

The Effects of Cochlear Implants on the Quality of Life of Severely Hearing Impaired Adults in New Zealand

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ABSTRACT

The purpose of this report is to provide information that contributes to understanding the effects that cochlear implants (CI(s)) have on the quality of life of severely hearing impaired adults in New Zealand. For those adults who have become deaf and identify themselves as being part of the hearing community, it is unlikely they (or their family members) will become proficient users of sign language and integrate into the Deaf Community. Rather, they wish to integrate into the hearing community through the restoration of their hearing, for which CIs are a viable hearing solution. For them, severe to profound hearing loss is debilitating, encompassing feelings of being excluded to social isolation, reduced work opportunities, stresses within family relations, and an increased prevalence of depression and mental health issues. The findings of this report are based on a survey of 111 individuals about their quality of life pre and post CI, and face-to-face interviews with 10 individuals about their experiences. Many of the respondents reported that deafness had a severe negative impact on their lives due to the communication difficulties they faced. These ranged from lost career opportunities, the onset of mental health issues and the breakdown in family relations. Upon having their hearing restored through a CI, the respondents stated that their quality of life had improved dramatically, reporting improvements in their physical, emotional, mental and social wellbeing, family relations, career opportunities and self-confidence.

In 1997, the World Health Organisation (WHO) defined the health of an individual as being not only free of disease, but on an holistic state of physical, mental and social wellbeing. Based upon this model, the WHO recommended that a measurement of an individual's health must include an estimation of their wellbeing and quality of life alongside a reported presence of disease.

The construct 'Quality of Life' is an individual's perception of their position within society, and in relation to their goals, expectations, standards and concerns. Felce and Perry (2005) outlined Quality of life as a comprehensive construct, spanning five areas of wellbeing, including:

- Physical Wellbeing
- Material Wellbeing
- Social Wellbeing
- Emotional Wellbeing
- Productive Wellbeing

The OECD (2011) reported that people's health is one of their most valued aspects of their quality of life, with surveys in many countries finding that people put health status and employment at the top of what impacts their lives. Individuals also reported other influencers on their quality of life, such as being able to participate in family and community life, socialising, attending school and further education.

For the majority of people who have been hearing and become deaf, these opportunities become more limited as their hearing deteriorates. Bond *et al* (2009) found that individuals reported significant changes in their quality of life due to becoming more isolated from family and friends. In addition, many experienced reduced opportunities at work, further education and participation in social activities. The social isolation reported by severely hearing disabled adults has been attributed to the communication impairments caused by their hearing loss.

An epidemiology study conducted by Cochlear Limited (CLTD) as part of their Core Value Dossier (2013:49) also highlighted how the communication difficulties experienced by

severely hearing disabled adults impacted on their quality of life. Some of the issues experienced and reported include:

- Anxiety
- Social withdrawal
- Anger and frustration
- Depression and depressive symptoms
- Self-criticism
- Panic disorders
- Social phobias

In concurrence with these findings, Hawthorne and Hogan (2002) and Wilson (1997) also found that individual's affected with moderate to severe hearing loss struggled more in social situations and needed increased assistance with daily living which impacted on their quality of life. Research into the economic impact of hearing loss conducted by Access Economics (2005) supports these findings, noting that individuals living with a severe hearing loss were sixteen times more likely to require help for difficulty in daily living than their hearing peers. In addition, the report noted that severe hearing loss rated between a major depressive episode and pneumonia as per the WHO burden of disease model while Ware *et al* (1993) found that people with severe hearing loss, and those who rated their hearing loss as problematic, reported a reduced quality of life.

Furthermore, a study into the effects of hearing loss on quality of life conducted by Hogan (2009) found a variety of negative and poorer outcomes for those affected. Hogan cited research by Access Economics Australia (2005), Hogan *et al* (2001), Ware *et al* (1993, 1994) and Wilson (1997), all of which highlighted that individuals' with hearing loss experience both physical and mental health effects associated with their hearing loss.

