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## Key Words

Hearing impairment  
Rehabilitation  
Protocol  
Vocational enablement  
Work

## Abbreviations

ICF: International Classification of  
Functioning, Disability, and  
Health  
VEP: Vocational enablement  
protocol

# Hearing impairment, work, and vocational enablement

## Abstract

Within the International Classification of Functioning, Disability, and Health (ICF; WHO), participation in work is acknowledged as one of the major areas in life (D8). Difficulties that make it impossible for the person to optimally partake in work result in participation restriction. An increasing number of people with hearing loss are seeking help for occupational problems. Various studies identified issues that should be addressed in the management of employees with hearing loss and emphasized the importance of a tailored vocational enablement program. This paper describes a recently developed vocational enablement protocol (VEP) addressing the specific needs of those with hearing loss in the workforce. It is characterized by an integrated approach (occupational physician, otolaryngologist, audiologist, social worker/psychologist, speech-language pathologist). The goal is to facilitate participation in, and retention of, work. The protocol is currently implemented in a few audiological centers in the Netherlands. This paper presents data collected at the audiological center of the VU University Medical Center, Amsterdam. Thus far, 86 patients, aged 19 to 64 years (mean 48, SD 23), have completed the protocol. Experiences with the procedure are described, and recommendations for future practice and research are discussed.

## Sumario

Dentro de la Clasificación Internacional de (F)funcionamiento, (D)discapacidad y (S)salud (ICF; WHO), la participación laboral es reconocida como una de las áreas más importantes en la vida (D8). Las dificultades que hacen imposible para una persona participar óptimamente en el trabajo, conduce a una participación restringida. Un número cada vez mayor de hipoacúsicos están buscando ayuda frente a problemas ocupacionales. Varios estudios han identificado asuntos que deben ser dirigidos al manejo de empleados hipoacúsicos y han enfatizado la importancia de programas adaptados para la facilitación vocacional. Este trabajo describe un protocolo de facilitación vocacional recientemente desarrollado (VEP) dirigido hacia las necesidades específicas de quienes están en las fuerzas del trabajo y son hipoacúsicos. Se caracteriza por un enfoque integrado (médico ocupacional, otolaringólogo, audiólogo, trabajador social/psicólogo, patólogo del lenguaje). El objetivo es facilitar la participación en el trabajo y en su retención. El protocolo se ha implementado actualmente en pocos centros audiológicos en los Países Bajos. Este trabajo presenta los datos colectados en el centro audiológico de la (VU) Centro Médico Universitario VU, Amsterdam. Hasta ahora, han completado el protocolo 86 pacientes de 19 a 64 años (media de 48 y DS de 23). Se describen las experiencias con el procedimiento y se discuten recomendaciones para la práctica futura y la investigación.

When considering the dynamic aspects of hearing loss, not only factors such as age, cognition, and attention are relevant (Pichora-Fuller & Sing, 2006), also the environmental conditions under which one has to listen are of utmost importance (Borg, 2000). Environmental factors 'comprise the physical, social, and attitudinal environment in which people live and conduct their lives'. The World Health Organization's International Classification of Functioning, Disability and Health (ICF) (WHO, 2001) identifies environmental factors as a key component in defining the concept of disability. Environmental factors can improve or hinder an individual's body function, ability to execute an activity, and/or his/her participation in society. An environment with facilitators can improve the experience of people with disabilities in society whereas one with barriers, or without facilitators, will restrict their integration. Different environments, therefore, may have a different impact on the same individual with a given health condition.

Within the ICF, participation in work is acknowledged as one of the major areas in life (D8). For many people, one of the most significant determinants in their perceived status and position in society is their job (Scherich & Mowry, 1997). Difficulties that make it impossible for a person to optimally partake in work

result in participation restriction. An increasing number of people with hearing loss are seeking help for occupational problems.

