance 2010).

Many years of exposure to harmful noise levels have been suggested as the cause of significant noise injury in farmers. In 2002 it was reported that farmers had an average hearing profile 10-15 years worse than the general Australian population (Williams W. Forby-Atkinson L. Purdy S. Gartshore G. 2002). This is in comparison to Access Economics' estimation that one in six (16.7%) of the Australian population is affected by hearing loss (Access Economics 2006). Data from 1417 farmers in Victoria show that over 40% of participants (49.9% of men and 29.1% women) have a hearing problem in at least one ear and 31% participants have trouble hearing in both ears. Thirty



six point seven percent (36.7%) of farmers aged less than 60 years suffer a form of hearing loss and 53.7% of the age group of 60 or above are suffering from hearing problems. This figure is likely to be under reported due to the social stigma associated with deafness, as well as farmers also being unaware of the loss of hearing. As reported in Access Economics (2006) hearing loss can differ from one ear to the other (asymmetrical hearing loss). As a result of this, prevalence rates can be distorted in terms of the level of hearing loss. Asymmetrical hearing loss is particularly common in male farmers who often have hearing loss predominately in the left ear. This occurs as a result of looking over their right shoulder watching their work while driving older style tractors for extended hours, where the left ear is more directly exposed to motor noise. Importantly being able to hear effectively or able to adjust behaviours to compensate for hearing loss is important in reducing workplace accidents, falls or other home accidents (Lin and Ferrucci 2012). This is particularly important on farms where the workplace is the home where children and extended families live.

### **1.6 Farmers and social isolation**

Hearing loss also impacts across life, work and family domains, and has significant adverse psychosocial effects on affected individuals. Notably, people with hearing loss report increased rates of affective mood disorders and poorer social relations psychiatric disorder, particularly those rating their hearing as poor (Hogan 2009). This is a particularly important consideration in farming populations where poorer mental health outcomes and high rates of suicide are already present (Caldwell, Jorm et al. 2004, Miller K and Burns C 2008, Hogan 2009).

Hearing loss has been described as an under-estimated health problem with adult hearing loss associated with an increased risk for a variety of health conditions including diabetes, hypertension, heart attack and psychiatric disorders (Wilson DH 1997, Hogan, O'Loughlin et al. 2009). Additionally research undertaken by the Sustainable Farm Families™ program has found high rates of preventable lifestyle risk factors in farm men and women for diseases such as diabetes, cardiovascular disease and cancer (Brumby S, Willder S et al. 2010, Brumby, Chandrasekara et al. 2012).

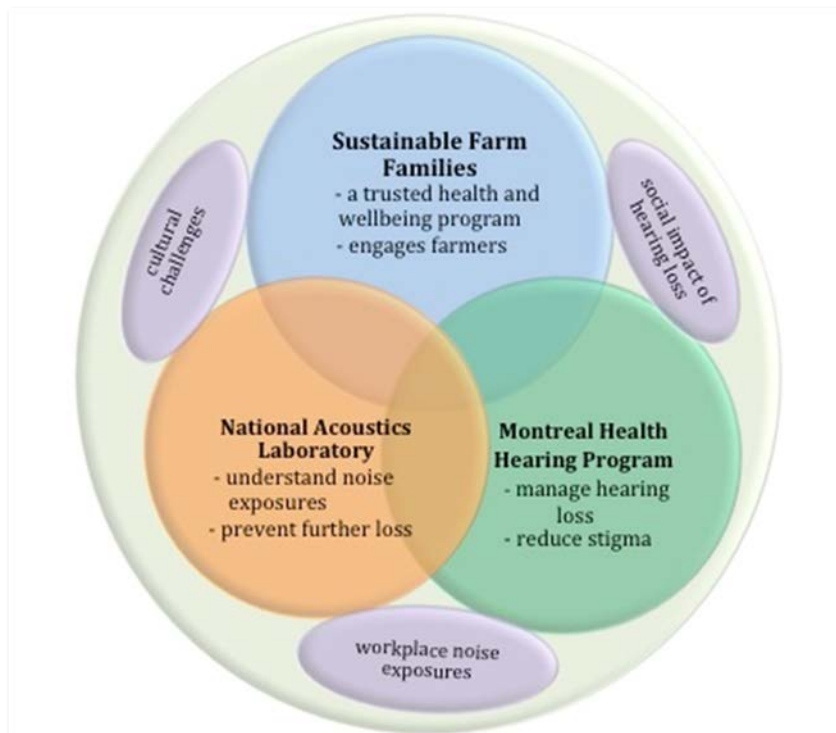


**Figure 1:** Recording noise levels at the Livestock Exchange Hamilton

## 2.0 THE SHHH HEARING PROJECT

### 2.1 Methods to engage with farm men and women

To work with farm men and women and develop the *Shhh hearing in a farming environment* program we combined three evidence-based programs. Firstly, a highly effective farmers' health program the Sustainable Farm Families™ program, which was known to successfully engage farm men and women across a variety of farming industries (Boymal, Rogers et al. 2007, Brumby, Martin et al. 2008, Brumby, Wilson et al. 2008, Brumby, Willder et al. 2009). Secondly, the Montreal Health Hearing Program (MHHP) based on Héту and Getty's rehabilitation program for people affected by hearing loss (Héту and Getty 1991). Finally the National Acoustic Laboratories (NAL) collaborated to further develop previous work with an on-farm noise audit involving farmers gathering noise measurements typical of their noisiest regular activities (Depczynski, Franklin et al. 2005). The combination of these three programs led to the development and implementation of *Shhh hearing in a farming environment*, which was funded by the National Health and Medicine Research Council GNT1033151 in 2011. Figure 2 illustrates the three specific program inputs (Sustainable Farm Families™, Montreal Health Hearing Program and National Acoustic Laboratories noise audits) and the specific external factors affecting farmer engagement such as cultural challenges, social impact of hearing loss and workplace noise exposures.



**Figure 2:** Making the Connections - programs used to address and prevent further hearing loss in farm men and women and develop the *Shhh hearing a farming environment* method (Brumby 2014).

## 2.2 Sustainable Farm Families Program —social learning and engagement

The Sustainable Farm Families™ programs were developed by drawing on both adult learning and health promotion frameworks. Evidence from health promotion informed us that different teaching approaches can either stifle or encourage the attainment of health knowledge by population groups (Wass 2001). Wenger (Wenger and Synder 2000) advised that in communities of practice, people who share a concern or a passion for something they do will learn how to do it better as they interact regularly. In addition Keen et. al. suggest that ‘our social and ecological sustainability depend on our capacity to learn together and respond to changing circumstances’ and that many of our current approaches to learning and responding to change occur within traditional institutional arrangement and values (Keen, Brown et al. 2005). Azjen and Fishbein’s (Azjen and Fishbein 1980) theory of reasoned action and planned behaviour focuses on the belief that behaviour change occurs when individuals and groups:

- Share values and beliefs,
- Share a common commitment to their new found knowledge,
- Discuss with peers how best to respond to the information delivered in their daily lives,
- Share an understanding of the possible negative effects of poor health behaviours within their business.

In the SFF™ program the farming business is both the traditional institutional arrangement as described by Keen et. al. (Keen, Brown et al. 2005) and the shared concern or passion as described by Wenger (2005). The understanding of the individual impact of health, wellbeing and safety on the farming business is the additional learning and knowledge that the participant gains through this learning model. That is, health, wellbeing and safety, while initially viewed as a separate domain from the farming business, is recognised as pivotal to both the emotional and economic success of the family farm business (Brumby 2013).

## 2.3 Montreal Hearing Help Program — hearing rehabilitation

The Montreal Hearing Help Program (MHHP) was developed in Canada as an early intervention to assist workers with noise induced hearing loss to; (i) overcome problems of reluctance and stigmatisation, (ii) improve their hearing and listening skills, and (iii) promote the prevention of noise induced hearing loss (Getty and Hetu 1991, Hétu and Getty 1991). It is a community-based public health outreach program which is designed to enable people to take the first, but critical steps towards accepting hearing help and its inherent benefits. The model has been extended in light of social psychological theory on identity processes and in this modified form consists of four phases: (i) recruitment and engagement, (ii) group work and identity transition (iii) post-group social identity network support, and (iv) finalisation. It is this model that will be used to inform the hearing rehabilitation phase and the impact of hearing impairment in farm men and women (Hétu, Jones et al. 1993).

## 2.4 On-farm noise audit

The on-farm noise audit was comprised of two parts. The first involved the farmers working with the *Shhh hearing in a farming environment* trained health staff to gather noise measurements that they considered typical of their noisiest regular activities. Examples of these include farm

machinery, livestock handling, milking equipment, shearing and woolshed machinery, tractors with and without cabs, power tools, motor bikes, quad bikes and some domestic appliances such as mix masters. These measurements were taken using a CEL-244 digital integrating Sound Level Meter.

The second part involved the use of personal dosimeters to assess and record personal noise exposure information from individuals working on farms using CEL-350/K4 dBadge dosimeters. This information was used to examine the typical daily noise exposures and compare it to the activities on farm during the wearing of the CEL-350/K4 dBadge dosimeters. On-farm activities were summarised in a short and individualised report. The report for each particular farm outlined noise levels, acceptable exposure times, and an explanation of their meaning, implication and brief suggestions about how to reduce noise exposure.



**Figure 3:** Undertaking on-farm noise audits using the CEL-244 digital integrating Sound Level Meter, Gippsland Victoria.

### **3.0 RESEARCH PLAN – METHODS AND TECHNIQUES TO BE INVOLVED**

#### **3.1 Objective and hypothesis**

The implementation of the research plan, as detailed below, was informed and supported by an *Shhh hearing* Advisory Group made up of regional and rural health service providers, staff from the SFF™ program, farm men and women and staff from Better Hearing. The *Shhh hearing* advisory group (see Appendix 1 for members and terms of reference) provided advice on both the content and mode of presentation for the training program. The group met regularly throughout the project to ensure its relevance.



**Hypothesis:** The *Shhh hearing* project tested the hypothesis that participating in early intervention hearing services focussed towards farming families will contribute to (a) reduction in the impact of hearing loss on farmers and their families (b) educate and empower farmers on their capacity to reduce their noise exposure.

The hearing (MHHP) training was delivered to SFF™ Health professionals as a train the trainer model by CIC Hogan who is adept at the MHHP. Additionally the Farm Noise Audit training was delivered by Dr. Warwick Williams from the National Acoustics Laboratory with training and competency assessments of SFF™ health professionals being undertaken.

Ethics was obtained from Deakin University Human Research Ethics Committee number 2012-006 and the project was registered with the Australian New Zealand Clinical Trials Registry (ANZCTR) ACTRN Trial number 12614000075684. See <http://www.anzctr.org.au/ACTRN12614000075684.aspx>

### **3.2 Study location, participants and eligibility**

The target population was farm men and women or agricultural workers located in Victoria and Queensland. An intervention group and a comparison group were nominated and participants were from a mixed environment of farming industries – i.e. pastoralists, orchardists, dairy and cropping.

### **3.3 Sample size**

The sample size of 100 farmers with 50 per intervention group and 50 per comparison group was selected to meet the power required (>.80) to detect the expected treatment effect size of 0.65 based on our previous research. Our experience in delivering programs to farming families suggests that there will be 54% males and 46% females attending the program. Partner were also invited to participate in the intervention group workshop.

### **3.4 Intervention protocol**

One hundred SFF™ participants (with self-reported hearing problems) were randomly allocated in workshop 1 to either (a) the intervention group condition (N=56), in which they received the ‘*Shhh hearing*’ workshop program and the on-farm noise audit and report, or (b) the waitlist comparison group (N=50) who received the on-farm noise audit and on-farm report. Outcomes for each group were tracked from pre-intervention to six-month follow-up. For further information please see ACTRN Trial number 12614000075684.

### **3.5 Intervention workshops 1 & 2**

*Shhh hearing* in a farming environment intervention workshop was delivered via two-structured workshops at least six months apart, but not more than 12 months apart, (see Appendix 2 for Agenda). Each workshop was designed to connect assessment and measurement through the personal audiogram and on-farm noise audit with information sharing and group learning on noise exposures, hearing loss and its social impact. Each participant received a copy of Hogan’s (2008) Easier Listening workbook, which provided coverage of some workshop topics and a space to reflect and document thoughts throughout the workshop. This was important in making the connection between what happened on-farm in relation to noise exposure, what they experienced in hearing

loss, the effect on their partners, family and friends and what action they needed to take. Typically the group size varied from four (4) to nineteen (19) and included partners that were able to attend.

The topics covered during workshop 1 included:

1. A physical health assessment and audiogram,
2. The worst things about living with hearing loss (as a person affected by hearing loss and as a partner effected by the person with hearing loss),
3. Understanding your audiogram results – what sounds do you miss?
4. Noise exposures on-farm – what do the figures mean? Wearing hearing protection and understanding classifications and the logarithmic scale of dB.
5. Hearing tactics – which included a variety of scenarios and role-play including:
  - a. Going to a barbecue (BBQ)
  - b. Learning to make a request
  - c. Going out to dinner
  - d. Doctors surgery
  - e. 'Push back' - what happens when you become assertive.
6. Action planning.

A key part of the workshops was the understanding of 'Push back'. 'Push back' is when a person with a hearing problem makes their problem known to others and requests some consideration from others such as speaking slowly and clearly, reducing other noises or asking other people to look at them when they speak and, in response people without hearing loss assert their rights back. The common result is that people with hearing loss find this 'push back' confronting, give up trying and retreat. The workshop provided useable and realistic tactics to improve skills in dealing with 'push back' and role-play was undertaken to improve skills.

Another key part of the workshop was the development of an action plan based on SMART goals (Specific, Measurable, Assignable, Realistic and Time-related) developed by Dr. George Doran (Doran 1981). These actions or goals were documented and formed part of the research record. Participants could choose more than one if they wished and must relate to hearing loss and the lessons of managing or increasing their control of noisy situations as discussed in the *Shhh hearing* in a farming environment workshop. Of the 56 participants 4% (2) chose not to participate in action planning leaving 54 participants providing 148 specified goals. Process evaluations of the workshop were undertaken following each workshop.