However, what is less clear is the nature of this relationship. Hogan *et al* (2001) believe an individual's perception of the severity of their hearing loss is dependent upon the difficulties they experience. Hogan proposed that there is a threshold effect between an individual's perception of their hearing loss and reduced quality of life. This means that up to a certain point, hearing loss has a negligible effect on health due to the minimal difficulties experienced by an individual, but after that point, when more difficulties are encountered, a considerable effect can be observed. In contrast, Wilson (1997) differs in his view, believing

there is a causal link between hearing loss and reduced quality of life rather than a perceptual linkage.

Still, as more difficulties in communication are experienced, individuals with severe hearing loss often withdraw from social participation and engagement in relationships. This intensifies the social isolation they experience and puts them at increased risk of associated health problems. Moreover, Kochlin & Rogin (2000) found communication difficulties only served to exacerbate social isolation through the withdrawal from social activities, which in turn, restricts social life even more.

Further health impacts of severe hearing loss have also been discovered, including a correlation between dementia, cognitive decline and severe hearing loss. To explore this phenomenon further, Lin *et al* (2011) conducted a prospective study to determine if hearing loss was a risk factor for dementia. Lin concluded that hearing loss was associated with acceleration in cognitive decline and was an independent risk factor for dementia. However, he noted it was unclear as to whether hearing loss was an early indicator of dementia or a modifiable risk.

Additionally, Lin & Ferrucci (2012) found an association between hearing loss and an individuals' risk of falling. They discovered that for every 10-decibel (db) increase in hearing loss, there was a 1.4 fold increase in falling, though the reason for this increase is still unknown. Kochlin & Rogin (2000) also discovered an increased risk to personal safety and the safety of others as hearing loss deteriorated, while Access Economics (2005) noted a 3.0 fold increase in the utilization of General Practitioner (GP) services by individuals with severe hearing loss.

As well as the impact on physical health, other areas known to impact on quality of life are education, employment, financial status, social and emotional wellbeing. The 2011 report into quality of life conducted by the OECD, found the two most influential factors impacting an individual's quality of life were health status and employment. Yet, Hogan *et al* (1999) found that those living with hearing loss had poorer educational and employment outcomes than the rest of the population. Furthermore, Cruickshank's *et al* (1998) found that individuals with a hearing loss were 2.42 times less likely to complete high school than their peers.

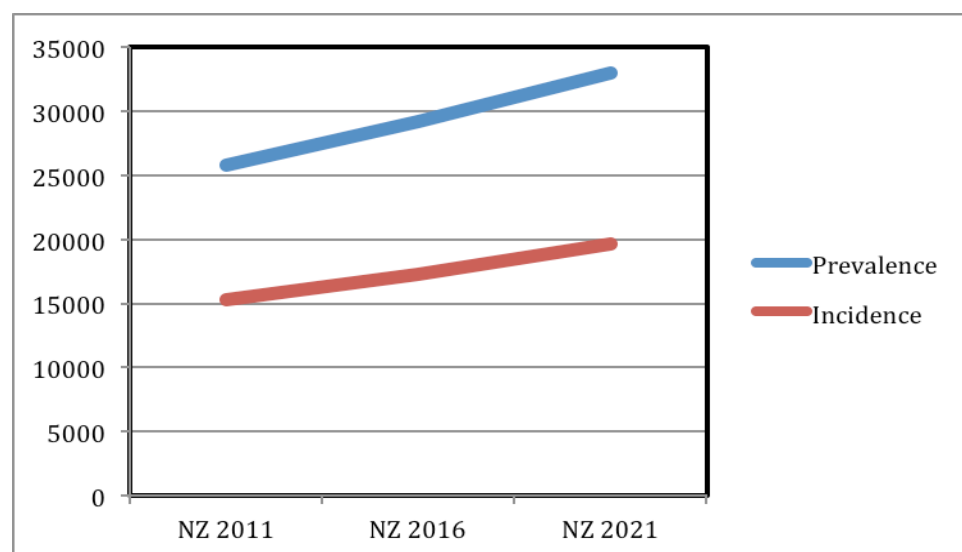
Likewise, the Access Economics report (2005:60), discovered poorer employment outcomes for older individuals with hearing loss, with 47.7 % of men aged between 45-64 living with a hearing loss being employed compared to 67.9% of their hearing peers. The same trend was noted for women aged between 45-64 with a hearing loss, with 30.2% employed compared to 46.7% of their hearing peers. The report calculated the lost earning potential to the Australian economy to be \$6.67 billion, equating to 0.79% of Gross Domestic Product (GDP).