This paper focuses on a vocational enablement protocol (VEP) and its implementation in clinical practice. To set the context, the first section presents prevalence data on hearing-related vocational difficulties. The second section describes a number of studies identifying key issues that need to be addressed in the management of employees with hearing loss. The final part of this paper portrays the VEP and experience with the procedure in clinical practice. The protocol is an example of good practice and not yet based on evidence.

## Numbers

In the United States, communication problems (hearing, language, and speech) are estimated to have a prevalence of 5% to 10% in the labor force (Ruben, 2000). Ruben estimated the combined costs of communication disorders to be 2.5% to 3% of the gross national product (GNP), which means a significant loss to the US economy. The author stated that our modern western economies have undergone fundamental changes during

the last half of the 20th century. In the past, we were largely dependent on manual labour. In the communication-age societies of today, occupations rely more and more on communication skills. This implies a greater burden on groups of people suffering from communication disorders, including those with hearing impairment.

Perhaps the burden of work-related communication difficulties resulting from hearing loss contributes to the disproportionate proportion of hard-of-hearing people taking early retirement. For example, prevalence data in Sweden show that while only 5.4% of the general population is reported to be hard-of-hearing, approximately 12% take early retirement (Danermark & Coniavitis Gellerstedt, 2004).

Not only does hearing loss appear to be related to earlier retirement, data suggest that hearing impairment results in greater unemployment in younger adults. Specifically, Parving and Christensen (1993) found that 30% of hearing impaired adults aged 20–35 years old were unemployed, compared to only a 12% unemployment rate in an age-matched reference group.

Since hearing loss may lead to early retirement or unemployment, it is important to examine work-related issues among hearing-impaired adults. The relevance of this issue is further underlined by the fact that in the Netherlands, about 3% of the labor force (i.e. 255 000 persons) report that they suffer from hearing impairment (Cuijpers & Lautenbach, 2006). Due to the ageing of the population and changes in retirement ages, the number of elderly employees is increasing, so leading to an increasing number of people with hearing loss seeking help for occupational problems. In a large survey among Dutch deaf and severely hearing-impaired people, counseling on how to handle one's own hearing loss at the workplace was one of the most frequently reported care needs (De Graaf & Bijl, 2002).

### **Impact of hearing impairment on occupational performance**

Among the disabilities that limit a person's involvement in work, hearing impairment is clearly recognized (Colledge et al, 1999). However, the vast majority of studies on the relationship between hearing and occupation are restricted to the causes of noise-induced hearing loss (NIHL), on how to protect employees from dangerous noise levels, and on the development of hearing protection programs. Occupational noise exposure is a serious risk for hearing (Hétu, 1994; May, 2000; Palmer et al, 2002; Nelson et al, 2005). However, existing hearing loss in employees, regardless of its origin, and even mild degrees of hearing impairment may adversely affect occupational performance and well-being. In particular adults with acquired hearing-impairment may encounter difficulties in coping with their auditory disabilities at work. The impact of hearing loss on occupational performance and well-being has barely been investigated in a systematic way. A relatively small number of studies have been published and have recently been the subject of a review by Danermark (2005) who concluded that employees with hearing impairment, in general, comprise a vulnerable group in the labor force for whom the conditions at work are more challenging than for normally-hearing colleagues.

Similar conclusions were drawn by Kramer et al (2006). They compared the occupational performance of a group of 151 employees with hearing impairment with that of a group of 60 workers with normal hearing. The groups were matched for age, gender, educational level, and type of job. The Amsterdam checklist for hearing and work (Kramer et al, 2006) was used in this study, measuring:

1. The persons' work tasks and performance (e.g. type of job, type of contract, work hours, work tasks, self-reported environmental noise). Also, sick-leave was assessed by asking the respondent the number of days in the past 12 months missed because of illness. Additionally, the type of illness was requested.
2. Auditory demands at work. Respondents were asked how often they had to 'communicate in quiet', 'communicate in noise', 'detect sounds', 'localize sounds', and 'distinguish between sounds' and how effortful they regarded each of those hearing activities.
3. General working conditions (e.g. job control, job demand, support at work, and career satisfaction).