At the second workshop participants were asked to report back on their progress and rate each previously planned action. A behaviourally anchored rating scale (BARS) designed for the SFF™ program was used (Brumby, Wilson et al. 2008) (Brumby 2013). The scale is vertically presented with points ranging from zero to five, where zero means 'did absolutely nothing' and five represents 'great results beyond my expectations' as is shown in Table 1. This combines a narrative and numerical rating scale to assist in quantifying achievement for participants.



**Table 1** SFF™ Behaviourally Anchored Rating Scale

SCALE	DESCRIPTION
5	Great results beyond my expectations
4	Had an impact others could see
3	Followed through with moderate results
2	Got started for a few weeks
1	Thought about it
0	Did absolutely nothing

### 3.6 Comparison group protocol

Farmers allocated to the comparison group did not participate in any workshops or receive any intervention from the research team, beyond collection of outcome data, at baseline and following on-farm noise audit. All comparison groups did receive a hard copy of the Easier Listening Booklet (Hogan 2008). Randomisation occurred at the program (geographic) level. This design was a partial single blind study, in which participants are unaware of interventions being implemented other than in their own setting.

### 3.7 Primary Outcome Measures

#### 3.7.1 Health behaviours and conditions (intervention only)

Evidence based and widely applied physical health tools developed by the Department of Human Services (2002) that include demographics, health conditions, and health behaviours were used (Department of Human Services 2002). The Depression, Anxiety, Stress, Scale 21 (DASS-21), made up of three seven-item subscales that measure the three dimensions specified in (Lovibond F & Lovibond 1995) tripartite model of affect: low positive affect (Depression), physiological hyperarousal (Anxiety), and negative affect (Stress) (Lovibond F & Lovibond 1995). The psychometric properties of the original 42-item version of the DASS are well-established and the short form maintains these properties and to date have been well accepted by farming populations.

#### 3.7.2 On-farm Noise Audit (intervention and comparison)

On farm and field noise assessments were undertaken using an integrated sound level meter (SLM) capable of carrying out continuous noise measurements (LAeq) and impulse noise measurements (LCpeak) to the requirements of the Australian / New Zealand Standards 1269.1 (Australian / New Zealand Standard 1269.1 1998 ). These field measurements were carried out by trained health professionals using a CEL - 244 digital integrating sound level meter (SLM) for the direct noise measurements of the sampled farm activities, while a CEL-350/K4 dBadge personal sound exposure meters (PSEM) were used to assess personal noise exposure. Both sets of measurements were conducted in accordance with the measurement and calibration procedures required by the ZS (Australian / New Zealand Standard 1269.1 1998 )

Noise Report's and Evaluation: Each farm (both intervention and comparison group) were provided with a standard format but individualised noise farm report for ease of interpretation. These were

simple A4 sheets which folded appropriately produced an A5 four page booklet (see Appendix 3 for example). Following receipt of the farm noise booklet a short evaluation survey was sought regarding their opinion of both the farm and the survey booklet. The intervention group did have the benefit of individual dosimeter reports, which were utilised if above threshold noises were recorded.

### ***3.7.3 Hearing loss and social impact (intervention and comparison)***

Surveys were developed by CIC Hogan to report the social impact of hearing loss on both the individual and the partner or family member -Social impact of hearing loss impact survey. Additional surveys were developed regarding knowledge of noise exposures and current practices on farm —Pre and post noise exposure survey, and the requesting and receiving help in social interactions survey - BIRT survey.

## ***3.8 Data Collection and Statistical Procedures***

A variety of data collection methods were important to this project. The data included hearing health data as well as self-reported perceptions of health status, mental health and of social and family context. Other data related to the learning process itself of experience of the SFF™ health professionals undergoing the Train the Trainer model.

All data was managed and analysed within the statistical program Statistical Package of Social Sciences (SPSS), a statistical package widely used in quantitative social science research and is suitable for multivariate analysis. Chi-square and t-tests were used to identify differences between the control and intervention groups at baseline and follow up using frequencies, Chi-square, Wilcoxon signed ranks test and t-tests. All analyses were conducted using SPSS (version 21).

Noise level data was entered into Microsoft Excel and analysed using SPSS. The identity of individual farmers was not linked to the pooled data. Descriptive statistics on range and central tendencies were obtained for average and peak noise emissions for each machinery type.

For full understanding of the data-gathering schedule please see Table 2.

## ***3.9 Involvement of farmers Steering Group***

The *Shhh hearing* in a farming environment steering group was formed at the commencement of the research to assist in the direction and provision of support for the project. Designated representative from across the partner organisation, industry, health and academia were invited to be involved (see the terms of reference Appendix 1). All members had equal rights and were encouraged to share their views critical or otherwise on project management, its roll out and service provision. The steering group met at least bi annually rotating between Hamilton and Melbourne to share the travelling. Farmer members were encouraged to participate in the *Shhh hearing* workshop programs with a view to increasing the understanding of the role of farming and health cross collaboration. The final steering group meeting was held in Melbourne in April 2015 at the Deakin Centre and presentations were given on the findings on the work.

**Table 2:** The *Shhh hearing* intervention and comparison group data gathering schedule.

BASILINE	ON-FARM NOISE AUDIT	3-5 MONTH FOLLOW-UP	TELEPHONE INTERVIEW	WORKSHOP 2 6-MONTH FOLLOW-UP
<b>INTERVENTION WORKSHOP 1 (1 DAY):</b> <ul style="list-style-type: none"> <li>Focus group sessions</li> <li>Hearing health sessions</li> <li>Table discussions</li> <li>Easier listening work book</li> <li>Health assessment</li> <li>Workshop Evaluation</li> </ul>				<b>INTERVENTION (½ DAY):</b> <ul style="list-style-type: none"> <li>Focus group sessions</li> <li>Hearing health</li> <li>Table discussions</li> <li>Easier listening work book</li> <li>Health assessment</li> <li>Workshop 2 Evaluation</li> </ul>
<b>CLINICAL DATA:</b> <ul style="list-style-type: none"> <li>Screening Audiogram</li> <li>BMI (height/weight)</li> <li>Fasting total cholesterol/glucose</li> <li>Blood pressure</li> <li>Heart rate</li> <li>Waist / hip measurements</li> <li>Respiratory</li> </ul>	<b>ON FARM DATA:</b> <ul style="list-style-type: none"> <li>Daily dosimeter recording</li> <li>On-farm noise measurement using SLM</li> <li>Dosimeter activity diary</li> <li>On- farm noise audit evaluation</li> </ul>			<b>CLINICAL DATA:</b> <ul style="list-style-type: none"> <li>BMI (height/weight)</li> <li>Fasting cholesterol/glucose</li> <li>Blood pressure</li> <li>Heart rate</li> <li>Waist / hip measurements</li> <li>Respiratory</li> </ul>
<b>SELF-REPORTED DATA:</b> <ul style="list-style-type: none"> <li>Demographics*</li> <li>Age, Country of origin</li> <li>Alcohol/smoking behaviours*</li> <li>Known health conditions*</li> <li>DASS</li> <li>Pre noise exposure knowledge/ awareness survey</li> <li>Hearing protection</li> <li>Farm safety &amp; injuries sustained</li> <li>Social impact of hearing loss impact survey</li> <li>BIRT survey</li> </ul>		<b>SELF-REPORTED DATA:</b> <ul style="list-style-type: none"> <li>Post noise exposure knowledge/awareness survey</li> <li>Hearing protection</li> <li>Social impact of hearing loss survey</li> <li>BIRT survey</li> </ul>	<b>SELF-REPORTED DATA:</b> <ul style="list-style-type: none"> <li>Hearing aid purchase</li> <li>Use of hearing tactics</li> <li>Action plan progress</li> </ul>	
<b>LEARNING AND BEHAVIOUR:</b> <ul style="list-style-type: none"> <li>Focus group sessions</li> <li>Develop and share action plan</li> <li>Role play</li> </ul>	<b>LEARNING AND BEHAVIOUR:</b> <ul style="list-style-type: none"> <li>On- farm noise report</li> <li>Easier listening work book</li> </ul>			<b>LEARNING AND BEHAVIOUR: BARS.</b> <ul style="list-style-type: none"> <li>Report on and rate action plan</li> <li>Redevelop action plan</li> <li>Workshop 2 evaluation</li> </ul>

Comparison Group only received what is highlighted yellow.

## 4.0 RESULTS

### 4.1 *Shhh hearing in farming environment*

Over the duration of the program a substantial amount of data was collected on a range of personal, demographic, noise, safety and psychosocial indicators. The purpose of this chapter is to present the data for discussion and results on the intervention and comparison groups. In total 106 participants (77 men and 29 women) began the *Shhh hearing in a farming environment* program with 56 in the intervention group and 50 in the comparison group. Partners were also invited to participate in the Intervention workshops and in some instances their data was included, where this is the case it was clearly noted.

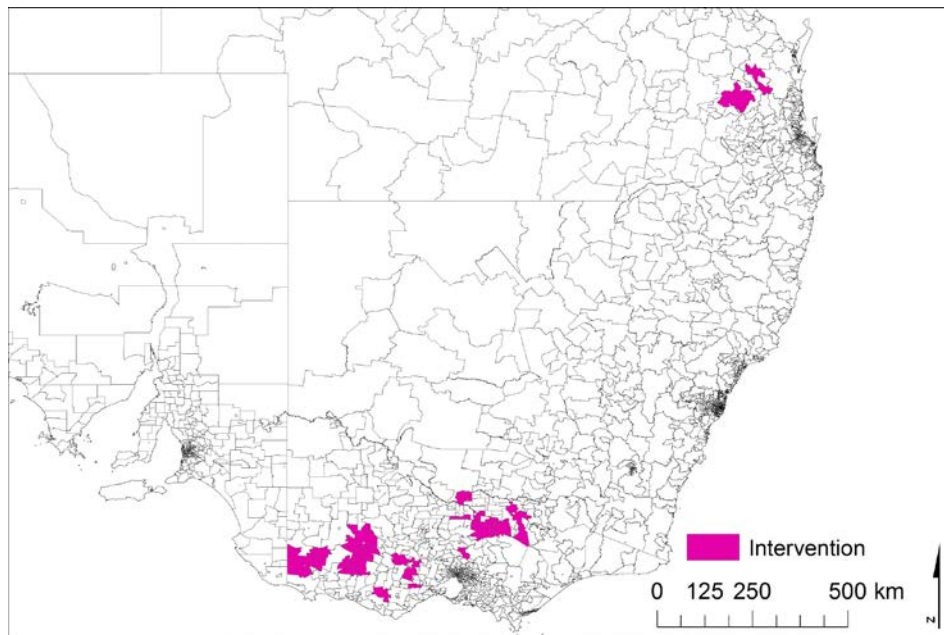
Age and gender were collected at baseline and are shown in Table 3. There was no statistical difference between the intervention and the comparison group. It is noted that there were fewer females participating comparison group, however this was not statistically different (see Table 3).

**Table 3:** Demographic characteristics of intervention and comparison group

CHARACTERISTIC	GROUP	BASELINE (SD)	DIFFERENCE BETWEEN GROUPS
<b>General demographics</b>			
Male, n (%)	Intervention (n=36)	36 (64.3)	$\chi^2 (1)=3.33$
	Comparison (n=41)	41 (82.0)	$p=0.07$
Female, n (%)	Intervention (n=20)	20 (35.7)	
	Comparison (n=9)	9 (18.0)	
Age in year, mean (SD)	Intervention (n=56)	59.1 (8.2)	$t=1.10$
	Comparison (n=50)	57.3 (8.4)	$p=0.27$

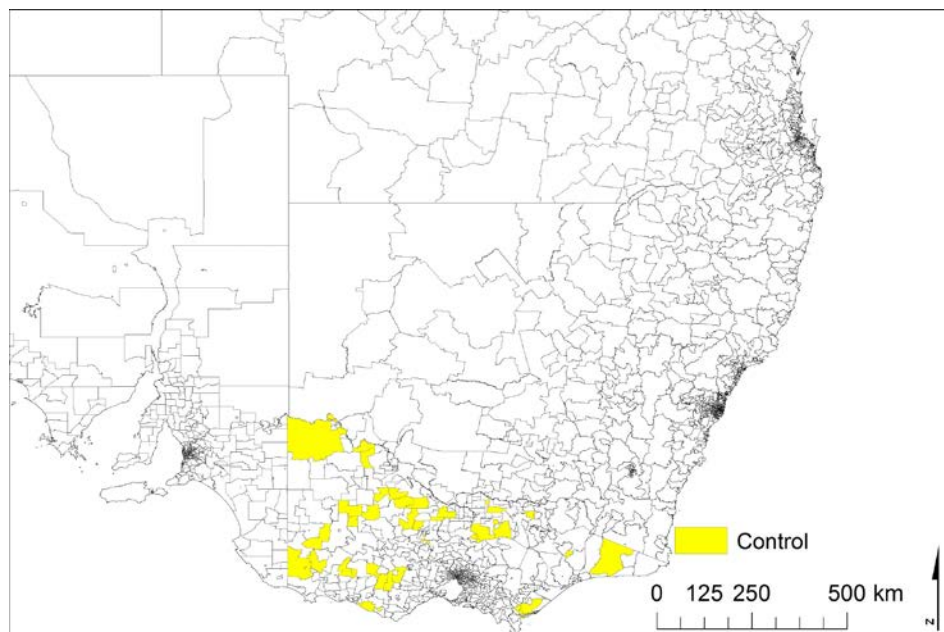


**Figure 4:** Farmers and table group discussion *Shhh hearing* workshop 1



**Figure 5:** The locations that the intervention participants came from.

**Farming type:** Participants indicated their primary farming activity to be: sheep production (59% in the intervention group, 30% in the control group); beef cattle (20% in the intervention group, 12% in the control group); cropping (13% in the intervention group, 38% in the control group); and dairy production (7% in the intervention group, 8% in the control group), with the majority being mixed enterprises.



