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Abstract

A nationwide survey of cochlear implant recipients was conducted to study how implants may impact people at work. Using a self-reporting questionnaire, recipients using four cochlear implant designs were surveyed about spoken communication on the job, overall job performance, job satisfaction, confidence in job retention and in seeking new employment, job promotion, and income. Of the implant recipients using their implants at work (106 people), the majority used their implants during all work hours and reported positive changes in their job situations. The survey results suggest that cochlear implants may help in mitigating functional limitations in the workplace resulting from profound hearing loss.

Clearly, deaf people are often at a disadvantage competing with normal hearing employees in the general work force (Winakur, 1973; Birnbaum, 1982). Marshall (1982) reports that communication problems inherent in hearing loss are the primary variables detrimental to successful job search, placement, and retention. Furthermore, the need for hearing-impaired people to maximize both receptive and expressive communication skills is of considerable concern today because of the changing job market, which is shifting from manufacturing to service-oriented jobs that are heavily dependent on spoken communication.

Although certain remedial measures such as lipreading and auditory training can help the profoundly hearing-impaired person, the most effective way to improve communication skills is to improve the individual's ability to hear. Most often, significant improvement in hearing ability can be achieved with conventional hearing aids. However, there are an estimated 131,000 to 294,000 profoundly hearing-impaired people for whom hearing aids provide little or no benefit (Hopkins et al., 1986). The development of the cochlear implant represents an unprecedented breakthrough in the auditory rehabilitation of these individuals. Cochlear implantation is the only medical treatment that may improve hearing abilities for those people with profound sensorineural hearing loss, a condition previously medically untreatable.

Little information is available on how cochlear implants assist hearing-impaired individuals with their communication skills in the workplace. In one study, 51 single-channel cochlear implant users were asked to rate the help derived from the implant at work. The majority (56%) noted that the cochlear implant was of "much" help or a "great" help at work. Twenty-five percent indicated that it was of no benefit. The remainder indicated that there was no change (House and Berliner, 1986). This study is the first attempt to explore the vocational consequences of cochlear implant use as reported by a nationwide group of cochlear implant recipients.

A cochlear implant is a device designed to stimulate the hearing nerve with electrical impulses. It is an acoustic transducer that changes sound or acoustic energy into electrical energy which can be received and conducted by the auditory nerve. These electrical signals then are interpreted by the brain as sound. When an individual has a pro-

found sensorineural hearing loss, hair cells of the inner ear are either missing or damaged and are unable to convert sound into electrical impulses. Although the hair cells are damaged in these individuals, some auditory nerve fibers are often still functional. The cochlear implant electrically stimulates these healthy nerve endings in order to create sound perception.

Cochlear implant candidates must have: (1) profound hearing losses in both ears, (2) lack of useful hearing for understanding speech when fitted with appropriate hearing aids, (3) no serious medical condition precluding surgery, (4) strong support from others such as family and friends, and (5) a strong desire to maximize their hearing potential. Documented cochlear implant benefits include: (1) restoration of a level of auditory sensation in response to sounds across the speech frequency range, (2) an increased awareness of environmental sounds, and (3) significant improvement in the ability to recognize speech when combined with lipreading. In addition, some multichannel cochlear implant patients have been able to recognize speech without using lipreading (Gantz et al., 1988). Furthermore, some multichannel patients can converse interactively on the telephone (Clark, 1986).

According to the major manufacturers of cochlear implants, there are now more than 2,000 cochlear implant recipients worldwide. At the time of this study (August, 1986), there were four implant designs available. These designs included the 3M/House signle-channel implant, the Nucleus 22-channel implant, the University of California at San Francisco/Storz implant, and the Ineraid cochlear implant. For a complete description of these designs, see Balkany (1986). This nationwide study surveyed recipients of these four implant designs to determine how the implants affected the recipients on the job.

Method

A Job Performance Inventory (JPI) was developed to assess 17 vocational outcomes and to obtain demographic data on cochlear implant recipients. Some questions compared the individual's responses prior to cochlear implant surgery and again after the surgery. Other questions assessed the degree to which the implant had changed a particular vocational outcome (e.g., confidence level in keeping a job, income, understanding spoken communication). Several questions were adapted from the questionnaire used in the 1984 Secondary School Graduate Follow-up Program for the Deaf (Macleod-Gallinger, 1985).