What is more, the World Health Organisation (WHO) Global Burden of Disease model, places the onset of hearing loss in adults as the third leading cause of disability (Stephens *et al*, 2011). Based on the WHO Global Burden of Disease project, prevalence and incidence rates for New Zealand were calculated by CLTD, as 0.7% of the population with rates predicted to rise to 0.88% over the next eight years.

Table 1.0. Prevalence & Incidence of Severe Hearing Loss in NZ:

Year	Adult Population	Prevalence	Incidence
NZ 2011	3415983	25866	15285
NZ 2016	3590541	29195	17271
NZ 2021	3751087	33054	19643

Figure 1.0. Prevalence & Incidence of Severe Hearing Loss in NZ:



The detriment to quality of life caused by severe to profound hearing loss is significant, yet funding is limited within New Zealand (Gunn, 2010). Lengthy waiting times for a cochlear implant have been shown to further exacerbate health and quality of life outcomes for adults with severe hearing loss. Guitar *et al* (2013), found that adults exposed to lengthy waits, combined with the uncertainty of surgery dates for an implant, were at increased risk of developing chronic stress and associated health problems.

Given the effect of severe hearing loss on quality of life, the National Institute of Clinical Excellence (NICE) in the UK conducted a comprehensive review of Cochlear Implants on the health utility and quality of life gains to deaf adults. NICE found that Cochlear Implants were a cost effective use of NHS resources and recommended that individuals who met the criteria for a Cochlear Implant, should be implanted within six months.

Aim

This study continues the investigation of severe hearing loss on quality of life for post lingual deaf adults in New Zealand, and the impact a Cochlear Implant has on their self reported quality of life. The aim of this study was to provide information that contributes to understanding the effects that Cochlear Implants have on the quality of life of severely hearing impaired adults in New Zealand. It was anticipated that severely hearing disabled adults would report an improvement in quality of life post CI.

Method

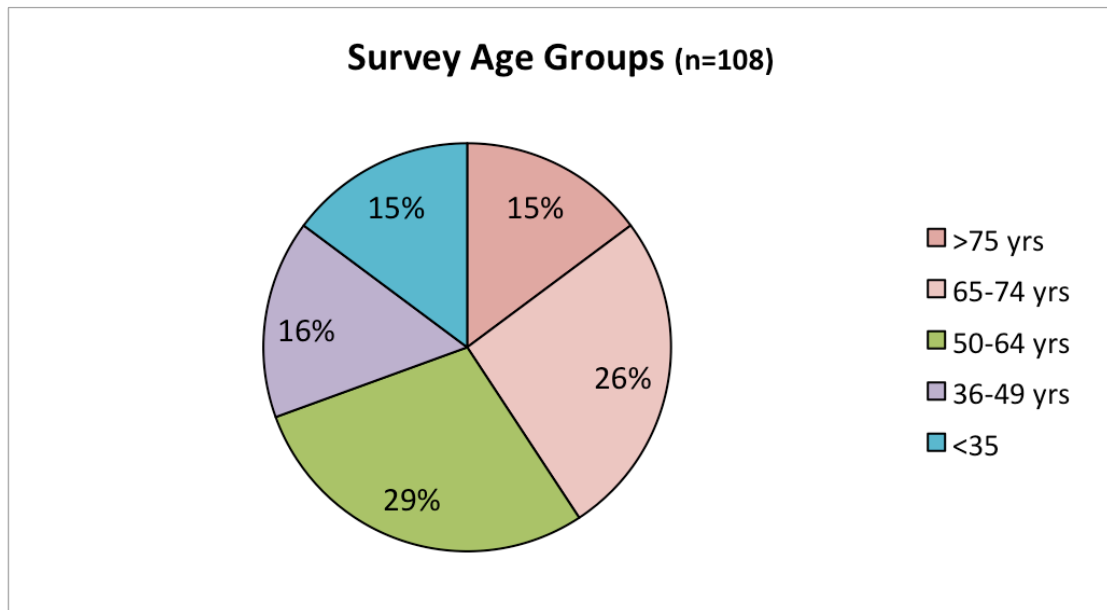
For a hearing loss to impact on quality of life, there must be a reported hearing disability. Therefore, respondents included in this study were identified as having a severe hearing loss/disability through acceptance onto the publicly funded Northern Cochlear Implant Programme.