**Figure 6:** The locations that the comparison participants came from

In the intervention group the three frequency average hearing loss (2000/4000/6000Hz) left ear was 42 dB and 39 dB right ear. This is common in farming populations; the left ear hearing loss is often associated with shooting and older style tractors without cabins. All (100%) participating farmers rated noise on their property as a problem before the commencement of the program. 12.5% of

these participants self-reported good hearing in both ears, 12.5% difficulty hearing with one ear, 64.3% a little trouble hearing in both ears and 10.7% a lot of trouble hearing in both ears.



**Figure 7:** Undertaking an audiogram, Casterton Workshop

Only 12.5% of intervention participants reported their health to be fair or poor, although 32.1% (18) reported suffering a farm injury or illness in the previous 6 months. This figure represents a higher percentage of accidents than reported by other SFF™ participants and may support research undertaken by (Choi, Peek-Asa et al. 2005) indicating an increase in farm accidents is associated with hearing loss. Moderate to severe body pain in the previous 4 weeks was reported by 50% (28) of participants. There were mild but clinically significant DASS scores (Lovibond F & Lovibond 1995) or anxiety (4%), depression (9%) and stress (23%) and moderate or greater DASS scores for anxiety (7%), depression (9%) and stress (6%).

#### **4.2 Shhh hearing Workshop Evaluations (intervention group)**

Each workshop session was evaluated with numerous questions regarding learning opportunity, pace, ability to apply in the lives were scored by a 7 point likert scale (named after psychologist Rensis Likert) which are a popular and longstanding approach to scaling survey responses (deVaus 1999). The score was strongly disagree = 1, neither agree nor disagree = 4, and 7 being strongly agree. See Appendix 4 for a copy of the evaluation survey.



**Table 4:** Workshop 1 Evaluation Summary for intervention group (n=56) and partners (n=16)

<b>BASED ON A SCORE OF 1 - 7</b>	<b>Ararat</b>	<b>Casterton</b>	<b>Colac</b>	<b>Hamilton</b>	<b>Shepparton</b>	<b>Violet Town</b>	<b>Wondai</b>	<b>WORKSHOP AVERAGE MEAN</b>
<b>My physical assessment &amp; audiogram</b>	6.32	6.56	6.39	6.36	6.46	6.44	5.89	<b>6.35</b>
<b>The worst thing about living with hearing loss</b>	6.33	6.59	6.38	6.31	6.45	6.38	6.00	<b>6.35</b>
<b>Understanding the audiogram &amp; hearing loss</b>	6.46	6.50	6.58	6.28	6.52	6.50	6.00	<b>6.41</b>
<b>BBQ and dinner exercise</b>	6.37	6.51	5.73	6.10	6.43	6.39	5.71	<b>6.18</b>
<b>Tricks of the trade</b>	6.43	6.47	5.98	6.46	6.50	6.39	5.87	<b>6.30</b>
<b>Restaurant &amp; doctors surgery</b>	6.23	6.49	5.64	6.38	6.49	6.44	5.94	<b>6.23</b>
<b>Technology to assist with hearing</b>	N/A	N/A	N/A	6.30	6.62	6.56	N/A	<b>6.49</b>
<b>Action planning</b>	6.57	6.73	6.32	6.07	6.54	6.44	6.46	<b>6.45</b>

Participants were also asked to make any comments regarding the *Shhh hearing* workshops and below are some examples.

- “It (the workshop) has made me think about being more assertive in managing my hearing loss.”
- “Lots of info regarding management techniques. Opportunity to have all questions answered throughout the presentation was excellent.”
- “Workshop was excellent. Made me so much more aware of my hearing problem and how to live with it.”
- “Relaxed, informative, great interaction amongst group, well balanced with great presenters.”
- “Made me more aware of how hearing loss can affect lifestyle and health.”

A final question asked participants to rate the overall workshop with the majority of intervention participants reported that they enjoyed the *Shh hearing* workshop program with only one person saying that they did not enjoy it (mean score out of 10 [1 = did not enjoy at all, 10=fully enjoyed] =8.21 mean score, SD=1.65].

### **4.3 Behaviours post workshop program**

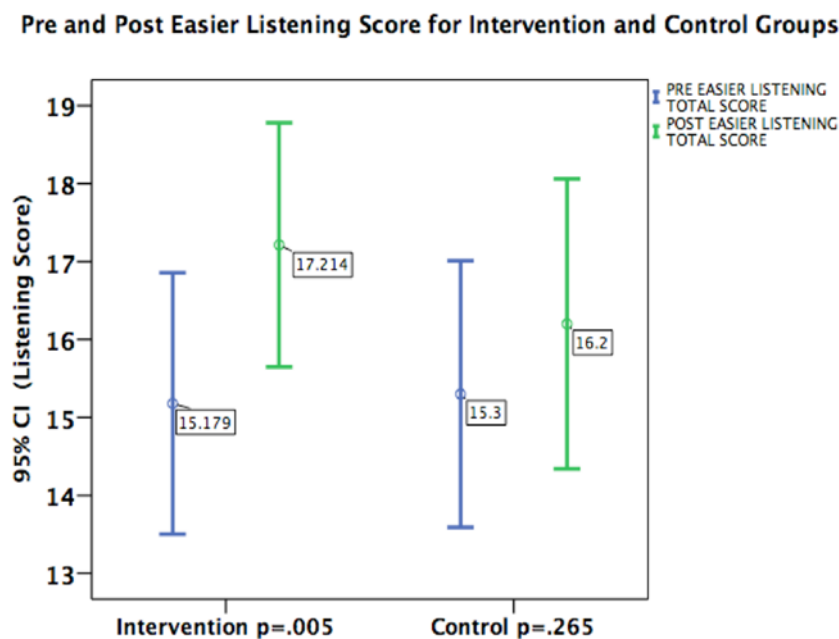
After the program 56% agreed/ strongly agreed that they noticed their hearing problems more. This is to be expected and is consistent with findings from Getty and Hetu (1991). As a result of the program 66% agreed/strongly agreed that they felt better able to manage their hearing problems compared to when they started the program. Participants described taking a range of actions following the program (see Table 5). One person took up a hearing aid post the program while

another three began reusing hearing aids they already owned. Eighty two per cent (82%) indicated they started using hearing tactics post intervention (as taught in the workshop) with 96% reporting the tactics appeared to be working. Popular tactics included facing people when speaking (72%), letting people know that they had hearing problems (44%) and negotiating an improved communication environment (68%), for example, a quieter room or away from noise.

**Table 5.** Reported actions taken by intervention participants post *Shhh hearing* workshop program

ACTIONS TAKEN FOLLOWING PROGRAM	n (%)
<i>Since the workshop, have you used any hearing tricks of the trade (n=54)</i>	
Yes	44 (81.5)
No	10 (18.5)
<i>Do the tactics appear to be working? (n=53)</i>	
Yes	51 (96.2)
No	2 (3.8)
<i>Hearing tactics used since workshop (n=25) post program that people said they</i>	
Eliminate the problem before it arises	9 (36.0)
Assert your communication needs	12 (48.0)
Negotiate a better communication environment	17 (68.0)
Let people know you are having hearing problems	11 (44.0)
Let people know before an event that you may have trouble hearing and ask for assistance	9 (36.0)
Face the person when talking to them	18 (72.0)
Ask them to speak slowly and clearly	8 (32.0)
Ask person a question while giving them back the information you have already heard (paraphrase)	5 (20.0)
Ask them to repeat what they have said	15 (60.0)
Move away from background noise	12 (48.0)
Put up with it	6 (24.0)
Pretend you understand when you don't	6 (24.0)
Go home/ stay home	0
Avoid problem situations	2 (8.0)
<i>Since Shhhh program participant has purchased (n=55)</i>	
Any electronic devices	1 (1.8)
Other amplification systems	0
Personal amplifier listening system (not hearing aid)	2 (3.6)
Amplifier for doorbell	0
Amplified TV listening system	2 (3.7)
<i>Hearing aid... (n=54)</i>	
Purchased since program	1 (1.9)
Applied for since program	0
Reused since program	3 (5.6)
In one ear	2 (3.6)
In two ears	2 (3.6)
<i>Situations hearing aid is used in (n=15)</i>	
At home	1 (6.7)
On outings	3 (20.0)
At work	1 (6.7)
During spare time	1 (1.8)

Responses to the Easier Listening strategies pre and post the intervention (intervention workshop and a copy of the Easier Listening book provided) were measured with the social impact of hearing loss survey for both control (comparison) and intervention group. A higher score on the Easier Listening Scale (Hogan 2008) indicates that hearing loss has less social impact. Figure 8 shows the changes in the mean total score pre and post. The comparison group received only a copy of the Easier Listening booklet. A significant improvement was seen in the intervention group ( $p=.005$ ), whilst an improvement was not noted in the comparison group it was not significant ( $p=.265$ ). Figure 8 shows the change pre and post in the Easier Listening Score (social impact of hearing loss) between the intervention and comparison group.



**Figure 8:** Pre and Post Easier Listening Score for Intervention and Control Groups

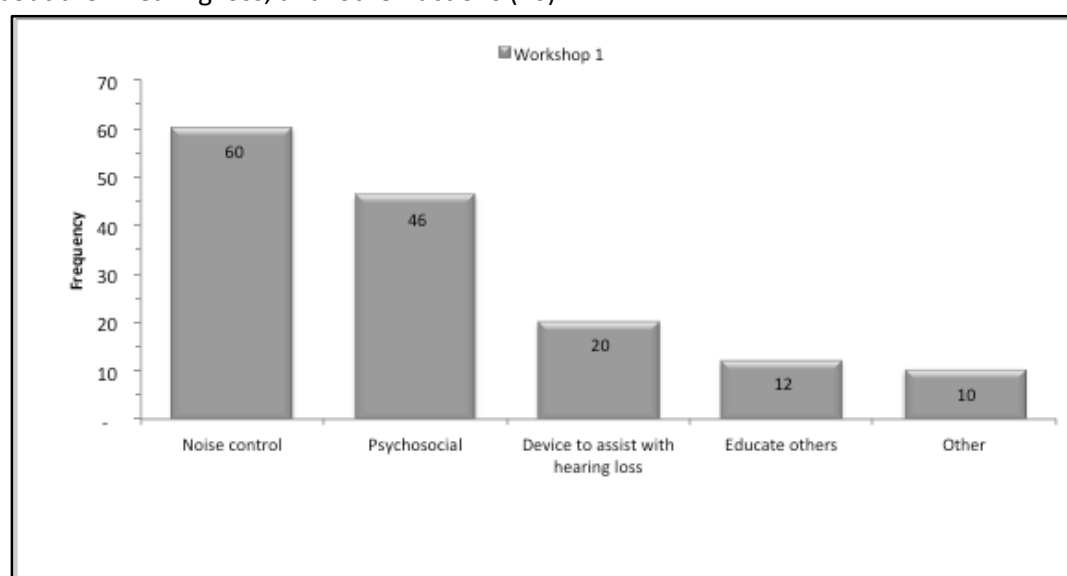
The BIRT survey developed by CIC Anthony Hogan and was adapted from Erdman, Crowley et al. (1984) work with counselling the hearing impaired. The BIRT survey asked participants to consider situations that they find themselves in. For example “I cannot understand the person at the bank (I cannot hear them through the glass) and I tell them that I have a hearing loss and ask them to write things down for me.” Participants need to rate how likely it is that you would ask for assistance and then also rate how likely it is that this person would help you. As outlined in Table 6 both intervention and comparison participants were more likely to ask for help following involvement in the program (BIRT - Ask for Help). However, the intervention group were statistically more confident following the *Shhh hearing* workshops that they would receive help (BIRT- Receive Help).

**Table 6:** Asking for and receiving help (BIRT)

OUTCOME MEASURE	GROUP	BASELINE MEAN (SD)	3-5 MONTH FOLLOW UP MEAN (SD)	MEAN CHANGE FROM BASELINE (SE)	CI
BIRT – Ask for Help, Total Score, mean (SD)	Intervention (baseline: <i>n</i> =31, follow up: <i>n</i> =45)	5.26 (2.49)	7.08 (1.88)	-1.63 (0.35) <i>t</i> = -4.68, <i>p</i> =0.000*	-2.34-- 0.92
	Control (baseline: <i>n</i> =50, follow up: <i>n</i> =47)	5.57 (2.44)	6.52 (2.24)	-1.02 (0.40) <i>t</i> = -2.58, <i>p</i> =0.013*	-1.81-- 0.22
BIRT – Receive Help, Total Score, mean (SD)	Intervention (baseline: <i>n</i> =32, follow up: <i>n</i> =46)	6.02 (2.45)	7.71 (1.29)	-1.47 (0.40) <i>t</i> = -3.71, <i>p</i> =0.001*	-2.27-- 0.66
	Control (baseline: <i>n</i> =50, follow up: <i>n</i> =47)	6.60 (2.04)	7.08 (2.54)	-0.41 (0.41) <i>t</i> = -1.02, <i>p</i> =0.32	-1.22-- 0.40

#### 4.4 Action plans (intervention only)

At the conclusion of the *Shhh hearing* workshop 54/56 participants chose to participate in action planning writing a total of 148 specified goals addressing: 60 actions were on noise control on farm or at home; 46 actions were psychosocial actions and included actions related to the use of techniques introduced in the workshop to minimise hearing and listening difficulties, as well as taking the time to relax and reduce stress; 20 actions related to devices to assist with hearing loss including hearing aids and devices to improve television viewing; 12 actions related to educating others about their hearing loss; and ‘other’ actions (10).

**Figure 9:** Participant action plan choices following workshop 1 (n=148 actions)

These actions are shown in Figure 9, with taking control of noise – this could be on-farm or at home – having the highest number of preferences, followed by psychosocial actions. Psychosocial actions included the use of management techniques to minimise hearing and listening difficulties, using ‘tricks of the trade towards easier listening’ as described by (Hogan 2008) and taking time to relax and reduce stress. Assistive devices rated third and included hearing aids as well as devices to improve TV viewing pleasure for both the participant and their family. Importantly these participant responses highlighted very clearly to the research team and other health professionals that taking action on hearing loss doesn’t equate to getting a hearing aid.