The JPI was mailed to 358 cochlear implant recipients. The manufacturers of the four cochlear implants mailed the questionnaires in order to maintain confidentiality of patient names. 3M mailed 183 JPI's to all individuals who had received the 3M/House cochlear implant after October, 1984. Cochlear Corporation mailed 100 JPI's to all recipients of the Nucleus Multichannel Cochlear Implant. Symbion Corporation mailed the JPI to all 60 Ineraid recipients and Storz Instrument Company mailed the JPI to all 15 Storz implant recipients. The JPI's were mailed twice two weeks apart to maximize the return rate. The questionnaires were returned to the investigators. Responses were accepted for analysis up to 31 days after the first mailing.

Results

There were 256 Job Performance Inventories (JPI's) returned (71.7% return rate). Of those 256 questionnaires, 35 were omitted because they were mailed inappropriately to children. Fourteen JPI's could not be used because the respondents that had been implanted had not yet been fitted with the external components of the device. An additional four JPI's were omitted because they were not completed. Therefore, there were 202 usable JPI's. In the 202 useable JPI's, 118 people indicated that they were currently employed. There were 106 of those who reported that they used their implants at work. This group of 106 was the primary focus of this study.

Table 1 shows the demographics of this group. The majority of the 106 employed respondents were employed in white collar jobs and were college educated. Eighty three indicated that they were adventitiously deafened. There were 63 men and 43 women with an average age of 45.5 years. The average length of time they had been using their implants was 17 months.

The JPI asked 17 questions about the vocational changes resulting from cochlear implant use on the job beginning with Question 5 on the form. Results for each of these questions will be addressed using the 106 JPI's of the respondents who were employed and used their implant at work. All 106 respondents did not answer every question so the number responding differs for each question.

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TABLE 1

CHARACTERISTICS OF 106 COCHLEAR IMPLANT RECIPIENTS WHO USED THE IMPLANT AT WORK

GENDER	*N=106*
Female	43
Male	63

AGE	*N=97*
Mean	45.5 yrs
Standard Deviation	12.7 yrs

AGE ONSET OF DEAFNESS	
0-3 yrs	21
3-18 yrs	24
18+ yrs	59

OCCUPATIONAL LEVEL	*N=101*
White Collar	85
Blue Collar	16

IMPLANT TYPE	*N=102*
Nucleus	35
3M/House	39
Storz	5
Ineraid	23

LENGTH OF IMPLANT USE	*N=81*
Mean (mos.)	17.4
Standard Deviation	15.4

Note: The total N differs for each factor because respondents did not answer all questions.

Questions and responses.

Question 5. Employment status (before and after implantation)? (1. Yes, I had a job, 2. No, I did not have a job but was looking for a job, 3. No, I did not have a job and I was not looking for a job).

Question 5 compared the employment status prior to implantation to employment status following initial stimulation by sound through the implant. The majority of the respondents (86%) did not change jobs following implantation.

Question 6. Type of occupation (before and after implantation)? (Choice of seven categories.)

No respondents indicated that they moved from white collar jobs to blue collar jobs or vice versa after implantation.

Question 7. Average time spent per day in spoken communication on the job (before and after implantation)? (0-1 hours, 1-2 hours, 2-4 hours, 4-6 hours, 6-8 hours).

Question 7 compared the average time per day spent in spoken communication on the job before and after implantation. A Wilcoxon Matched Pairs Signed Ranks Test indicated that a significant number of individuals increased the amount of time spent in spoken communication on the job after implantation ($p < .05$). After implantation, 54.7% used spoken communication on the job 4 to 8 hours per work day, 17.9% used spoken communication 2 to 3.9 hours, and 19.8% used spoken communication less than 2 hours per day.

Question 8. How much do you feel your cochlear implant has changed your understanding of spoken communication on the job (circle one)? (1 - greatly decreased, 2 - somewhat decreased, 3 - no change, 4 - somewhat increased, 5 - greatly increased).

Question 8 asked respondents to rank the degree of change in understanding spoken communication on the job. Ninety-four out of 103 (91.2%) indicated that their understanding of spoken communication somewhat or greatly increased on the job as a result of cochlear implant use. Only eight out of 103 noted no change and one person reported a decreased understanding of spoken communication after implantation. Table 2 lists changes resulting from implant use for questions 8, 9, 11, 12, and 14.

Question 9. How much do you feel your cochlear implant has affected your job performance (circle one)? (1 - greatly decreased, 2 - somewhat decreased, 3 - no change, 4 - somewhat increased,

TABLE 2

CHANGES RESULTING FROM IMPLANT USE ON THE JOB

VOCATIONAL OUTCOME	N	DECREASED	NO CHANGE	INCREASED
Spoken communication on the job	103	1.0%	7.8%	91.2%
Overall job performance	102	2.0%	31.4%	66.6%
Confidence in job retention	103	1.0%	35.0%	64.0%
Confidence in obtaining a new job	94	0%	43.6%	56.4%
Change in income	100	1.0%	85.0%	14.0%

Note: Total number differs because respondents did not answer all questions.