To examine the potential impact of CIs on the quality of life of severely hearing disabled adults, the study design utilized information based upon the WHO-QOL 100 measure, interviews with researchers and consumers, and a review of the literature on impact of severe hearing loss on quality of life. Combining this information, a self-report online survey was developed, which included 33 questions to encompass experiences with severe hearing loss and CIs. Respondents completed the online survey through the Survey Monkey digital

platform.

A total of 111 respondents began the survey, of which 84 had a CI and 27 were on the national waiting list for an implant. Sixty-three specified their gender as female and 46 male, with 108 indicating their age range as noted below in Figure 2.0:

Figure 2.0: Age demographic of Survey Respondents.



In addition to the survey, face-to-face interviews were conducted with ten individuals about their experiences pre and post CI. Of the ten interview respondents, six had a CI, while four were interviewed both pre and post CI.

The survey included eight questions pertaining to demographic information (e.g. pre-post CI, date of birth, gender, family status, educational attainment level, profession, employment status, health insurance). Seventeen items concerned the respondents' quality of life (for both pre & post CI) and covered areas such as medication use, sleep, mood, hearing & communication, self-care, relations, family life, intimate relations, citizenship and work. The questions used a four-point scale ranging in values from "I do not" to "I do". An additional seven items in the survey assessed the quality of life impact a CI had on the life of the respondent. The majority of the items were scored on a five-point scale, similar to the example above ranging in values from "greatly improved" to "not improved".

Results

Results were analysed using the in-built analytic software on Survey Monkey, which compared responses for those pre and post CI. In addition, narrative responses were correlated for a commonality between experiences.

The data responses for educational and employment levels are presented in Table 2.0.

Table 2.0: Education & Employment Levels

	Did not complete High School	High School	Trade/undefined Qualification	Vocational Qualification	University Degree	Post Graduate/Master Degree	Doctorate Degree	Total
Q1: Yes, I have a cochlear implant.	8.43% 7	34.94% 29	14.46% 12	22.89% 19	16.87% 14	2.41% 2	0% 0	83
Q1: No, I do not have a cochlear implant.	0% 0	29.17% 7	25% 6	33.33% 8	4.17% 1	8.33% 2	0% 0	24
Total Respondents	7	36	17	27	15	4	0	106

	Student	Employed	Unemployed	Retired	Retired early due to disability	Total
Q1: Yes, I have a cochlear implant.	7.50% 6	41.25% 33	10% 8	32.50% 26	8.75% 7	80
Q1: No, I do not have a cochlear implant.	0% 0	36% 9	8% 2	52% 13	4% 1	25
Total Respondents	6	42	10	38	8	104

Similar outcomes are reported for educational attainment in both groups, with the exception of a University degree where 16.87% of post CI compared to 4.17% of pre CI users have a degree. Employment data is also comparable, with 41.25% of post CI and 36% of pre CI users being employed, though 52% of pre CI users are retired in contrast to 32.5% of post CI users. Patient reported experiences gave further insights into employment issues faced by pre and post CI users. Two patients interviewed reported having to close their businesses due to difficulties in communicating with their clients. The following is an abstract from a narrative with a pre CI client:

A: "The effects which deafness has on ones life cannot be over-estimated. Not only did I lose my Practice, my livelihood, my savings for retirement - all traumatic never to be recovered results, but I lost my place in our Society. Deafness isolates you from your family, from your

friends, from every avenue of previous communication. Such humble necessities as shopping, making a Doctor's appointment, asking for directions, even how much an item costs, are all a minefield for the deaf. A deaf person in company causes awkwardness. With the best will in the world the pace of life cannot be slowed down until the deaf person has "got it". We who are deaf are all too much aware of the imposition on the most understanding people, and the result is that the deaf will withdraw still further into their isolation. In their own little and silent world they muddle through, knowing at least that they are not a trouble to anybody. Likening it to a living death is not too much of an exaggeration."

In contrast, during a face-to-face interview with a post CI client, an employer's perspective was shared, which highlighted the benefits of a cochlear implant to employee productivity:

B: "Prior to A having his cochlear implant his hearing had deteriorated to such an extent it was very difficult for us to communicate, messages could easily be misconstrued/which was a huge concern in an environment that demands attention to detail while working with such fine tolerances. After having the CI, communication over day-to-day operations is easy and A can now take part in daily conversations. As an employer the outcome is fantastic, it makes for a happy & productive team."

Questions 9 & 10 in the survey related to medicinal use and GP visits. Post CI users reported a lower dependency on medicines and fewer visits to their GP than pre CI users. Forty-three percent of pre CI users were dependent on three or more medicines a day in comparison to 19% of post CI users. A similar trend was noted for GP visits, with 15.48% of post CI users regularly visiting their GP in contrast to 31.82% of pre CI users. In addition, 30% of all respondents reported endangering themselves or another as a direct result of their severe hearing loss.

Questions 11 & 12 related to sleep and mood. In regards to sleep, 19% of post CI users could get back to sleep without difficulty as opposed to 31.8% of pre CI users. Furthermore, 45% of post CI users reported feeling anxious in comparison to 83% of pre CI users. Table 3.0 summarizes the responses:

Table 3.0: Mood responses:

	I do not feel anxious worried or depressed.	I am slightly anxious, worried or depressed.	I am moderately anxious, worried or depressed.	I am extremely anxious, worried or depressed.	Total Respondents
Q1: Yes, I have a cochlear implant.	55.00% 44	32.50% 26	8.75% 7	3.75% 3	80
Q1: No, I do not have a cochlear implant.	18.18% 4	59.09% 13	22.73% 5	0% 0	22
Total Respondents	48	39	12	3	102

In relation to support from family and friends, there was no notable difference in the results; however, there was a significant difference in feelings of loneliness and relationships with others. Of the respondents, 8.4% of post CI users reported often feeling lonely in contrast to 29% of pre CI users. Patient reported experiences gave a qualitative insight into the above quantifiable measure. Excerpts from face to face interviews are included to give an in-depth understanding of the issues facing severely hearing-impaired adults.

C: "Inability to understand verbal communication results in feelings of isolation when you are left out of group conversations. To avoid shame, people with hearing loss sometimes choose isolation."

D: "The stress of living with hearing loss can make you distrust others, have chronic sadness or depression, nervousness, anger or irritability, isolation, poor self-image, feelings of incompetence or inadequacy, or feeling marginalised."