At the follow up workshop 6-8 months later the intervention participants reviewed their actions on the behaviourally anchored rating scale (BARS) as used by (Brumby, Willder et al. 2009). Participants reported the following progress:

- Absolutely nothing (1%)
- Thought about it (10%)
- Got started for a few weeks (7%)
- Followed through with moderate results (28%)
- Had an impact that others could see (29%)
- Great results beyond my expectations (23%)

The above scale allowed participants to rate their own achievements from the previous workshop providing examples of good/poor or effective/ineffective behaviours while working to achieve their *Shhh hearing* action plans. The chart in Figure 10 shows how the participants individually rated themselves at workshop two, which was held between 6-8 months after workshop one. As participants chose more than one action area, multiple responses are expected to match their chosen actions. What is immediately obvious from the BARS is the number of actions (80%) –and therefore participants– that had ‘followed through with moderate results’, or ‘had an impact others could see’ (30%) or displayed ‘great results way beyond their expectations’ (23%).

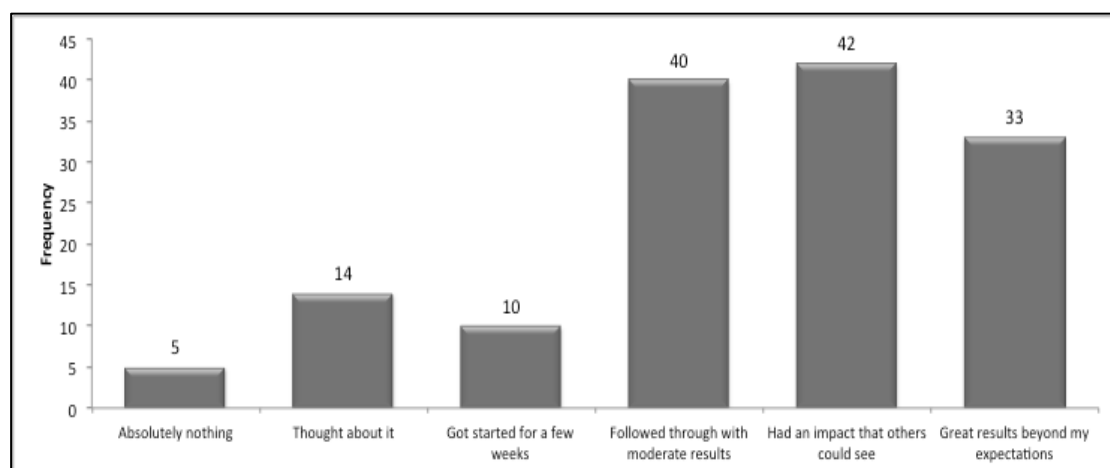


Figure 10 Participant BARS scores at workshop two.

#### 4.5 On-farm noise audits

On-farm noise audits were undertaken for all participants (intervention and comparison) and were taken on properties from Victoria and Southern Queensland, Australia and included farms involved in dairy, beef, wool, prime lamb, pork and cropping production.

As part of the on-farm noise audit, typical noise levels from numerous farm activities were measured, with the noise measurement demonstrating the relative loudness ( $L_{Aeq}$ ) of tasks and machinery to participating individuals.



**Figure 11:** Testing the dB level of the Quad bike. Please note: a helmet was recommended for useage.

Noise exposures: A summary of personal noise exposures parameters is presented in Table 7 as mean values and standard deviations (SD). An important finding was the simple t-test showed no differences in the exposures (Pa2h) or other results between men and women. This finding — of female and male exposures being similar— is not surprising given the very nature of family farming, and that most of the farms in this study were family owned farms where everyone undertakes farming tasks. It does also indicate that messaging aimed at preventing noise induced hearing loss should be directed towards both males and females. Additionally the use of wearing the dosimeter also showed that whilst normal day-time activities were easily nominated and measured, unexpected events (such as shooting a feral animal or in this case a snake) provided unanticipated and damaging noise exposures (Williams, Brumby et al. 2015).

**Table 7:** Summary of farmer noise exposure assessment results

<b>Group</b>	<b>Subjects (N) (%)</b>	<b>Exposure (<math>L_{Aeq,8h}</math>) (dB) [range]</b>	<b><math>L_{Cpeak}</math> (dB) [range]*</b>	<b>Exposure (<math>Pa^2h</math>) [range]</b>	<b>Exposure time (h) [range]</b>
<b>All (m + f)</b>	51 (100%)	85.3 [70.9 – 96.7]	134.6 [122.0 - 143.5]	1.09 ( $\sigma = 2.4$ ) [0.04 - 14.9]	15.2 ( $\sigma = 8.5$ ) [1.5 - 28.5]
<b>Females (f)</b>	14 (27%)	85.2 [70.9 - 94.1]	135.7 [122.0 - 143.5]	1.14 ( $\sigma = 2.3$ ) [0.04 - 8.3]	15.4 ( $\sigma = 8.9$ ) [2.0 - 25.7]
<b>Males (m)</b>	37 (73%)	85.5 [71.1 - 96.7]	134.2 [122.4 - 143.5]	1.07 ( $\sigma = 2.5$ ) [65.9 - 93.6]	15.2 ( $\sigma = 8.5$ ) [1.5 - 28.5]

\*Note: An  $L_{Cpeak}$  value of 143.5 dB is the upper limit of measurement for this parameter on the CEL-244.

Importantly this work showed that more the 50% of the farm workers surveyed were exposed to noise levels above the recommended Australian Exposure Standard. Exposures ranged from 0.04Pa2h (71 dB) to 14.9 Pa2h (97dB), the equivalent to 15 times the recommended exposure standard (Williams, Brumby et al. 2015).



## 4.6 Hearing protector use

The use of hearing protection is an effective method of reducing noise exposures if they are worn correctly, fit for purpose and worn for the whole exposure. Part of the *Shhh hearing* project in the intervention group included a session on hearing protectors, their use and efficacy. Most participants were familiar with hearing protection, (plugs and ear muffs) but they were less familiar with the classification system and also the correct methods of usage and calculation of the reduction of noise exposures.



**Figure 12:** Photo of intervention participants learning how to roll earplugs in preparation for insertion.

## 4.7 On- farm noise exposure reports

Following a visit to the farms and the recording of noise levels, a report was done personalising the farm equipment exposures. If dosimeter data was available this was also analysed and where noise level exceeded safe level this was also included. The On-farm Noise report (see Appendix 3) was posted out and an evaluation form also provided. The on farm-noise audits proved to be very popular (although not all evaluations were returned) by both the intervention and comparison groups and the evaluation of these showed that they were well appreciated by all participants. See Table 8.

**Table 8:** Evaluation of the on-farm noise audit (n=85)

Measure	Agree	Disagree	Undecided
The farm visit was successful in updating my knowledge about farming tasks that affect my hearing	99% (84)	0% (0)	1% (1)
The farm noise control booklet updated my awareness of influencing my health status	99% (84)	0% (0)	1% (1)
The farm noise control booklet provided information about noise induced hearing loss	98% (83)	0% (0)	2% (2)
I found the language and concepts in the noise control booklet easy to grasp	99% (84)	0% (0)	1% (1)
The results of the farm noise audit have motivated me to use hearing protection	95% (81)	4% (3)*	1% (1)
I would recommend a farm noise audit to other farmers	99% (84)	0% (0)	1% (1)
I felt comfortable wearing the dosimeter (n=23 **)	100% (23)	0% (0)	0% (0)

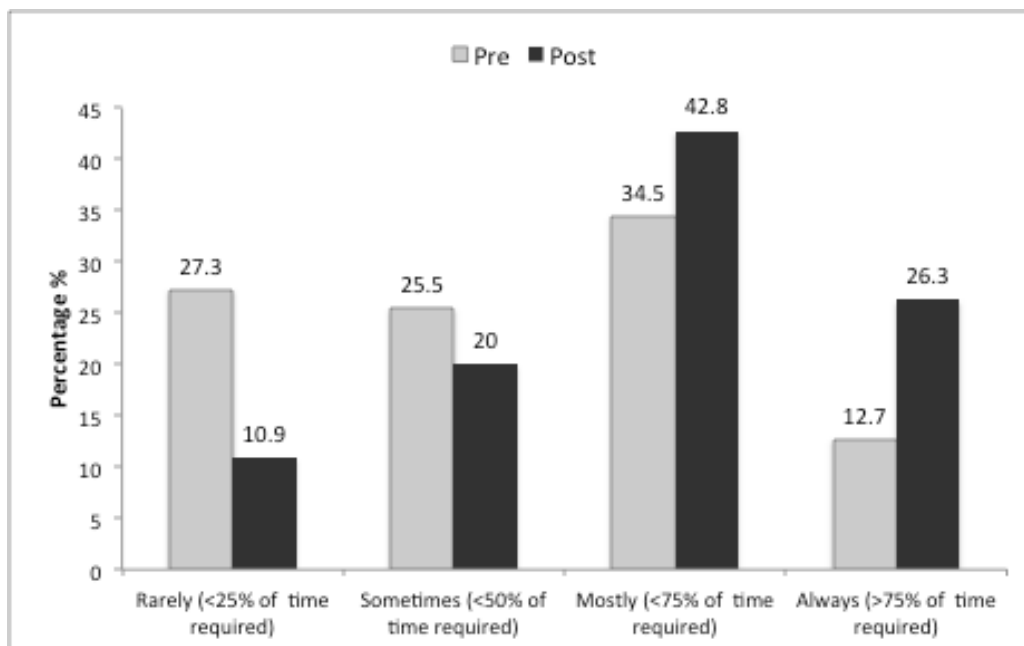
Some of the additional comments made by participants about the on- farm noise audit included:

*“I like the personal touch. Something that I can show my staff and say “this is why we wear ear protection.”*

*“The on- farm noise report has made me aware of how far in excess of recommended safe levels the implements that I farm with can damage my hearing”.*

The benefits of this personalised intervention worked well for all participants as that it was about their own farm and relevant to them and their farm business.

As much of the hearing impairment was from occupational exposures, wanting to minimise further and future minimise hearing loss was important. Pre and post surveys also included questions regarding the wearing of protection. It is acknowledged that use of PPE is a last resort as it is much more preferable to engineer out high noise levels, or remove the problem. Participants’ responses to the question ‘in the last month how often have you worn hearing protection in noisy situations on farm’ are shown in Figure 13. Comparing the baseline and post-program responses at 6-8 months shows the changes in practice participants made in the use of hearing protectors. A Wilcoxon test indicated a significant difference in how often participants reported wearing hearing protection in noisy situations,  $z = -3$ ,  $p=.002$ , with a statistically higher number of participants wearing hearing protection post-intervention. This is an important finding as previous work undertaken by (Williams, Purdy et al. 2004) showed that while having a hearing test performed and the results explained increased the overall awareness of noise and the risk of exposure, there was not a corresponding increase in the use of hearing protection over time. This new finding affirms the *Shhh hearing in a farming environment* process.



**Figure 13:** Pre and post responses to the question “in the last month how often have you worn hearing protection in noisy situations on farm?”

Other survey analysis has shown that as a result of the intervention farm men and women were more confident, better able to respond to their environments, the TV didn’t bother others as much (some had purchased hearing assistive devices), their partner better understood their hearing needs, hearing loss interfered less with their relationships, and they sought more down time for themselves after work. Participants were also inclined to rate their hearing loss more seriously following the interventions. Additionally it was also noted that 15% of the partners also had hearing loss of which they were unaware. This is a similar finding to Hétu et al who reported that as a result of the

Montreal Hearing Help Program people rated their hearing more severely. This is also consistent with the hypothesis that people misperceive the effects of their hearing loss, are reluctant to acknowledge difficulties and feel no urgency to try and solve them (Hétu, Jones et al. 1993).

#### **4.8 Dissemination of the Results from Shhh hearing**

Some of the researching findings have been published in peer reviewed journals and further papers are underway. Early data and results have been presented opportunistically at key international and national conferences in the health, wellbeing and OH&S field. The findings have also been presented at workshops for professionals who work with rural communities, and fed back on the [www.farmerhealth.org.au](http://www.farmerhealth.org.au) website. Below is a précis of where the key disseminations have taken place.

##### **4.8.1 Keynote Address**

- 2013 National Rural Health Conference – Strong Commitment, Bright Future, Adelaide — *Shhh hearing in a farming environment*
- 2014 Libby Harricks Oration, Brisbane, Australia - Deafness Forum of Australia—Making Connections

##### **4.8.2 Refereed Journal Articles**

- Brumby, S. (2014). Making Connections: The 2014 Libby Harricks Memorial Oration [Monograph] (pp. 7-34). Sydney: Deafness Forum Limited. Retrieved from <http://www.deafnessforum.org.au/images/pdf/2014%20Libby%20Harricks%20Memorial%20Oration.pdf>
- Williams, W., Brumby, S., Calvano, A., Hatherell, T., Mason, H., Mercer-Grant, C., & Hogan, A. (2015). Farmers' work-day noise exposure. *Australian Journal of Rural Health* (2), 67.
- Hogan, A., Phillips, R. L., Brumby, S. A., Williams, W., & Mercer-Grant, C. (2015). Higher social distress and lower psycho-social wellbeing: examining the coping capacity and health of people with hearing impairment. *Disability and Rehabilitation*, Early Online:1–6(0), 1-6 doi:10.3109/09638288.2014.996675

##### **4.8.3 Presentations at Conferences (peer reviewed)**

- 2012 Sowing the Seeds of Farmer Health, Hamilton. Victoria — *Shhh hearing in a farming environment*
- 2013 North American Agricultural Safety Summit, Minneapolis, USA *Careful they can't hear you.*
- 2014 XXXII World Congress of Audiology, Brisbane, QLD
- 2014 Safe Farms - Healthy Farmers, Launceston, Tasmania - Farm Noise Exposure
- 2015 NHMRC Research Translation Conference, Sydney, Australia— *Connecting evidence and reducing the effect of occupational hearing loss*
- 2015 31st International Congress on Occupational Health, Seoul, Korea
- 2016 International Society for Agricultural Safety and Health, Kentucky, USA

##### **4.8.4 General Media**

Opportunities were also made to involve media, particularly during recruitment and to increase the interest in noise induced hearing loss. The list below was not exhaustive as it was difficult to always get a copy of the local newspapers following workshops. An example is included as Appendix 6.