5 - greatly increased).

Question 9 asked respondents to rank their feelings about how cochlear implantation affected their overall job performance. Sixty-eight out of 102 respondents (66.6%) noted somewhat or greatly increased job performance as a result of implant use.

Question 10. Major mode of communication on the job before and after implantation (mark all that apply). (Choices: interpreter, sign language, lip/speech reading, gestures/pantomime, writing/pictorial, hearing with hearing aid(s)).

Question 10 evaluated whether changes in major modes of communication were noted following implantation. Figure 1 compares the number of respondents (n=103) using each major mode of communication on the job prior to implantation and after implantation. Eighty-six people reported that lipreading was a major communication mode before both and after implantation. More people (72) reported hearing as a major communication mode after implantation than before (33 people). Fewer people (21) reported writing as a major mode of communication after than before implantation (57 people). The use of writing, gestures, and sign language were reported less as major communication modes following implantation.

Question 11. How much do you feel your cochlear implant has changed your confidence level in keeping your job (circle one)? (1 - greatly decreased, 2 - somewhat decreased, 3 - no change, 4 - somewhat increased, 5 - greatly increased).

Question 11 measured changes in confidence levels about job retention. Sixty-six out of 103 (46%) indicated that their confidence level in retaining their job had somewhat or greatly increased. Thirty-five people (36%) stated that it stayed the same and only one respondent reported decreased confidence.

Question 12. How much do you feel your cochlear implant has changed your confidence level in obtaining a new job (cicle one)? (1 - greatly decreased, 2 - somewhat decreased, 3 -no change, 4 - somewhat increased, 5 - greatly increased).

Question 12 assessed confidence in seeking new employment. Fifty-three out of 94 people (56.4%) reported somewhat or greatly increased confidence with their implants.

Question 13. Have you gotten a job promotion as a result of your implant? (yes, no)

Only five out of 99 respondents reported a promotion resulting from cochlear implant use.

Question 14. How much has your cochlear

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implant changed your income (circle one)? (1 - greatly decreased, 2 - somwhat decreased, 3 - no change, 4 - somewhat increased, 5 - greatly increased).

Question 14 addressed income change as a result of implant use. Eighty-five out of 100 respondents indicated no change in income and 14 people reported an increase in income attributable to implant use.

Question 15. How do you feel about these areas of your job (before and after implantation)? (1 - very unhappy, 2 - often unhappy, 3 - not sure, 4 - often happy, 5 - very happy).

Question 15 was concerned with job satisfaction in five different areas, (1) pay, (2) activities/duties, (3) education and training on the job, (4) supervision, and (5) level of success. Figure 2 compares job satisfaction before implantation to after implantation in the five areas. Wilcoxon Matched Pairs Signed Ranks Tests were conducted for each of the five areas to determine if the numbers of individuals reporting a change after implantation was significant at the $p = .05$ level of significance.

In four areas there was a significant number of individuals reporting an increase in job satisfaction after implantation. There was not a significant difference before and after implantation for satisfaction with pay received ($p > .05$). However, there was a significant number reporting greater satisfaction with activities and duties on the job ($p < .05$), education and training on the job ($p < .05$), the supervisor/boss ($p < .05$), and success level ($p < .05$).

Question 16. Do you now have a job that you feel you could not have done before receiving your implant? (yes, no, unknown).

Sixty-four out of 104 (60.4%) answered no to this question. A substantial number (17) were unsure and 23 respondents checked yes.

Question 17. At the present time, do you feel you have a significant hearing loss which interferes with your job performance? (always, usually, sometimes, rarely, never).

Fourteen people reported that their hearing loss always or usually interfered with their jobs. Twenty-four people reported no job interference. A majority (59) indicated that their hearing loss sometimes affected their job performance. Note that this question did not assess pre-implant impressions or how much hearing was required in each particular job situation.