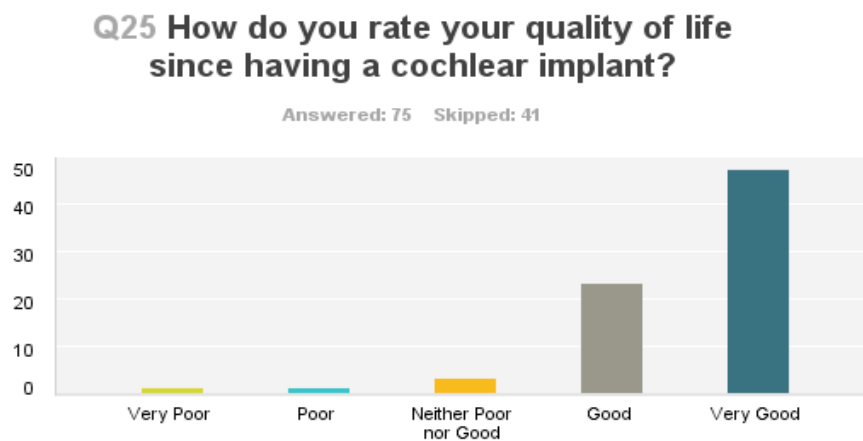
E: "Feeling depressed as a result of your hearing loss, you experience fear, anger, self-reproach, self-loathing, guilt, incompetence, unworthiness, and sadness. You may see the future as hopeless. At worst, thoughts of suicide can occur. The prejudices that are unfortunately often associated with hearing loss can exacerbate low self-esteem. People with hearing loss carry a social stigma as troublesome, slow witted, and tiresome."

In relation to levels of difficulty in hearing and communicating prior to having or pre-CI, there were similar responses noted for both groups with 53.4% and 60% reported respectively for difficulty in hearing and, 47.6% and 53.8% for difficulty with communication with others.

Over twice as many pre CI users needed help looking after themselves than post CI users, reporting assistance 45.5% of the time in comparison to 20%. There was no difference in ability to do household chores, though both groups reported difficulties in doing aspects of their jobs and participating in community life before having or pre CI.

Questions 25-32 in the survey were directed toward respondents post-CI and related to self-perceptions of changes in their quality of life. The percentage of respondents rating their overall Quality of Life post CI is shown in Figure 3.0:

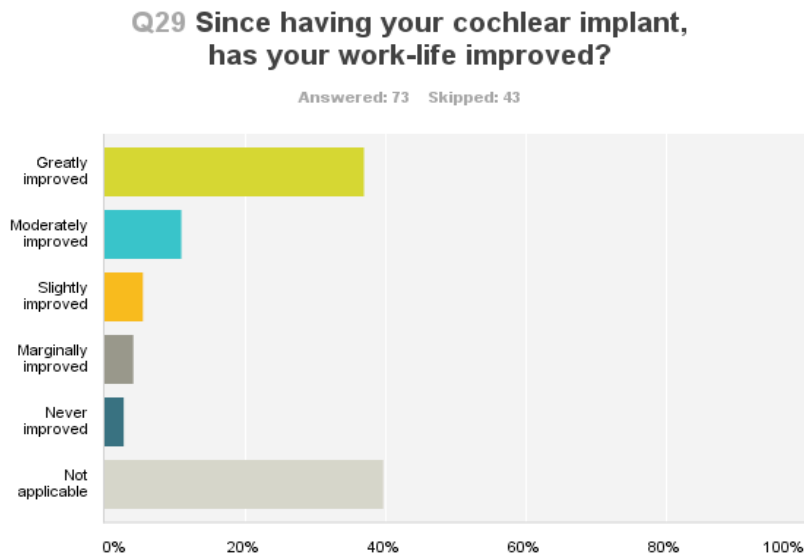
Figure 3.0 Quality of Life Post Cochlear Implant



In addition, 94% percent of post CI users rated their confidence as ‘very good’ and ‘good’ at 54% and 40% respectively. Likewise, 81.7% of respondents reported that their post CI hearing had positively affected their enjoyment of things, with 30% reporting their social participation had doubled and 66% reporting their participation in community life had improved.

Fifty eight percent of post CI respondents reported an improvement in their work life as highlighted in Figure 4.0:

Figure 4.0: Improvements in Work Life.



Some of the improvements at work noted by post CI users are included below:

F: "Dramatic change! I had been cut off before because people had given up on me. Now I can hear I am resuming a normal working life again. All my relationships have improved, I have been invited onto working groups, I can attend meetings, do training sessions, talk with confidence again."