- Deakin Health Update, Edition 1 2012, Helping farmers fight hearing loss
- Rural Health: Industrial deafness silent enemy in the bush, Beef Central, May 2012
- ACE Radio, Country today, April 2012

- On the Land, Warrnambool Standard, April 5, 2012 page 5 Noise and decibels
- ABC Rural Radio - Farmers going Deaf, Reporter Lucy Barbour 18/04/2012 and also other radio interviews were done
- Farming Focus, Newspaper, May 2012
- Numerous other website articles and promotions.

Findings and lessons from the *Shhh hearing* project are also included in the Agricultural Health and Medicine postgraduate subject through Deakin University, which is delivered to health and rural professionals.

## 5.0 CONCLUSION

*Shhh hearing in a farming environment* built on what we know from science, technology, social science, learning and behaviour change to help people hear more, listen better and prevent further damage (Brumby 2014). It managed to work with farm men and women by combining three evidence-based programs. Firstly, the highly effective farmers' health program the Sustainable Farm Families™ program, which continued to successfully engage farm men and women across a variety of farming industries. Secondly, the Montreal Hearing Help Program (MHHP) based on Hétu and Getty's rehabilitation program for people affected by hearing loss. Finally it built on the National Acoustic Laboratories (NAL) previous work with an on-farm noise audit involving farmers gathering noise measurements typical of their noisiest regular activities

Overwhelmingly positive responses were seen and reported in the intervention group. In particular, significant improvements were found in improved noise control in the home and the workplace, the use of hearing tactics for improved and better communication, changed purchasing patterns for farm equipment and an increased use of the appropriate and correct hearing protection. Positive feedback was received for the *Shh hearing* workshop, hearing assessment and the on-farm noise audit. This bodes well for reducing further and future hearing loss and also for protecting workers and family members. Positive results were also seen in the comparison group with increased use of hearing protection, and ability to request assistance with their hearing loss.

What the *Shhh hearing* program highlighted was how essential it is for service providers to be prepared to go beyond the traditional one-on-one clinical approach and to recognise health in its broadest contexts –workplace, family, social stigma, right through to new technology and ultimately engaged and serious health consumers. *Shhh hearing* necessitated looking outside the medical professions and using the workplace, industry groups and family as the sites for health, wellbeing and safety programs.

*Shhh hearing in a farming environment* also reinforces and confirms how important it is to continue with group work in adult settings. The actual bringing together of farm men and women was achieved mostly through the commonality of and love of farming. The image of the Australian farmer is deeply ingrained in our psyche and learning together as peers using common experiences of farming was important. This sharing of experience was seen during the second *Shhh hearing* workshop with participants sharing tips on how to reduce machinery noise, discussing the nuances of new assistive devices, conferring on how to manage noise at family functions and revealing the relief once they told others they had a hearing loss. We did, however, find that differing industry groups were quite parochial. For example dairy and prime lambs producers (farmers) were not a natural fit, as opposed to cropping and prime lambs possibly due to the different machinery and equipment involved in these production systems. Staff members' knowledge of farming was also

critical to create a sense of understanding and trustworthiness when working with the farm men and women – the farmers knew we had “walked in their shoes”.

*Shhh hearing in a farming environment* findings supported our hypothesis that by participating in this study, farmers with hearing impairment had their awareness raised about noise hazards and as a result, took more appropriate actions to protect either themselves their families and others from exposure to noise hazards.

*Shhh hearing* also found:

- A correlation between the experience of hearing disability, mental health and blood pressure (as per our published paper – (Hogan, Phillips et al. 2015).
- High levels of noise exposure occur on farms —51% of study participants were over the recommended Australian Standard for daily exposure limit with no significant difference between male and female exposure patterns. Noise education should focus on both men and women (Williams, Brumby et al. 2015).
- Partners of those with self-reported hearing loss should also be assessed.
- Higher anxiety and reduced self-confidence in farmers were associated with a decreasing ability to successfully manage their hearing impairment.
- Stress is higher and wellbeing lower when the fit between a persons coping capacity and environmental demands is poor.
- Addressing farmer-hearing health requires structural reforms and resources that address barriers that limit interaction— access, social stigma and an identity of self-reliance.
- Health professionals must engage more broadly (outside of health and medical arenas) and use the farm workplace, farm industry groups and farm families as the sites for health, wellbeing and safety programs.

The study supported our key thesis that by participating in this study, farmers with hearing loss had their awareness raised about noise hazards and as a result, took more appropriate actions to protect either themselves or, others from exposure to noise hazards.

Another key finding also was the correlation between the experience of hearing disability, mental health and blood pressure and is the subject of a manuscript currently under review.

### *Next Steps*

These results may be useful to inform the Office of Hearing’s upcoming national review into the efficacy and efficiency of existing hearing service models. Data from this study demonstrates the importance of interventions that promote greater awareness of hearing loss and which enhance the capacity of people to manage this disability with minimal intervention. The *Shhh hearing* data provided empirical support for existing theory about barriers to the acceptance of hearing impairment and the kinds of strategies that are effective in engaging people to take greater responsibility for their disability management. As a result of this and other studies, a compelling case is evident for a diversification of hearing services beyond those currently offered. As such, the results of this study should be of high relevance to policy makers.

There are lessons that we can take from our engagement with farm men and women and apply in other populations with noise induced hearing loss. These lessons include being more honest about our clinical models and subsequent practice and realise that genuine engagement with hearing impaired populations is hard work. It requires motivation, leaves no space for apathy by providers and requires strong political will and support. A highlight of the research was hearing the farmers discussing the purchase of new farm equipment after they had made the connection between noise exposure, the prevention of future hearing loss, managing their own hearing loss and making good choices for their farm business. They now take their mobile phones complete with a sound level



meter app to try out the potential machinery and even household purchases. As one farmer said “It sure feels better to be giving push back to the manufacturers rather than receiving it”.

There are a variety of reasons why farm men and women do and don’t engage with health organisations, health professionals and hearing services. Addressing their health, wellbeing and safety status requires not only structural reforms and resources, but also needs to overcome the barriers that inhibit interaction. These barriers include the contextual considerations of understanding communities, social stigma and the strong cultural identity of self-reliance. An important and vital part is to ensure that programs and policies are put in place that are suited to the communities they are serving and not just the backwash of metropolitan or other campaigns (National Rural Health Alliance 2011).

The *Shhh hearing* project demonstrates the importance of interventions that promote greater awareness of hearing impairment and enhance the capacity of people to manage this with minimal intervention, within their communities, workplaces and family. This means looking outside of the health and the medical arena to engage more broadly with the social determinants of health and the use of the workplace, industry and family as the sites for health, wellbeing and safety programs.

Finally, *Shhh hearing in a farming environment* provides evidence on strategies effective in engaging people, right from the source of noise exposure through to taking greater responsibility for their disability management. A compelling case is evident for a diversification of future hearing services.



**Figure 14:** The *Shhh hearing* team, Adrian Calvano, Susan Brumby, Heidi Mason and Warwick Williams



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## APPENDICES

### Appendix 1: Steering Committee Terms of Reference



in partnership with



#### Shhh hearing in a farming environment - Steering Group

##### TERMS OF REFERENCE

###### ROLE OF STEERING GROUP:

###### Purpose:

The role of the Steering Group is to act as a committee for the *Shhh hearing in a farming environment* project by providing recommendations in relation to the progress of the project and identify new areas of research or service delivery. The steering committee will comprise 10-12 members including key industry stakeholders and representatives as well as farmers who have participated in the project.

###### Role and Function:

Steering committee members will be asked to:

- Provide support and encourage the *Shhh hearing in a farming environment* team in the further development of the project
- Represent the community by making farmer perspectives known to staff
- Identify and advise on farmer needs
- Monitor farmer involvement and feedback and recommend changes as deemed appropriate
- Suggest and support further opportunities for farmer involvement in the project
- Feedback aspects of the project to their community, organisations and industry.
- To keep the *Shhh hearing in a farming environment* project on track as emergent issues force changes to be considered
- To provide those directly involved in the *Shhh hearing in a farming environment* project with guidance on project business issues.
- Monitoring that project goals are reached in a timely manner
- To provide support and encourage the *Shhh hearing in a farming environment* team in the development of the project

###### Frequency:

The steering committee will meet at least three times over the remaining 2 years of the project. One face-to-face meeting will be held, and two teleconferences.

The agenda will be distributed no later than 7 days prior to the meeting.

It is envisaged that 4 days in total will be required.

Between meetings, steering committee members may be emailed and asked to provide comment or advice on specific issues. Teleconference meetings will last approximately 60-90 minutes and the cost of each meeting/teleconference will be covered by the project.

The Steering Group may make recommendations regarding the appointment of community representatives or other industry or agency representatives; such appointments are subject to approval by the National Centre for Farmer Health.

National Centre for Farmer Health  
Western District Health Service  
20 Foster Street  
Hamilton Victoria 3300 Australia  
T +61 3 5551 8533 E [ncfh@wdhs.net](mailto:ncfh@wdhs.net)

### Membership:

The Steering Group will comprise:

Organisation	Name
A/Prof Susan Brumby Cate Mercer-Grant <b>Heidi O'Connell</b>	National Centre for Farmer Health Vic Deakin University <b>(Secretary)</b>
A/Prof Anthony Hogan Dr. Rebecca Phillips	Australian National University (ACT)
Dr. Warwick Williams	National Acoustic Laboratories NSW
Tim Saal	Australasian Centre for Rural and Remote Mental Health (QLD)
Joan Belle	Better Hearing Australia (VIC)
Farming Community Representatives	Karen Seiler (QLD) Dianne Bowles (VIC) David McKay (VIC)

### Sunset Clause

Unless otherwise extended by National Centre for Farmer Health, this Advisory Group shall cease after two years.

### Sitting Fees

This role is a voluntary position and attracts a maximum sitting fee of \$250 per meeting; some travelling expenses may be reimbursed.

Travelling expenses may be reimbursed in line with the Australian Taxation Office. It is the responsibility of the Farmer representative to provide the committee secretary with the details of the make and model of the motor vehicle prior to these expenses being paid.

15 October 2012



## Appendix 2: Shhh hearing workshop agenda



in partnership with



### Shhh hearing in a farming environment

Ararat  
Wednesday 10<sup>th</sup> October 2012  
Pyranees House – Ararat Hospital

### AGENDA

Session leader

Scribe

7:30 – 9:00am Welcome Everyone  
Physical Health Assessment –  
including fasting cholesterol & glucose,  
blood pressure, eyes, Piko & weight  
(10 minutes per physical)  
Audiograms (15 minutes per physical)  
**Breakfast**

9:00 – 9:15am Introductions  
9:15 – 9:35am What's the worst thing?  
9:35 – 9:55am Your Audiogram explanation  
9:55 – 10:15am Information on hearing loss (Pg.12-13)

#### 10:15 – 10:45am Morning Tea

10:45 – 11:15pm Noise exposure (*refer to handout*)  
11:15 – 11:45pm BBQ exercise (Pg.14)  
11:45 – 12:15pm Dinner party  
(Pg.21)

#### 12:15 – 1:00pm Lunch

1:00 – 1:30pm Tricks of the trade (Pg.19)  
1:30 – 2:00pm Doctors surgery  
2:00 – 2:30pm Restaurant/pub (*refer to handout*)

#### 2:30 – 3:00pm Afternoon tea

3:00 – 3:30pm What are my options? (Pg. 10)  
Professions and hearing technologies  
3:30pm– 4:00pm Important Learnings and action plans

#### 4:00pm Finish

## Appendix 3: On-farm noise control booklet



### Report of your farming noise exposure



**Errol and Karen Seilor  
Wooroolin**

21 August 2012

Clinical Assoc Prof. Susan Brumby, Ms Cate Mercer-Grant, Ms Heidi Mason (RN),  
Mr Adrian Calvano (RN) – National Centre for Farmer Health.  
Dr Warwick Williams. National Acoustics Laboratory  
Dr Anthony Hogan, Australian National University  
Dr Rebecca Taylor, Australian National University

Karen's total noise exposure for an 8 hour farming day was  $1.46 \text{ Pa}^2\text{h}$  which is over the daily recommendation of  $1 \text{ Pa}^2\text{h}$ , indicating the you are at risk of hearing damage. By comparison Errol's total noise exposure for an 8 hour day was just  $0.06 \text{ Pa}^2\text{h}$  which is under the recommendation of  $1 \text{ Pa}^2\text{h}$ , - good news!

### How can you prevent hearing loss?

In table 1, the tasks which fall under the recommended daily maximum have been highlighted in **green** and the tasks that fall over the recommended daily maximum are highlighted **red**. This is to remind you use noise control measures when performing these tasks.

If you wanted to limit your noise exposure and prevent hearing loss, you could take simple noise control measures such as wearing earplugs or muffs, when performing tasks you anticipate will be noisy (using the Kenwood mixmaster or the 410 shotgun).

We hope this information has been helpful to you. Thank you for allowing us to come and visit your farm and if you have any questions please contact Heidi Mason (Research Assistant) at the National Centre for Farmer Health on (03) 5551 8533.



**Piggery 75.6 dB**



**Tractor (inside cabin) 77.9 dB**

The Shhh hearing in a farming environment research project is funded by the National Health and Medicine Research Council GNT1033151. Research partners include the National Centre for Farmer Health, Australian National University and National Acoustics Laboratory. The contents of this publication do not reflect the views of the NHMRC.