An analysis of group differences revealed that the 'self-perceived environmental noise' level was significantly higher among those with hearing loss compared with normally-hearing subjects ( $p < 0.01$ ). Similarly, the reported 'effort in hearing' needed during listening was significantly higher in the hearing-impaired group ( $p < 0.001$ ). No differences were found for the general working conditions, except for 'job control' (interrupting work or taking breaks when wanted). Hearing-impaired participants perceived themselves to have significantly less 'control' at work compared to their normally-hearing colleagues ( $p < 0.01$ ). Also, the reported number of days sick-leave appeared to be significantly different in the two groups. In the hearing-impaired group, the proportion of employees reporting sick-leave (77%) was significantly higher than among the normally-hearing controls (55%) ( $p < 0.01$ ). In addition, the proportion of people reporting sick-leave due to stress-related complaints (fatigue, strain, and burnout) was significantly higher among those with hearing impairment (26%) than in the normally-hearing group (7%) ( $p < 0.05$ ).

Two variables appeared to contribute significantly in the regression model predicting sick-leave due to stress-related complaints: job demand (a general working condition) and the necessity to continuously distinguish between and identify sounds. Surprisingly, the requirement to identify sounds at work appeared to be the only hearing-related factor associated with sick-leave among those with hearing loss, rather than the necessity to communicate in noise. It seems that 'identification of sounds' is a factor in hearing that deserves further attention and should not be neglected.

A similar conclusion was drawn by Gatehouse and Noble (2004) and Morata et al (2005). Gatehouse and Noble developed the speech, spatial, and qualities of hearing scale (SSQ) dealing with the reality of hearing in the everyday dynamic and demanding world. Comparing SSQ scores of 153 clinic clients to an independent measure of handicap covering distress and related emotional effects, they found that the disability-handicap relationship was governed by 'identification of sounds', 'attention', 'spatial hearing', and 'effort problems' rather than 'intelligibility of speech'. Gatehouse and Noble argued that

traditional research in audiology focuses on speech hearing alone, whereas other functions in hearing as served by the auditory system are equally important.

Morata et al (2005) conducted focus groups among workers with self-reported hearing loss and occupational noise exposure. When reporting the difficulties they encountered working in noise, the employees' primary concerns were about job safety as the result of a reduced ability to hear and distinguish between environmental sounds and warning signals, and their inability to monitor essential equipment sounds. Apparently misunderstanding environmental sounds generally leads to embarrassment, fear, distress, anxiety, and a feeling of losing control.

The other results of the study by Kramer et al (2006) concerning job control very much support the findings reported by Danermark and Coniavitis-Gellerstedt (2004) who studied a group of 445 employees with hearing impairment. Scores on a questionnaire measuring the psychosocial work environment of those employees were compared to reference data obtained from more than 8000 people employed by local municipalities. The results revealed a much more demanding psychosocial environment at work for the hard-of-hearing group compared with the normally-hearing reference group. The most important difference appeared to be the self-assessed lower degree of control at work for those with hearing impairment.

Apparently, people with hearing impairments feel a greater need to have control over their work (i.e. organizing their own schedules so as to be able to take breaks; or interrupt work after having had auditory demanding activities). It seems that providing control over their work enhances their wellbeing.

A further example is a study by Grimby and Ringdahl (2000). They compared 35 hearing-impaired adult full-time workers with 1256 normally-hearing employed people below 65 years of age, and used various measures of quality of life as outcome indicators. An important finding of the study was that hearing-impaired full-time workers reported a higher degree of psychosocial distress in terms of 'lack of energy' and 'social isolation'.

Finally, Detaille et al (2003) investigated what support hearing-impaired people needed in order to be able to cope at work. The results showed that employees with hearing loss observed a substantial lack of knowledge among colleagues, employers, and even professionals about what the specific limitations and needs of hearing-impaired employees are and of what it means to be hearing impaired. They reported the urgent need for informational and training programs to increase awareness among all stake-holders (employees, colleagues, employers, trade unions, health professionals) about how to manage hearing loss at work.