G: "Three years after being implanted, my salary had doubled and I finally became manager of a department, previously out of reach because of my hearing."

Family life improved for 90% of post CI users and there was also a notable change for couples involved in intimate relationships, with 45.7% reporting improvements in their intimate relations.

In narrative responses, all of the respondents reported that deafness had a severe negative impact on their lives due to the communication difficulties they faced. These ranged from lost career opportunities, the onset of mental health issues and the breakdown in family relations. A sample of excerpts from pre CI clients noted the following:

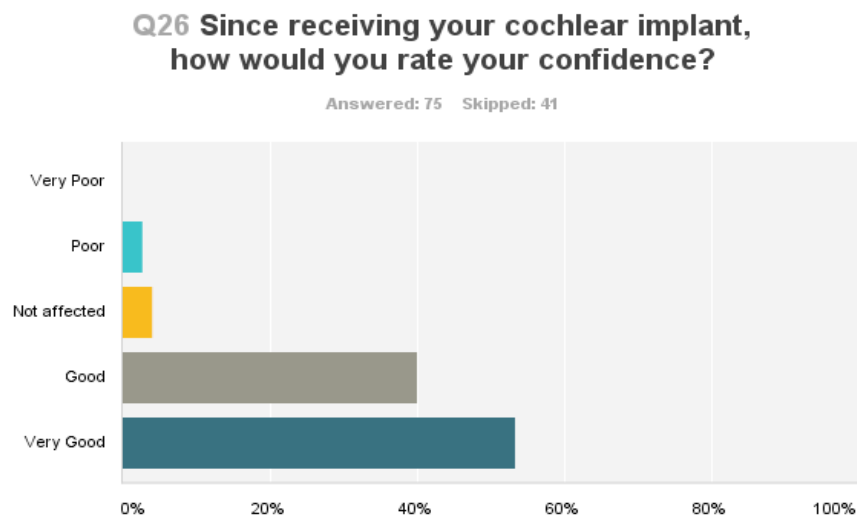
H: "I feel cut off from my family, my friends and loved ones. I live in a silent world, where my ability to communicate with those around me has been very cruelly robbed from me."

I: "My children miss not having me there as the wise ear to sound their issues off, and to guide them through their life's journey. As parents, we want to be there for our children, giving them words of wisdom and encouragement in every situation. But when you cannot hear your child's spoken word, that ability to guide and mentor diminishes, and so too does your role as a parent."

J: "To cultivate any intimate relationship communication is a vital ingredient and deafness makes it impossible. Deafness is a barrier to relationships..."

In comparison, upon having their hearing restored, 94% of CI users reported an improvement in their confidence; with 81.7% reporting their post CI hearing had positively affected their enjoyment of things. Additionally, 30% reported their social participation had doubled and 66% reporting their participation in community life had improved.

Figure 5.0: Confidence levels post Cochlear Implants



Discussion

The results of this survey clearly show that Cochlear implants are associated with impressive improvements in the physical, material, social, emotional, and productive well-being of adults with severe hearing loss, providing strong evidence for the importance of cochlear implants in improving quality of life. The use of Cochlear Implants as a hearing solution for severely hearing impaired adults positively related to the following areas of quality of life:

- Improved health status
- Reduced anxiety
- Improved career opportunities & earning capacity
- Improved relationships with family and friends
- Improved self confidence and esteem
- Improved personal & intimate relationships
- Increased social participation & community activity
- Increased Enjoyment of life

In contrast, more negative outcomes were noted for those with a severe hearing loss (pre CI). A larger proportion of them reported being dependent upon medications, and utilized GP services more than those with a cochlear implant. Furthermore, a third of all respondents reported putting themselves or others in danger as a direct result of their hearing loss before having, or waiting to have a cochlear implant which supports the findings of Kochlin & Rogin (2000). This is indicative of reduced health outcomes and higher health and safety risks for this group, adding support to the findings of Access Economics (2005) and Guitar *et al* (2013).