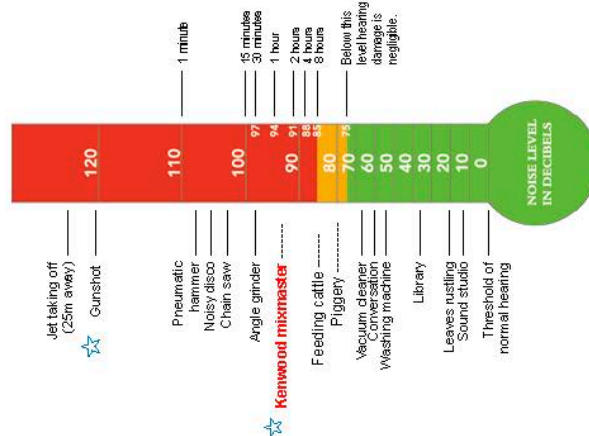
## Did you know?

85 decibels (dB) - is the maximum permitted level of noise you should be exposed to daily.  
75 dB - is the standard level of noise you can be exposed to daily with negligible risk.

1 Pascal squared hour ( $\text{Pa}^2\text{h}$ ) is equal to 85dB and is your MAXIMUM DAILY ALLOWABLE NOISE DOSE during an 8 hour working day.

Recommended usage time ( $T_{\text{rec}}$  h) is the maximum level of time you can perform a particular task for before exceeding the standard.

The noise thermometer below shows the dB rating of some of your farming tasks, along with common farming tasks.



The above noise levels are approximate and should only be taken as a guide

Adapted from the website of Australian Hearing, <http://www.hearing.com.au/> accessed 2 April 2012

## How does your noise exposure measure up?

The tasks measured were given an average allocated time that you might perform them for daily. The total hours of farming was set at 8 hours per day. Those readings underlined have been taken from the dosimeter.

The dB reading in the left column tells you how each activity rated. All tasks were under the recommended maximum of 85dB except for using the Kenwood mixmaster and using the 410 to shoot at the snake.

The maximum recommended usage time is also shown for each individual task in the far right column so you can see that if you spent just 1.23 hours using the Kenwood mixmaster you have already met your recommended daily limit of 85 dB or 1  $\text{Pa}^2\text{h}$ . By comparison, you could spend 69 hours in the piggery before reaching your maximum daily exposure. This does not take into consideration other activities you may perform for the rest of your working day.

Table 1.

Daily exposure of farming

Karen	dB (Laeq)	Time (h)	Exposure ( $\text{Pa}^2\text{h}$ )	Trac
Office work	65.5	2.00	0.00	713
On quad bike - weed spraying	70.9	2.00	0.01	205.37
Feeding cattle	80.7	1.00	0.05	21.32
Automatic pig pellet feeder	66.8	0.50	0.00	528.33
Piggery	75.6	0.50	0.01	69.41
Kenwood mixmaster	92.6	2.00	1.46	1.23
Shot at snake with 410	143			
Actual		8.00	1.52	This is your daily exposure
Mean	90.12		0.25	
Errol				
Excavator work	77.80	5.00	0.12	41.59
Tractor in cabin	77.90	2.00	0.05	41.2
Driving in ute	74.80	1.00	0.01	83.46
Actual		8.00	0.18	
Mean	87.70		0.06	

This is the maximum recommended usage time

This is the dB reading

This is your daily exposure

## Appendix 4: Intervention Workshop Evaluation Survey



in partnership with



### Shhh hearing in a farming environment - Evaluation Form

ID Code: \_\_\_\_\_ Date: \_\_\_\_\_ Venue: \_\_\_\_\_

Score:

1

2

3

4

5

6

7

Strongly  
Disagree

Disagree

Somewhat  
Disagree

Undecided

Agree  
Somewhat

Agree

Strongly Agree

Session	1	2	3	4	4	5	6	7	8
<b>Score each question</b>	Physical assessment	The worst thing about living with hearing loss?	Audiogram Explained	Information on hearing loss	Noise exposure	BBQ / Dinner party	Doctors surgery/ Pub	What are my options	Action planning
<b>Shhh hearing sessions</b>									
The session was successful in updating my <u>knowledge</u> about									
The session was successful in updating my <u>awareness of how</u> I can influence my health status									
I can see how I can <u>apply</u> the content of the session in my life and work									
There was appropriate balance between information giving, activities and questions									
The session was conducted at an appropriate pace ...									
I found the language and concepts easy to grasp ...									
<b>Easier Listening</b>									
Easier Listening contained useful information									
<b>Learning Outcomes</b>									
I felt I was an active learner									
<b>Course Organisation</b>									
The organisation of the session positively assisted learning and understanding									

Shhh hearing in a farming environment Course Evaluation V.1 ©



Comments about the course overall (to be completed at the conclusion of the program)				
The venue and food were appropriate	Strongly disagree <input type="checkbox"/>	Disagree <input type="checkbox"/>	Agree <input type="checkbox"/>	Strongly agree <input type="checkbox"/>
	Comment: .....			
The pre-course information was appropriate *	Strongly disagree <input type="checkbox"/>	Disagree <input type="checkbox"/>	Agree <input type="checkbox"/>	Strongly agree <input type="checkbox"/>
	Comment: .....			
<i>* Plain language statement, consent form, participation letter, final reminder letter or text</i>				
I was comfortable with the format of the course and the discussions?	Strongly disagree <input type="checkbox"/>	Disagree <input type="checkbox"/>	Agree <input type="checkbox"/>	Strongly agree <input type="checkbox"/>
	Comment: .....			
The course should be:	Longer <input type="checkbox"/>	Shorter <input type="checkbox"/>	More practical <input type="checkbox"/>	Not changed <input type="checkbox"/>
	Comment: .....			

**Comments about the course overall (to be completed at the conclusion of the program)**

What is the highest level of education you received?

- ☐ Primary School
 ☐ Secondary School - Up to Year 11
 ☐ Secondary – Completed Year 12  
☐ Tertiary – Bachelor
 ☐ Post-Graduate studies

Have you attended TAFE? ☐ Yes ☐ No

If yes, what course did you attend at TAFE: .....

How much does it cost on average for a visit to the G.P.? .....

Does your GP bulk bill? ☐ Yes ☐ No

Would you recommend the course to your friends or industry people?

**Yes**  
☐

**No**  
☐

Give reasons for your answer.

---



---

What have you liked about the course overall?

---



---

Did the program make you feel more empowered about your hearing health?

---

What do you think could be improved?

---



---

**THANK YOU**

Shhh hearing in a farming environment Course Evaluation V.1 ©

## Appendix 5a: Poster Presentation NHMRC Research Translation Conference 2015



Susan Brumby<sup>1,2</sup>, Anthony Hogan<sup>3</sup>, Warwick Williams<sup>4</sup>,

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(+61)3 55518533 [www.farmerhealth.org.au](http://www.farmerhealth.org.au)

<sup>2</sup>Deakin University, Waurin Ponds, Australia

<sup>3</sup>University of Canberra, Australia. <sup>4</sup>National Acoustic Laboratories, Australia.

### BACKGROUND:

Agriculture has long been seen as an industry where workers have high exposures to workplace noise<sup>1</sup> with subsequent risks to hearing and general health. National and international research reports both higher rates of hearing deficit and earlier hearing loss occurring in farming populations.<sup>2,3</sup> Hearing difficulty and the subsequent psychosocial effect has been identified as a considerable problem in farming and rural populations.<sup>2</sup> This is further compounded by the difficulty of engaging farm men and women in both hearing and health services generally.<sup>4</sup> Hearing loss has also been significantly associated with agricultural injuries.<sup>4</sup>

### OBJECTIVE:

To test the hypothesis that participating in evidence based early intervention hearing services focused towards farmers will contribute to (a) significant reduction in the impact of noise induced hearing loss and (b) educate and empower farmers on their capacity to reduce their noise exposure.

### METHODOLOGY:

To reduce the harmful effect of occupational hearing loss the *Shhh hearing in a farming environment* project needed to connect with farmers, their families, and their farm workplace.

Evidence-based interventions to form *Shhh in a farming environment* project were:

1. A farmers health program known to engage well with farm men and women—The Sustainable Farm Families Program<sup>TM</sup> 6,7
2. A hearing health rehabilitation program focussed on noise induced hearing loss — The Montreal Hearing Help Program<sup>8</sup>
3. An on-farm noise program that measured exposures from machinery and/or farm activities<sup>9</sup> through National Acoustic Laboratories

Figure 1 shows the relationship between the 3 chosen evidence base strategies. The study included 106 farm men and women who all self-reported hearing loss. Fifty-six participants were allocated to the intervention group and involved in above listed strategies 1-3 and 50 participants were allocated to the comparison group and were only involved in strategy 3. No significant difference was found between groups. See Table 1. Chi-square and t paired-tests were used to identify differences between the intervention and comparison group at two time points for noise exposure knowledge and awareness, strategies to reduce the social impact of hearing loss and actions to identify and then reduce on-farm noise.



Figure 1: Connecting the evidence based interventions for the Shhh project.



Pre and Post Easier Listening Score for Intervention and Control Groups

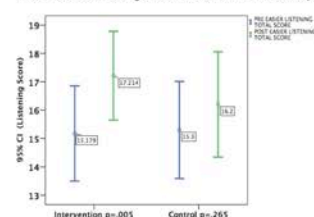


Figure 2: Reducing the social effect of occupational hearing loss

Table 1. Demographic characteristics

Characteristic	Group	Baseline (SD)	Difference between groups
<b>General demographics</b>			
Male, n (%)	Intervention (n=36)	36 (64.3)	$\chi^2(1)=3.33$ $p=0.07$
	Comparison (n=41)	41 (82.0)	
Female, n (%)	Intervention (n=20)	20 (35.7)	$t=1.10$ $p=0.27$
	Comparison (n=9)	9 (18.0)	
Age in years, mean (SD)	Intervention (n=56)	59.1 (8.2)	$t=1.10$ $p=0.27$
	Comparison (n=50)	57.3 (8.4)	

### RESULTS:

**On farm noise:** More than 51% of the farmers surveyed were exposed to on-farm noise above the recommended Australian Exposure Standard.<sup>10</sup> Pre and post assessment on the use of hearing protection in noisy farm situations showed a significant improvement in the intervention group only,  $z = -3.134$ ,  $p = .002$ .

**Social impact of hearing loss:** Higher scores on the Easier Listening Scale<sup>11</sup> indicate hearing loss has less social impact. Figure 2 shows the change (pre and post) in the social impact of hearing loss between the two groups as measured with the Easier Listening Scale.

*Shhh hearing in a farming environment* builds on what we know from science, technology, social science, learning and behaviour change to help people hear more and listen better.


### References:

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The Shhh hearing in a farming environment research project is funded by the National Health and Medicine Research Council (NHMRC) Project Grant GNT 1033151. The contents of this presentation do not reflect the views of the NHMRC.





## Appendix 5b: Poster Presentation Safety Summit, MRASH, USA 2013



NATIONAL CENTRE FOR  
FARMER HEALTH

Healthy farmers, safe farms

in partnership with

# Careful – they can't hear you

**Susan Brumby<sup>1</sup>, Anthony Hogan<sup>2</sup>, Warwick Williams<sup>3</sup>, Cate Mercer-Grant<sup>4</sup>, Adrian Calvano<sup>4</sup>**

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<sup>2</sup> University of Canberra, Australia . <sup>3</sup> National Acoustics Laboratories, Australia . <sup>4</sup> Western District Health Service, Hamilton, Australia




Figure 1: NCFH staff conducting farm noise audits

**BACKGROUND:**

Agriculture has long been seen as an industry where workers have high noise exposures with subsequent risks to farmers hearing and general health. **Hearing difficulty has been identified as a significant and often unrecognised problem in farming populations<sup>1</sup>.** A total of 44.5% of previous Sustainable Farm Families<sup>TM</sup> (SFF) participants<sup>2</sup> self reported a hearing difficulty. Health professionals globally have also noted that hearing loss was associated with higher rates of farm injury and this awareness was a gap in current farmer education<sup>3</sup>.

**METHODOLOGY:**

Health professionals were trained to conduct field noise assessments by National Acoustics Laboratories on farms (Figure 1), using an integrated sound level meter and dosimeters as per the requirements of AS/NZS 1269.1:2005. The subject cohort is a convenience sample drawn from the SFF program who had previously identified a hearing difficulty. Participants were involved in mixed production systems from Victoria and Queensland, Australia. Production systems included dairy, beef, wool and cropping enterprises.

**PRELIMINARY RESULTS:**

Participants were provided with a detailed farm noise report (Table 1) explaining their exposure risk according to the national exposure standard derived from common farm activities, including the A-weighted, equivalent continuous sound pressure level ( $L_{Aeq}$ ) and exposure ( $E_{A,T}$ ) in Pascal squared hours ( $Pa^2h$ ). Routine activities such as shearing, unloading wood and auger use, were not perceived by participants as noisy.

Specific noise management strategies were provided to the participants who were actively interested and engaged in the process. Preliminary evaluations suggest that farmers were more motivated to protect their hearing after undergoing a farm noise audit (Table 2).

**Table 1: Example of farm noise report.**

Equipment/Activity	dB ( $L_{Aeq}$ )	Time (h)	Exposure $Pa^2h^*$	Trec (h:m)
Iseki SX65 Tractor	90.3	0.05	0.02	2.21
Massey Ferguson 35x Tractor	95	0.05	0.06	0.48
Husqvarna 570 chainsaw	105.8	0.05	0.76	0.04
Feed Cattle	82.9	4	0.31	12.58
Cutting/unloading wood	96.3	3.85	6.57	0.35
<b>Actual</b>		<b>8.00</b>	<b>7.73</b>	

\*The maximum recommended daily exposure is 10  $Pa^2h$

**3 KEY LEARNINGS:**

1. Farm noise audits were appreciated by farmers
2. Farmers were unaware of the extent of their incidental noise exposure
3. Farmers will take measures to protect both themselves and others from further noise exposures



This study has been funded from the Office of Hearing Services through the National Health and Medical Research Council and in partnership with the National Acoustics Laboratories and University of Canberra, Australia.