In summary, key issues that need to be addressed in the management of employees with hearing loss are:

- mental distress, effortful listening
- job control
- self-reported noise level
- noisy environments
- lack of knowledge

### **Vocational enablement protocol (VEP)**

Vocational enablement refers to services for maintaining, facilitating, or improving the employment situation. As mentioned in

the previous paragraph, various studies identified issues that should be addressed in the management of employees with hearing disabilities. However, standardized protocols including these issues are largely lacking. It seems that in current audiological practices, the specific needs of hearing-impaired adults with work-related difficulties are not dealt with in a standard manner.

Hétu and Getty (1991) established a hearing rehabilitation program for employees affected with noise-induced hearing loss, based on a public health model and identifying different causes of the problems and several levels of intervention. The authors strongly argued that an integrated (multidisciplinary) approach would be crucial for a successful management of the rather complex problems. As hearing disabilities not only affect the individuals who suffer from hearing impairment, but also anyone with whom they interact, Hétu and Getty proclaimed that actions on a single level (i.e. restricting the rehabilitation program to the hearing-impaired employee only) would have little effect. They identified different domains to be included in the rehabilitation process: the hearing-impaired person, significant others (family, friends, colleagues), the workplace, health services, and the society (population). The interventions to be applied were: psychosocial support (coping), provision of information and knowledge (types of hearing impairment, consequences) and skill development (hearing tactics).

In line with the work of Hétu and Getty (1991), an optimized protocol addressing the specific needs of those who are occupationally involved and who report problems at work due to impaired hearing was developed in the Netherlands (De Jager and Goedegebure, 2003, Sorgdrager et al, 2006). The vocational enablement protocol (VEP) is the product of the Expertise Center for Hearing and Work. Currently, four Dutch organizations are participating in this center: (1) the Netherlands Center for Occupational Diseases, Amsterdam; (2) the audiological center of the Academic Medical Center, Amsterdam; (3) the audiological center of the VU University medical center, Amsterdam; and (4) the audiological center of the Leiden University Medical Center, Leiden. The protocol may be regarded as a potential model for good practice in this field.

The VEP comprises a half-day assessment of complex problems conducted by a team of professionals from multiple disciplines: audiologist, otolaryngologist, occupational physician, social worker, psychologist, and speech-language pathologist. Based on a standard procedure, the team examines the auditory functioning of the individual and seeks to identify and clarify causes of the problems at work, evaluates the existence of additional psychosocial problems in the individual, investigates the acoustical environment at the workplace (if indicated), and finally makes recommendations for appropriate treatment.

In sum, the protocol provides:

- a multidimensional evaluation of the situation and problems at work both from the patient's and professional's perspective, including an assessment of the auditory demands at the workplace,
- a thorough diagnostic examination of the individual's auditory profile
- assessment of an individual's coping abilities
- an examination of the workplace (if indicated)
- recommendations for an enablement plan and options available

- a comprehensive written report

The final goal is to facilitate participation in and retention of work.

### *Procedure*

In general, people get referred to the protocol by their occupational physician. Once an individual is referred, two questionnaires are sent to the patient's home. One is the Amsterdam checklist for hearing and work (Kramer et al, 2006). Details are provided in the previous section of this paper. Also, to assess a person's ability to cope with hearing impairment, several scales of the communication profile for the hearing impaired (CPHI), including 'maladaptive behaviours', '(non) verbal strategies', 'self-acceptance', 'acceptance of loss', and 'stress and withdrawal' are administered. (Demorest & Erdman, 1987; Mokkink et al, 2008). Patients are instructed to complete the questionnaires and bring them in during the consultation hour.

In the clinic, the patient's hearing status is assessed using an extensive battery of auditory tests, including pure-tone and speech audiometry and speech-reception-threshold (SRT) tests. An SRT test measures a person's ability to understand speech either in quiet or in noise. It adaptively estimates the signal-to-noise ratio (SNR) at which the participant reproduces 50% of the sentences without error. SRT noise tests were applied using two types of noise: steady state noise (Plomp & Mimpen, 1979) and fluctuating noise (Festen & Plomp, 1990). Loudness scaling, a test measuring the ability to identify sounds, and a localization test (Kramer et al, 1996; Boymans et al, 2008) are added if indicated. To examine aided hearing, a free-field version of the SRT noise test is also performed.