The study conducted by Guitar *et al* (2013) highlighted that within the New Zealand context, CI candidates on the public waiting list are exposed to lengthy and uncertain waiting times for an implant. They concluded this maybe an additional risk factor for candidates developing further stress-related health issues.

The respondents in this study, who are currently waiting for a CI, indicated higher levels of stress, social isolation and loneliness than post CI users as per the findings of Guitar *et al* (2013). In addition, Lin *et al* (2011) and Hogan (2009) also noted, individuals with severe hearing loss who become increasingly isolated are at greater risk of not only further decrements in communication skills, but cognitive decline and dementia.

Furthermore, previous research has found an association between social isolation and increased feelings of anxiety. Respondents in this study who are waiting for a CI also reported both higher incidences of social isolation and anxiety. It could be inferred that an

increase in social isolation and the subsequent reduction in social support puts an individual at increase risk of developing mood and emotional disorders, though the exact reason for this association is still unclear.

Given both groups of respondents in this study reported difficulties with hearing concentration and communicating with others prior to, and waiting for a CI, it could be suggested that these two factors play an integral role in the negative feelings reported by severely hearing impaired adults. One could imply that these negative feelings have a detrimental impact on interpersonal relationships, intimate relations, family functioning and emotional wellbeing.

Much of the literature on severe hearing loss indicates that adults often experience feelings of embarrassment, frustration, anger, rejection, and irritability which results in them withdrawing from social relationships, becoming isolated and lonely. This is aligned with the narratives given by respondents in this study.

In contrast, post CI users reported improved interpersonal relationships, enhanced career opportunities, improved confidence and emotional well being, enhanced social participation and community engagement. They were also three times more likely to have a warm and close familial relationship and loving intimate relations than a pre CI user. This would signify that there is a positive relationship between having a cochlear implant and an improvement in relationships. The logical conclusion would be the CI user experiences improved hearing and communication which lends itself to improvements in relationships and family functioning.

When questioned about work experiences, the majority of respondents reported difficulties at work prior to, or waiting to have a CI, especially in relation to communicating with colleagues and using the phone. For those on the waiting list for a CI, many expressed grave concerns around job security, with many experiencing anxiety about the impact of their hearing loss on their productivity. Two CI users reported having to close their businesses prior to them receiving their CI due to their difficulty in communicating with clients.

One pre CI user (who was an accountant and financial adviser), responsible for giving high level financial advice was afraid of misunderstanding the verbal instructions of their clients and opted to take early retirement.

In comparison, 58% of post CI users reported an improvement in their work life and productivity, with a one CI user doubling their salary within three years of implantation. Conversely, the National Institute of Clinical Excellence found that cochlear implants were a cost effective hearing solution for severely hearing disabled adults, given the health utility and quality of life gains to the individual. Although the economic impact of hearing loss on productivity has not been quantified in the New Zealand context, one could assume a similar trend to that noted in Australia by Access Economics (2005) of a cost of 0.7 % of GDP.

Post Cochlear Implant respondents stated that their quality of life had improved dramatically, reporting improvements in their confidence, enjoyment of things, social and community participation, social wellbeing, family relations and career opportunities. As one consumer noted, "Living with severe hearing loss was like being in a state of perpetual solitary confinement, cut off from all human relationships. The cochlear implant broke me out of my prison and gave me my life and freedom back." These benefits highlight the positive impact cochlear implants have on the quality of life of severely hearing disabled adults.

Conclusion

Overall, the study findings are aligned with previous research into the effects of cochlear implants on the quality of life of severely hearing disabled adults. The results of this study are important for a couple of reasons.

Firstly, they highlight the effects of cochlear implants on quality of life for severely hearing impaired adults in New Zealand.

Secondly, they imply that cochlear implants offer significant improvements to the quality of life of severely hearing impaired adults across a number of spectrums, including: health, emotional well being, education & employment, interpersonal relationships, family functioning & community engagement. The findings of this study are limited and further research is required to investigate the mechanism between severe hearing disability life and the impact of cochlear implants have in improving quality of life outcomes.

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