**References:**

1. Lower, T., Fragar, L., Depczynski, J., Challinor, K., Mills, J., & Williams, W. (2010). Improving hearing health for farming families *Rural and Remote Health* (online), 10(1350)

2. Brumby, S., Wilder, S., & Martin, J. (2009). The Sustainable Farm Families Project: changing attitudes to health. *The International Electronic Journal of Rural and Remote Health Research, Education, Practice and Policy*, 9(1012).

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[www.farmerhealth.org.au](http://www.farmerhealth.org.au)



www.standard.net.au

THURSDAY, April 5, 2012 ON THE LAND - 5

# Auctioneer's long range

## Voice measures 98.1 decibels

By STEVE HYNES

BERNIE Grant may look friendly, but he's a dangerous man.

If you care about your hearing, you won't hang around the Hamilton stock agent when he's in full song at the saleyards.

The LMB Linke auctioneer's saleyards patter was measured at 98.1 decibels by the Hamilton-based National Centre for Farmer Health (NCFH) — a level deemed dangerous to hearing over a prolonged period.

The measurement was made by researchers training to carry out a survey into noise encountered by farmers in their working lives.

They were surprised to find that, apart from impulse noises such as a nail gun, Mr Grant was the noisiest thing they measured.

Mr Grant was slightly bemused by the finding, but quite happy to be deemed the loudest of the loudmouths.

"You need a good voice to be a successful auctioneer," he said.

The hearing survey will

see researchers armed with sound level meters tracking farmers around their properties to pin down the hearing hazards within their farming operations.

Research assistant Heidi Mason said hearing loss was a serious problem among farmers.

"Industrial deafness is almost a standing joke among primary producers of a certain age, after years sitting in the saddle of a Ferguson tractor or being exposed to some other source of loud and persistent industrial noise."

Ms Mason said 85 decibels was the recommended maximum safe sustained noise level.

"If farmers are being exposed to sustained noise anywhere near, or above that level, they are at a real risk of long-term, even permanent hearing damage."

The noise survey is being funded by the National Health and Medical Research Council and will take place over two years in Victoria and Queensland.

Training for the project started in February.

The project team includes



Hamilton stock agent Bernie Grant.

Ms Mason, NCFH director Sue Brumby, Cate Mercer-Grant, Warwick Williams, from the National Acoustics Laboratory, and Anthony Hogan, from Australian National University.

In training, the NCFH group completed noise audits on a sheep property at Vasey where the loudest noise came from the elbow of a shearing down-tube, and at a Dunkeld beef enterprise.

where the cattle crush was the worst offender. Measurements in a dairy at Byaduk found attaching teat cups was the noisiest operation.

Ms Mason said the focus

would be on producers who believed they may have some hearing problems. Farmers are invited to have their farm noise audited by the team.

shynes@standardfairfax.com.au

120335832 Picture: STEVE HYNES

## Appendix 7: Ethics Approval

Human Research Ethics



**DEAKIN**  
UNIVERSITY AUSTRALIA

Deakin Research Integrity  
70 Elgar Road Burwood Victoria  
Postal: 221 Burwood Highway  
Burwood Victoria 3125 Australia  
Telephone 03 9251 7123 Facsimile 03 9244 6581  
research-ethics@deakin.edu.au

### Memorandum

**To:** A/Prof Susan Alison Brumby  
School of Medicine

**CC:**

**From:** Deakin University Human Research Ethics Committee (DUHREC)  
**Date:** 24 February, 2012  
**Subject:** 2012-006  
Shhh hearing in a farming environment

Please quote this project number in all future communications

The application for this project was considered at the DUHREC meeting held on 13/02/2012.

Approval has been given for A/Prof Susan Alison Brumby, School of Medicine, to undertake this project from 24/02/2012 to 24/02/2016.

The approval given by the Deakin University Human Research Ethics Committee is given only for the project and for the period as stated in the approval. It is your responsibility to contact the Human Research Ethics Unit immediately should any of the following occur:

- Serious or unexpected adverse effects on the participants
- Any proposed changes in the protocol, including extensions of time.
- Any events which might affect the continuing ethical acceptability of the project.
- The project is discontinued before the expected date of completion.
- Modifications are requested by other HRECs.

In addition you will be required to report on the progress of your project at least once every year and at the conclusion of the project. Failure to report as required will result in suspension of your approval to proceed with the project.

DUHREC may need to audit this project as part of the requirements for monitoring set out in the National Statement on Ethical Conduct in Human Research (2007).

Human Research Ethics Unit  
research-ethics@deakin.edu.au  
Telephone: 03 9251 7123

## Appendix 8: Shhh hearing Workshop Evaluations (Intervention group only)

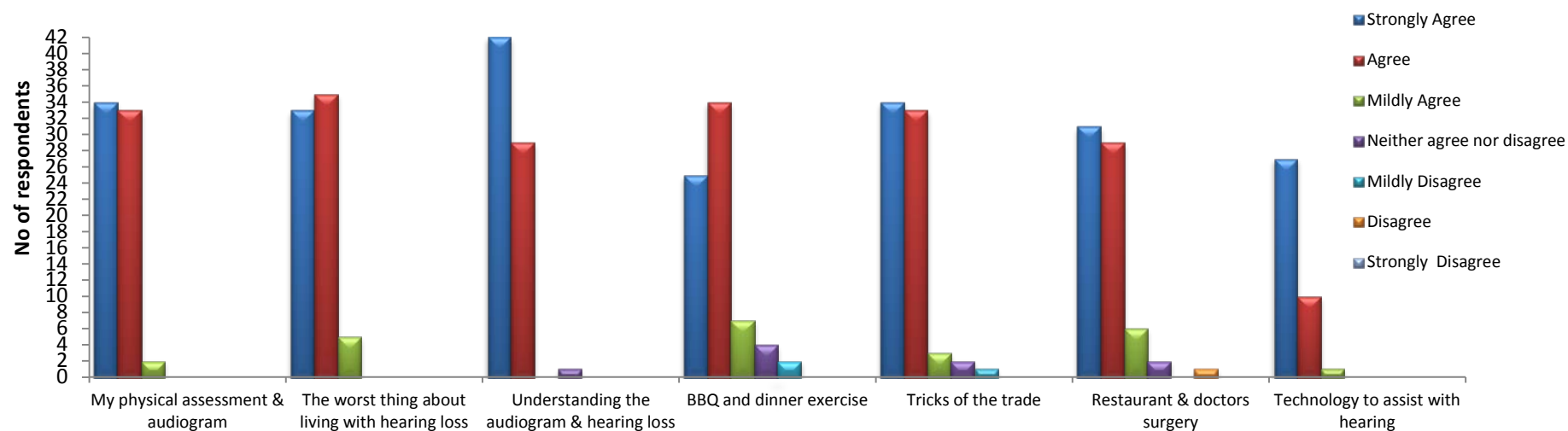
The session was successful on updating my knowledge about..

Participant numbers: 56

Partner numbers: 16

	Strongly Agree	Agree	Mildly Agree	Neither agree nor disagree	Mildly Disagree	Disagree	Strongly Disagree	No Comment /Not Applicable
My physical assessment & audiogram	34	33	2	0	0	0	0	0
The worst thing about living with hearing loss	33	35	5	0	0	0	0	0
Understanding the audiogram & hearing loss	42	29	0	1	0	0	0	0
BBQ and dinner exercise	25	34	7	4	2	0	0	0
Tricks of the trade	34	33	3	2	1	0	0	0
Restaurant & doctors surgery	31	29	6	2	0	1	0	0
Technology to assist with hearing	27	10	1	0	0	0	0	0

Action planning



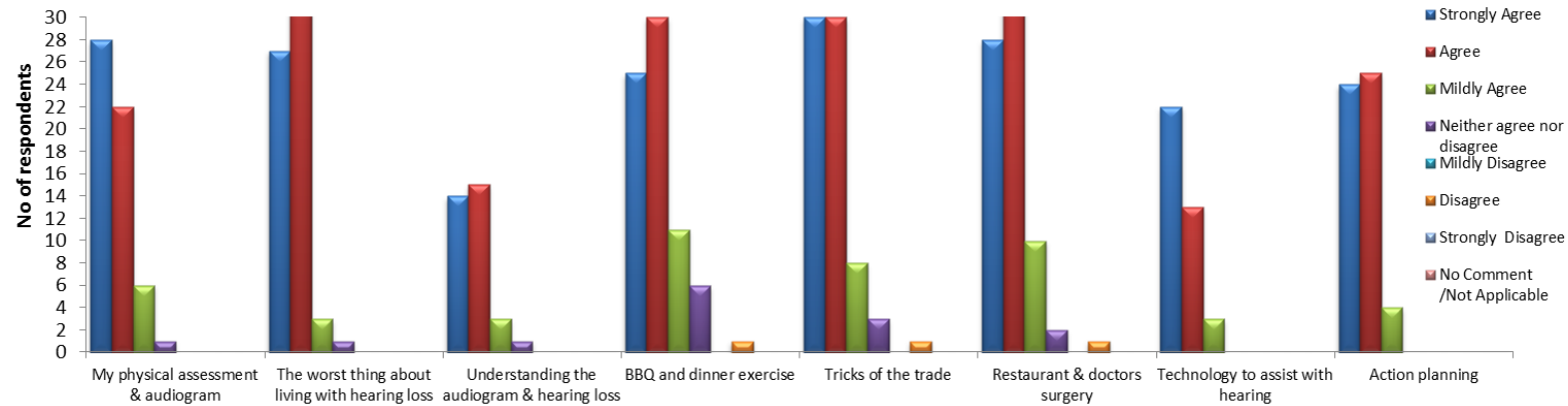


# I can see how the information applies in my life and work status

Participant numbers: 56

Partner numbers: 16

	Strongly Agree	Agree	Mildly Agree	Neither agree nor disagree	Mildly Disagree	Disagree	Strongly Disagree	No Comment /Not Applicable
My physical assessment & audiogram	28	22	6	1	0	0	0	0
The worst thing about living with hearing loss	27	41	3	1	0	0	0	0
Understanding the audiogram & hearing loss	14	15	3	1	0	0	0	0
BBQ and dinner exercise	25	30	11	6	0	1	0	0
Tricks of the trade	30	30	8	3	0	1	0	0
Restaurant & doctors surgery	28	31	10	2	0	1	0	0
Technology to assist with hearing	22	13	3	0	0	0	0	0
Action planning	24	25	4	0	0	0	0	0

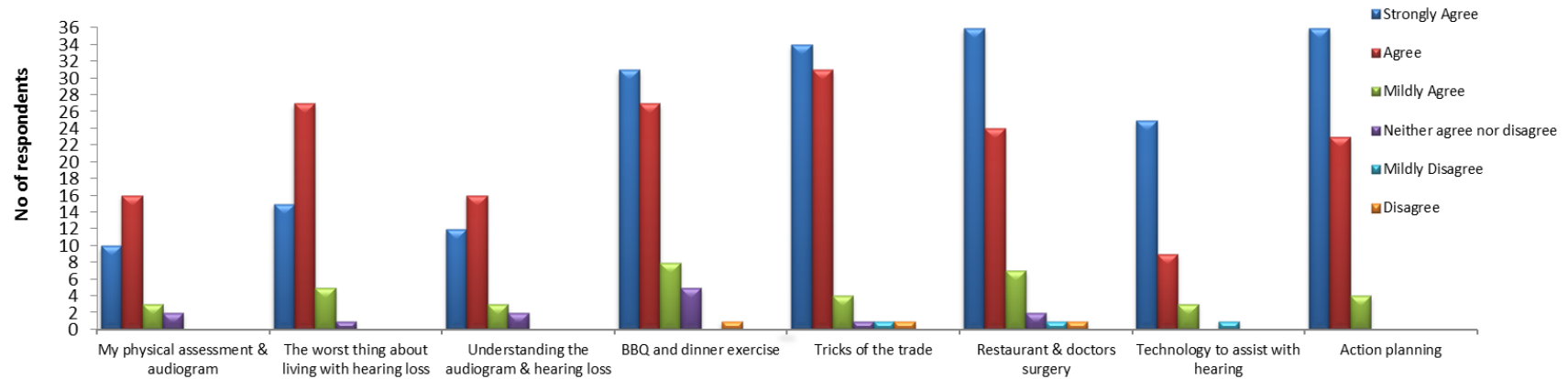


## The session was successful in raising my awareness of how I can influence my surroundings

Participant numbers: 56

Partner numbers: 16

	Strongly Agree	Agree	Mildly Agree	Neither agree nor disagree	Mildly Disagree	Disagree	Strongly Disagree	No Comment/Not Applicable
My physical assessment & audiogram	10	16	3	2	0	0	0	0
The worst thing about living with hearing loss	15	27	5	1	0	0	0	0
Understanding the audiogram & hearing loss	12	16	3	2	0	0	0	0
BBQ and dinner exercise	31	27	8	5	0	1	0	0
Tricks of the trade	34	31	4	1	1	1	0	0
Restaurant & doctors surgery	36	24	7	2	1	1	0	0
Technology to assist with hearing	25	9	3	0	1	0	0	0
Action planning	36	23	4	0	0	0	0	0