FIGURE 1

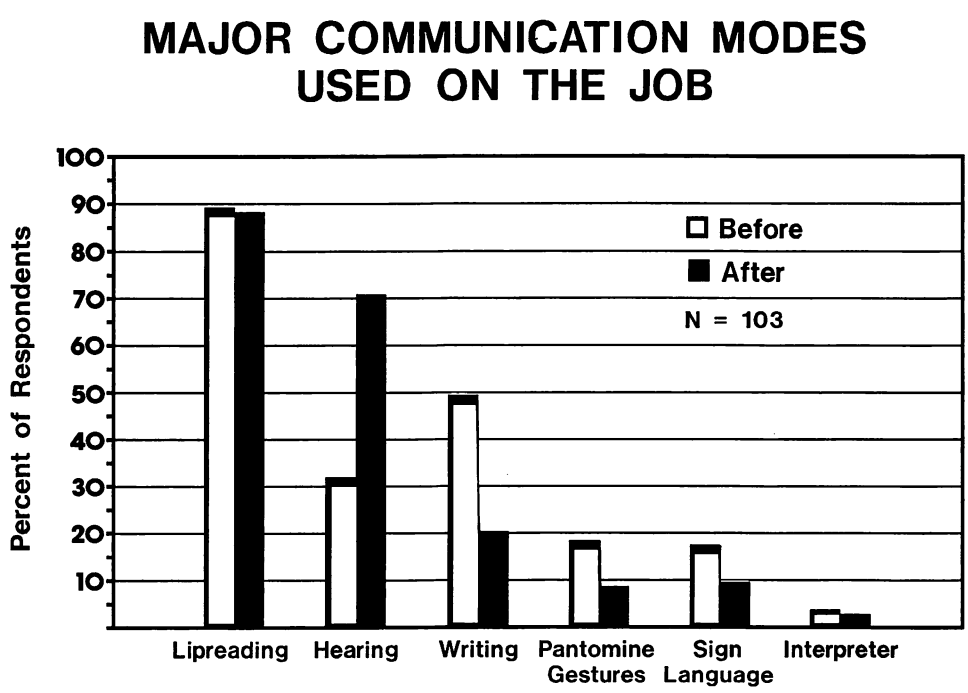

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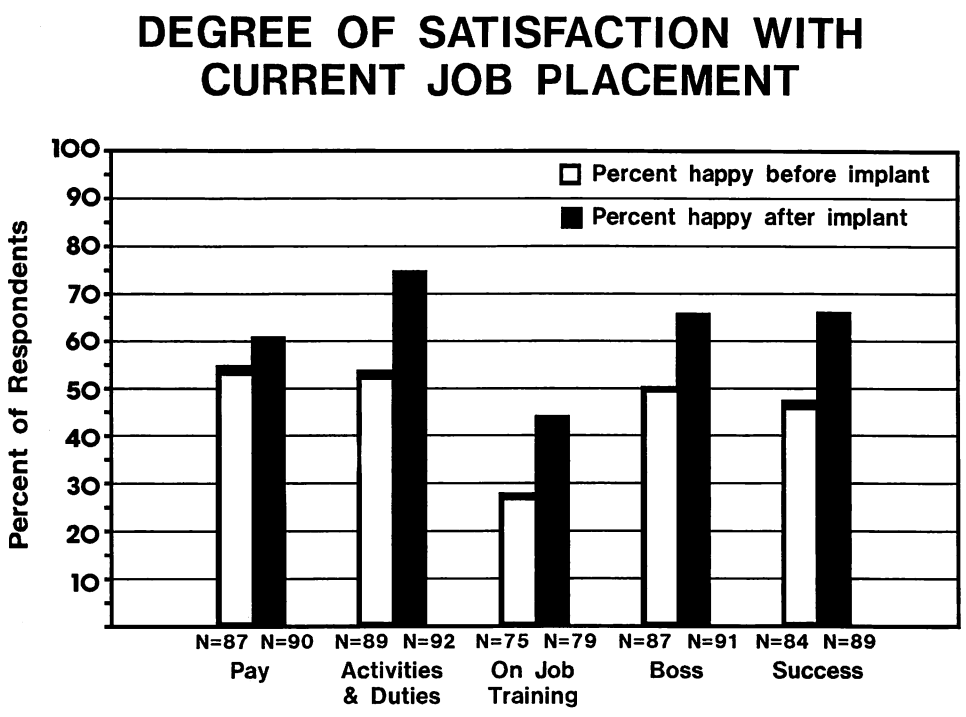
FIGURE 2



Discussion

A survey was sent to 358 cochlear implant recipients in order to assess the vocational consequences of cochlear implant use. This study analyzed 106 surveys representing implant recipients who used their cochlear implants on the job.

There were several limitations to this study that prevent generalization to all profoundly hearing-impaired workers who use cochlear implants. First, the survey questions were not pilot-tested for reliability or for psychometric characteristics. However, a group of professionals including audiologists, rehabilitation counselors, employers, and implant users reviewed the questions for appropriateness and ease of understanding.