Furthermore, a semi-structured interview is conducted by the psychologist evaluating the patient's psychosocial history, the individual's specific needs, attitude, and expectations and an evaluation of the problems at work from the patient's perspective. Referral information is taken into account. The interview is attended by the occupational physician of the team to specifically evaluate the work-related problems and possible solutions, and to discuss legal issues.

At the end of the session, all test results are examined by an audiologist, psychologist, and occupational physician and explained to the patient. Possibilities of technical, speech-therapeutical, and/or psychosocial interventions are then discussed.

If indicated, the workplace is visited and acoustically examined by conducting a speech-transmission-index (STI) measurement. The STI provides an assessment of the intelligibility of speech at the workplace and verifies whether speech is comprehensible for the employee with hearing problems (Houtgast & Steeneken, 1973). The STI measures the combined effect of background noise and reverberation.

At the end, all findings are discussed in a broad multidisciplinary team followed by the construction of a written report including specific recommendations for the patient and the management plan. The report is then sent to the referrer. To clarify the diagnostic findings and to elucidate the reasonableness of recommendations proposed, each referrer is phoned by the occupational physician of the team. The duty of the occupational physician on site is to communicate with the

employer and to monitor and supervise the implementation of the recommendations.

Finally, to meet the needs of people complaining about the lack of knowledge among professionals, employers, colleagues, and significant others about issues related to hearing and work, an extensive information package presented on CD was developed (Kramer, 2006). The package provides information on a large number of matters related to hearing and work. It focuses on a better understanding of the specific difficulties people with hearing impairment may experience at work. It also points out the various options available to reduce the occupational problems of such people.

As mentioned, the VEP is currently implemented in some audiological centers in the Netherlands. The following section presents experiences with the protocol and data collected at the audiological center of the VU University medical center, Amsterdam.

### *Participants*

Thus far, 86 employees (53% male) completed the protocol. Their ages ranged from 19 to 64 with a mean of 48 years ( $SD = 23$  years). Their mean pure-tone hearing loss (0.5, 1, 2, 4 kHz; averaged across both ears) was 44.1 dB HL and ranged from 6 to 113 dB HL. The scores on the SRT-in-fluctuating-noise test in the best ear ranged from  $-14.6$  dB SNR to 6.6 dB SNR, with a mean of  $-5.8$  dB SNR ( $SD = 4.4$  dB). All participants were native Dutch speakers.

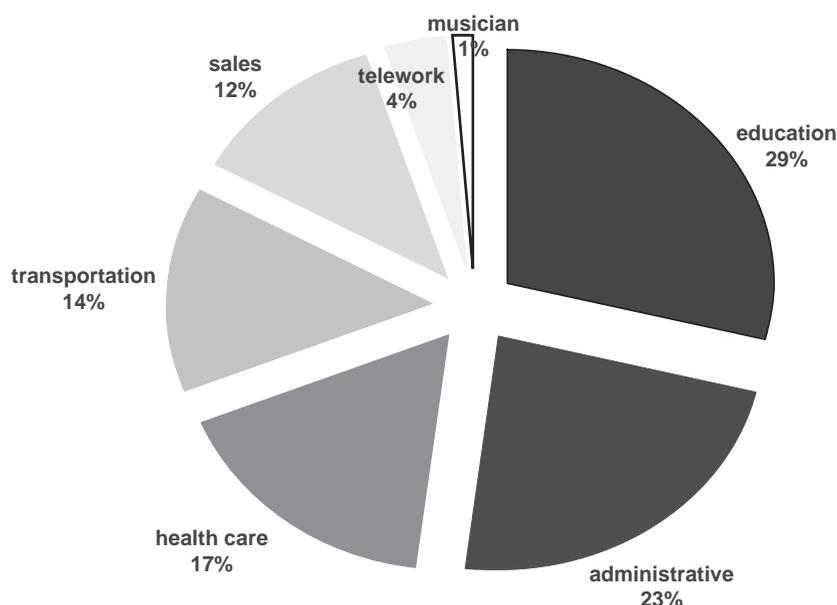
A wide variety of jobs was encountered in the sample. Figure 1 presents a classification. Most commonly, employees were involved in educational settings (teaching, coaching, instructing). A slightly smaller proportion of patients were engaged in administrative jobs (office employees, secretaries, researchers, staff members). The transportation sector included police officers, pilots, stewards, and drivers. The section 'sales' included cashiers, shop attendants, and representatives. It must be noted that a job title in itself provides little information about the tasks to be performed. For example, a police officer who is conducting patrol duties by car and who assists at incidents such as criminal activities or road-related incidents is doing totally different things than a police officer who is completing administrative procedures all day long.