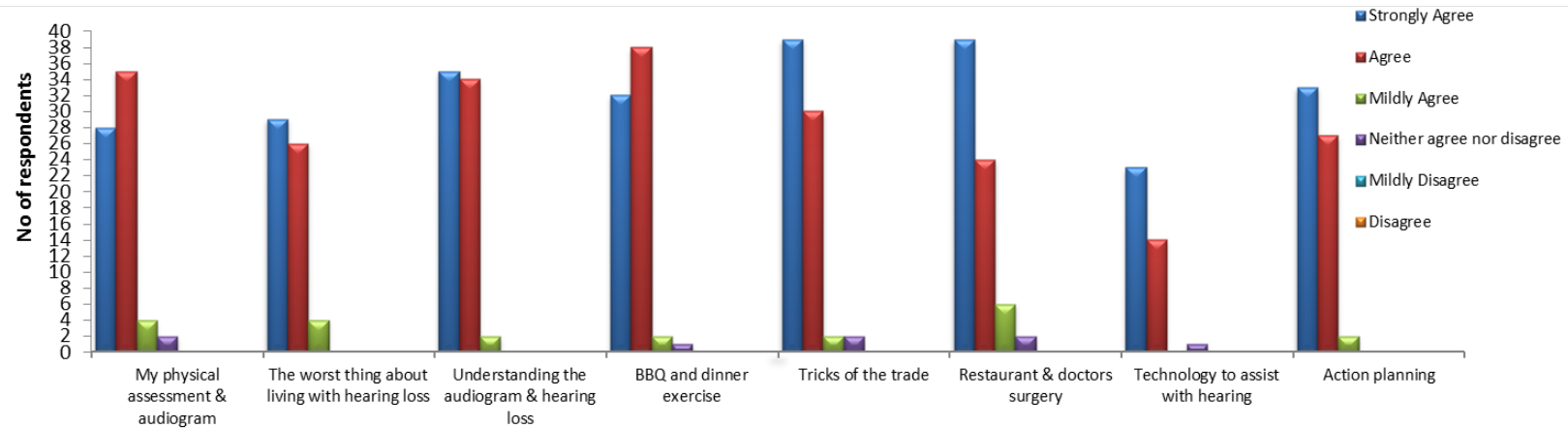


## There was appropriate balance between information giving, activities and questions

Participant numbers: 56

Partner numbers: 16

	Strongly Agree	Agree	Mildly Agree	Neither agree nor disagree	Mildly Disagree	Disagree	Strongly Disagree	No Comment /Not Applicable
My physical assessment & audiogram	28	35	4	2	0	0	0	0
The worst thing about living with hearing loss	29	26	4	0	0	0	0	0
Understanding the audiogram & hearing loss	35	34	2	0	0	0	0	0
BBQ and dinner exercise	32	38	2	1	0	0	0	0
Tricks of the trade	39	30	2	2	0	0	0	0
Restaurant & doctors surgery	39	24	6	2	0	0	0	0
Technology to assist with hearing	23	14	0	1	0	0	0	0
Action planning	33	27	2	0	0	0	0	0

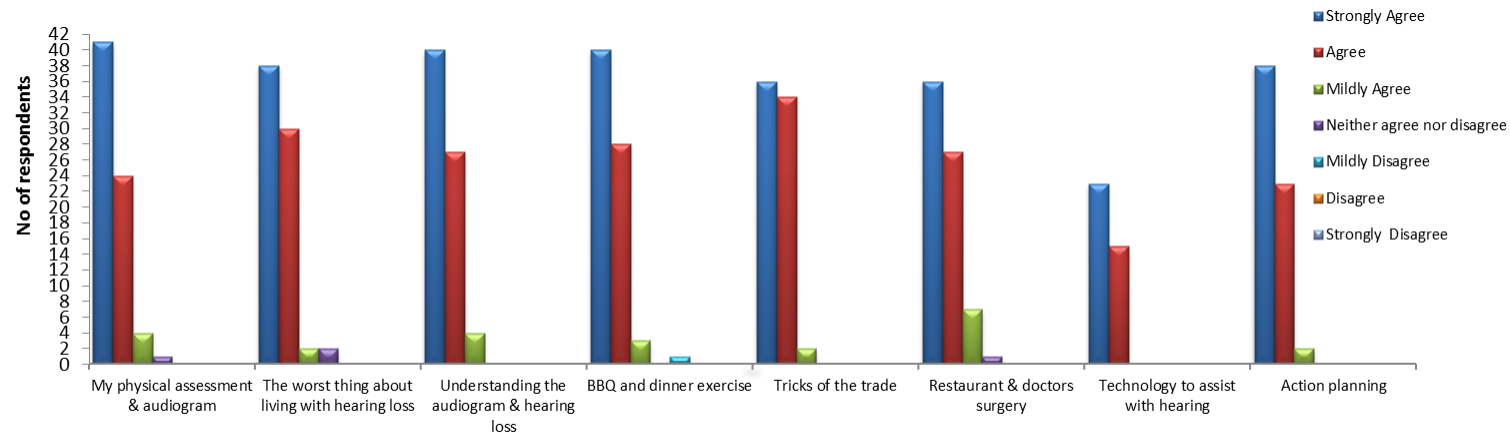


The session was conducted at an appropriate pace

Participant numbers: 56

Partner numbers: 16

	Strongly Agree	Agree	Mildly Agree	Neither agree nor disagree	Mildly Disagree	Disagree	Strongly Disagree	No Comment /Not Applicable
My physical assessment & audiogram	41	24	4	1	0	0	0	0
The worst thing about living with hearing loss	38	30	2	2	0	0	0	0
Understanding the audiogram & hearing loss	40	27	4	0	0	0	0	0
BBQ and dinner exercise	40	28	3	0	1	0	0	0
Tricks of the trade	36	34	2	0	0	0	0	0
Restaurant & doctors surgery	36	27	7	1	0	0	0	0
Technology to assist with hearing	23	15	0	0	0	0	0	0
Action planning	38	23	2	0	0	0	0	0

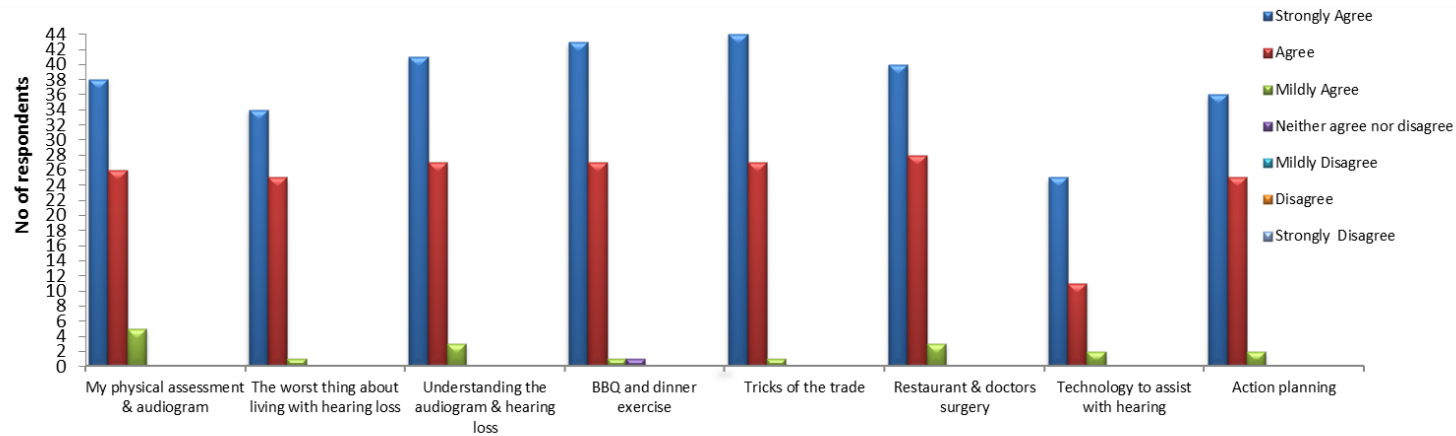


## I found the language and concepts easy to grasp

Participant numbers: 56

Partner numbers: 16

	Strongly Agree	Agree	Mildly Agree	Neither agree nor disagree	Mildly Disagree	Disagree	Strongly Disagree	No Comment /Not Applicable
My physical assessment & audiogram	38	26	5	0	0	0	0	0
The worst thing about living with hearing loss	34	25	1	0	0	0	0	0
Understanding the audiogram & hearing loss	41	27	3	0	0	0	0	0
BBQ and dinner exercise	43	27	1	1	0	0	0	0
Tricks of the trade	44	27	1	0	0	0	0	0
Restaurant & doctors surgery	40	28	3	0	0	0	0	0
Technology to assist with hearing	25	11	2	0	0	0	0	0
Action planning	36	25	2	0	0	0	0	0

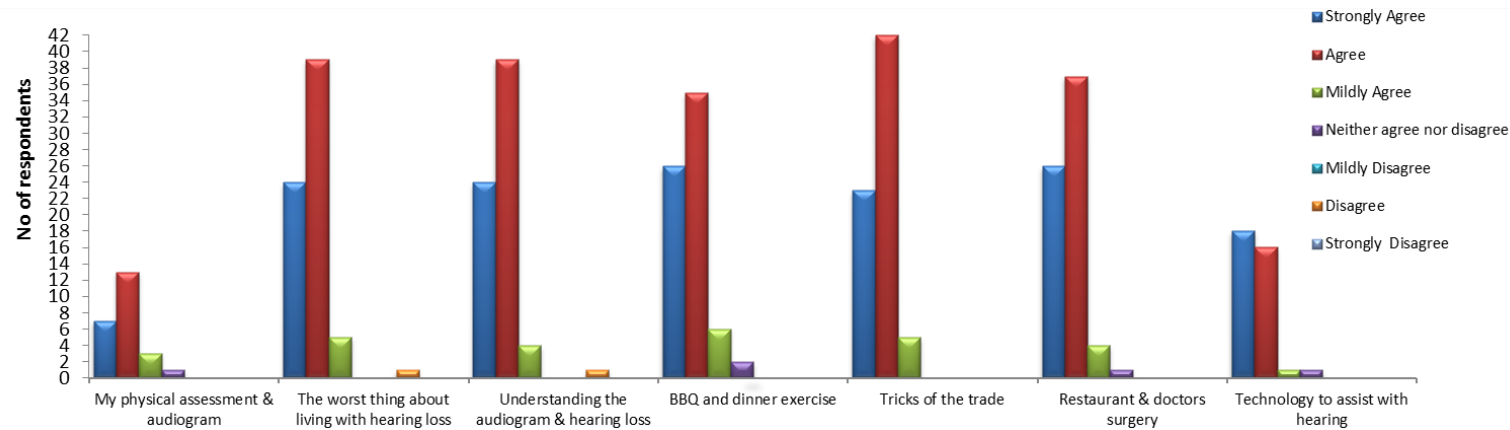


## The Easier Listening booklet contained useful information

Participant numbers: 56

Partner numbers: 16

	Strongly Agree	Agree	Mildly Agree	Neither agree nor disagree	Mildly Disagree	Disagree	Strongly Disagree	No Comment /Not Applicable
My physical assessment & audiogram	7	13	3	1	0	0	0	0
The worst thing about living with hearing loss	24	39	5	0	0	1	0	0
Understanding the audiogram & hearing loss	24	39	4	0	0	1	0	0
BBQ and dinner exercise	26	35	6	2	0	0	0	0
Tricks of the trade	23	42	5	0	0	0	0	0
Restaurant & doctors surgery	26	37	4	1	0	0	0	0
Technology to assist with hearing	18	16	1	1	0	0	0	0
Action planning	0	0	0	0	0	0	0	0

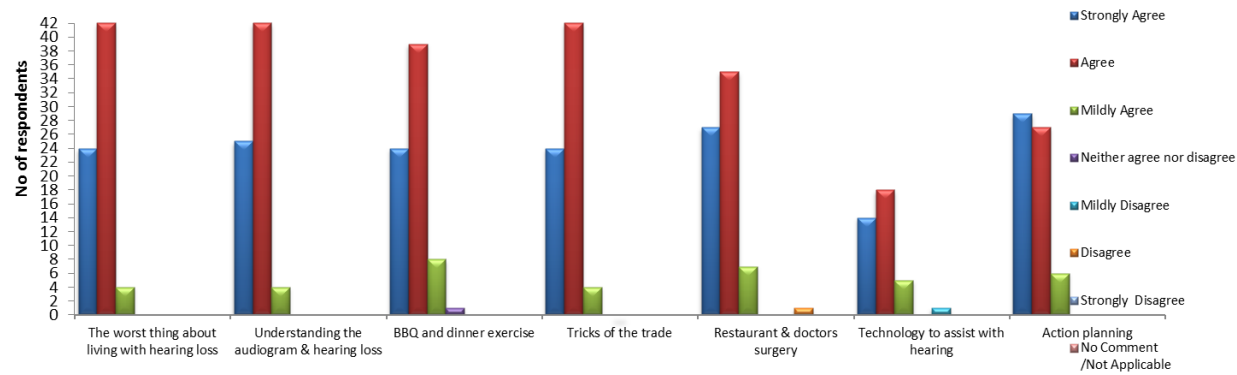


## The Easier Listening booklet contained useful information

Participant numbers: 56

Partner numbers: 16

	Strongly Agree	Agree	Mildly Agree	Neither agree nor disagree	Mildly Disagree	Disagree	Strongly Disagree	No Comment /Not Applicable
My physical assessment & audiogram	0	0	0	0	0	0	0	0
The worst thing about living with hearing loss	24	42	4	0	0	0	0	0
Understanding the audiogram & hearing loss	25	42	4	0	0	0	0	0
BBQ and dinner exercise	24	39	8	1	0	0	0	0
Tricks of the trade	24	42	4	0	0	0	0	0
Restaurant & doctors surgery	27	35	7	0	0	1	0	0
Technology to assist with hearing	14	18	5	0	1	0	0	0
Action planning	29	27	6	0	0	0	0	0



## The organistiaon of the session positively assisted learning and understanding

Participant numbers: 56

Partner numbers: 16

	Strongly Agree	Agree	Mildly Agree	Neither agree nor disagree	Mildly Disagree	Disagree	Strongly Disagree	No Comment /Not Applicable
My physical assessment & audiogram	0	0	0	0	0	0	0	0
The worst thing about living with hearing loss	34	32	4	0	0	0	0	0
Understanding the audiogram & hearing loss	38	30	2	0	0	0	0	0
BBQ and dinner exercise	33	34	3	0	1	0	0	0
Tricks of the trade	32	35	3	1	0	0	0	0
Restaurant & doctors surgery	36	31	2	1	0	0	0	0
Technology to assist with hearing	23	13	2	0	0	0	0	0
Action planning	39	19	3	0	0	0	0	1