Second, the survey demographics indicated that most of the employed implant recipients were white collar, college-educated, and lost their hearing after entering the workplace. They also had stable work histories. Therefore, the survey results cannot be interpreted as representing all potential employed cochlear implant users.

Finally, the survey recipients represented implant patients having their implants an average of only 17.5 months. Several studies have reported improvement in speech performance over time in implant users (Schindler et al., 1986). Therefore, the survey results do not represent the maximum benefit a user might gain from a cochlear implant. Longitudinal studies are required in order to examine the long term effects of implant use in the workplace.

In spite of the survey's limitations, several results suggest that cochlear implants significantly help in mitigating functional limitations resulting from profound hearing loss on the job.

1). Changes in major modes of communication were reported after implantation. Although lipreading remained the most frequently cited mode, hearing through the implant was the second most frequently reported mode after implantation. Prior to implantation, writing was the communication strategy cited most frequently after lipreading.

2). Implant users reported using significantly more spoken communication on the job. They also indicated that they understood speech better during their working hours

with the cochlear implant.

3). Job satisfaction and the feeling of success on the job increased for most implant users. Increased confidence in job retention or in seeking new employment were reported by over half of the respondents. A significant number of implant users reported that their on-the-job training and employee/employer relations had improved following implantation. While few cochlear implant recipients who used their implant at work reported a change in income or job promotion as a result of implant, well over half of them reported an increase in overall job performance. Some individuals were already beginning to perform jobs that they felt they were unable to do prior to receiving a cochlear implant.

Implications

The survey results strongly suggest that cochlear implants assist profoundly hearing-impaired workers. However, appropriate selection of cochlear implant candidates must be made. The appropriate selection of an individual requires medical, audiological, and psychological testing as well as appropriate counseling of the client about what to expect from the implant. Cochlear implants do not provide normal perception of speech through hearing alone. Post-implant auditory training is mandatory in order to maximize an individual's hearing potential. This rehabilitation period, which also includes the adjustment and fitting of the speech processor, can require as much as 30 to 50 hours. Therefore, commitment to the rehabilitation period must be assured prior to surgery.

In conclusion, cochlear implants offer an alternative to profoundly hearing-impaired persons, who desire to improve their understanding of spoken communication. This study demonstrated that the majority of cochlear implant recipients nationwide who use their implants at work are deriving significant benefit from them with respect to improved spoken communication at work, job satisfaction, confidence in retaining or changing employment, and improved overall job performance.

REFERENCES

Balkany, T.J. (1986). **The Cochlear Implant.** Philadelphia: W.B. Saunders.

Birnbaum, D.S. (1982). An analysis of government job status for hearing impaired. **Deaf American, 35,** 15-24.

Clark, G.M. (1986). The University of Melbourne/Cochlear Corporation (Nucleus) Program. **Otolaryngology Clinic North America, 19,** 329-354.

Gantz, B.J., Tyler, R.S., Knutson, J.F., Woodworth, G., Abbas, P., McCabe, B.F., Hinrichs, J., Tye-Murry, N. Lansing, C., Kuk, F., and Brown, C. (1988). Evaluation of five different cochlear implant designs: audiologic assessment and predictors of performance. **Laryngoscope, 98,** 1100-1106.

Hopkinson, N., McFarland, W., Owens, E., Reed, C., Shallop, J., Tillman, T., Tyler, R., and Williams, P. (1986). Cochlear implants. **ASHA, 28:4,** 29-52.

House, W.F. and Berliner, K.I. (1986). Safety and efficacy of the House/3M Cochlear Implant in profoundly deaf adults. **Otolaryngology Clinics of North America, 19,** 275-286.

MacLeod-Gallinger, (1984). **Secondary school graduate follow-up program for the deaf (5th Annual Report).** Rochester, N.Y.: National Technical Institute for the Deaf.

Marshall, K. (1982). The vocational impact of hearing impairment as reviewed by a vocational rehabilitation counselor. In R. Hull (Ed.), **Rehabilitative Audiology.** New York: Grune and Stratton, Inc.

Schindler, R.A., Kessler, D.K., Rebscher, S.J., and Yanda, J. (1986). The University of California, San Francisco/Storz Cochlear Implant Program. **Otolaryngology Clinics of North America, 19,** 287-305.

Winakur, I. (1973). **The income determinants of the Gallaudet College Alumni** (Doctoral dissertation, The American University). Dissertation Abstracts International, University Microfilm No. 74-16933.