### *Reasons for referral*

Most of the patients (60%) were referred by occupational physicians from all over the country. About 40% were referred by ENT specialists and general practitioners. The most common reason for referral was a general request for advice regarding the hearing problems at work. Other referrals were more specific and included requests for a prescription for a technical device, communication training or counseling.

### *Recommendations*

The final recommendations composed by the multidisciplinary team were largely patient driven. During the interview with the professionals (i.e. audiologist, psychologist, occupational physician), patients were actively motivated to report their needs and to suggest solutions. Recommendations were made after having carefully evaluated the environmental characteristics of the workplace and the conditions of the job.



**Figure 1.** Classification of the jobs of the patients (N = 86) enrolled in the vocational enablement program.

Overall, a wide range of recommendations aiming to improve the occupational conditions and to facilitate participation in and retention of work were made. Table 1 shows the proportion of individuals receiving the different types of advice. One of the most frequently proposed actions was a hearing-aid fitting or a refitting. The latter was necessary in case of inappropriate fine-tuning or if the hearing aids were obsolete (i.e. older than five years). In addition, assistive listening devices were prescribed in 20% of the cases. These comprised FM systems, loops, infrared systems, amplified phones, tactile beepers, and visual alerting systems.

Work-related accommodations were classified into three categories: 're-delegation of assignments', 'restructuring of time schedules', and 'environmental modifications' (Scherich & Mowry, 1997). 'Re-delegation of assignment' comprised elim-

ination of nonessential job functions or removal of highly demanding tasks (e.g. meetings, telephone work).

If auditorily demanding tasks could not easily be eliminated or the individual did not wish to forego them, restructuring of time schedules was an option. Effortful listening situations, such as meetings, should be rescheduled to the morning, since lack of energy at the end of the day may worsen the listening conditions even further. People with hearing impairment often experience fatigue at work due to effortful listening (Kramer et al, 1997, 2006). Also, the insertion of breaks during the day was recommended and, if possible, a whole day off in the middle of the week was preferred above an extra day off before or after the weekend. In total, 16% of the employees received this type of advice.

Environmental modifications were prescribed in 30% of the cases. Such modifications included rearrangement of the furniture in the room, the provision of light, the improvement of room acoustics by providing absorption materials such as furniture, carpets, and curtains. In addition, removal of machines generating noise (e.g. fax machines, printers, and copiers) from the room was a highly essential recommendation within this respect.

Psychosocial counseling was suggested in 21% of the cases. This service was delivered either in individual or in a group setting under the supervision of a social worker. Most patients received individual counseling that was provided 'at home' by means of the home education program (Kramer et al, 2005). It encourages significant others (i.e. family members, colleagues) to be involved.

Communication training, one of the most frequently suggested recommendations (31%), mainly refers to lip-reading (speech reading). It could be argued that anyone with hearing impairment should receive training in speech reading (Boothroyd, 2007). This skill may be particularly suitable for challenging situations where understanding is difficult, with or without assistive listening devices.

**Table 1.** Summary of the recommendations provided by the multidisciplinary team. The right-hand column presents the proportion of employees receiving the particular recommendation.\*

Hearing aid (re)fitting	54%
Communication training (lip-reading)	31%
Environmental modifications (furniture, light, separate room etc.)	30%
Psychosocial counseling	21%
Assistive listening devices	20%
Re-delegation of assignments	18%
Restructuring of time schedules	16%
Further medical examination	8%
Occupational retraining or redeployment/ending employment	8%
Hearing protection	5%

\*Since more than one form of advice could be given to an individual, the proportions do not add up to 100.

In a minority of cases (8%), occupational retraining or ending employment was advised. A person was declared unfit for duty, only after both their hearing status and the conditions and circumstances under which they had to function had been considered carefully.

In general, if the workplace did not allow any of the recommendations (Table 1) to be implemented, the only option was occupational re-training or redeployment. In the present group of workers, few people were declared unfit for work. Among those were a bath superintendent and a mechanic repairing juice machines. The latter person had a profound symmetrical hearing impairment. He worked full-time repairing juice machines which were located in various buildings all over the country. He had to communicate with his supervisor all day long using his mobile phone, mostly while driving his car. On several occasions he had visited his occupational physician and complained about the enormous auditory demands he faced everyday in the course of his job. He received neither understanding, nor sympathy from his occupational physician. While he had rarely taken sick leave over the years, this patient appeared to be affected by burn-out when he visited the audiological center. After having been through a period of burn-out, this person successfully received a cochlear implant. Currently, he is in a process of returning to work.

In a small minority of cases (5%), hearing protection was recommended. The explanation for the small proportion is that only a few employees in the present sample worked in places with hazardous noise levels. In these few cases, the workplace was visited and a STI-measurement was conducted.

Overall, the majority of patients who completed the protocol reported that the vocational program had facilitated their participation in work. Twenty percent of the employees encountered reluctant employers who were not willing to cooperate and who refused to implement the recommended intervention or they were just not satisfied and continued to experience difficulties. This was particularly the case for difficult to accommodate places, and in cases where transitions between levels of care and communication among professionals and with patients failed. Long term reports of (un)satisfied patients, however, are unknown. Overall, it was our observation that people with hearing impairment are highly motivated to work, given that appropriate interventions are provided.

## Discussion

Experiences with the vocational enablement program, applied to 86 workers, yielded useful information. In agreement with Héту and Getty (1991) it was found that an integrated approach is indispensable for an accurate assessment and management of the occupational difficulties experienced by employees with hearing impairment. Patients were satisfied with the integrated service. Neither the hearing status in itself, nor the job title as such provides sufficient information to determine the extent to which the worker matches the job. An extensive evaluation of the workplace, the tasks to be performed, and the conditions under which one has to work is of utmost importance.

The different elements of the VEP are broadly similar to those of other models of auditory rehabilitation as described in the

literature. Héту and Getty's model has already been mentioned. Another example is Stephens' updated model, including 'evaluation' (of activity limitation, participation restriction, contextual factors), 'integration and decision making' (goal setting), 'short term remediation' (instrumentation, strategies, ancillary help) and 'ongoing remediation' (Stephens, 2003). The model of Kiessling (2003) contains the same elements and includes an extra section on 'outcome measurement', which is an issue that needs further attention in the VEP. However, applicability of Stephens' and Kiessling's models to employees with hearing-related problems at work has not been demonstrated yet. As such the present data may have added value. Furthermore, even though both Stephens' and Kiessling's models largely imply a multidisciplinary approach, this issue received less explicit attention.

A multidisciplinary team has added values. It provides specialized knowledge and ample experience in the various disciplines involved. Also, contact with and taking the message (recommendations) to the stakeholders at the workplace (e.g. occupational physicians, employers) is much easier when the message is communicated by a member of the team who is coming from the same discipline as the contact person at work (e.g. occupational physician).

A further important conclusion is that the requirement of vocational enablement programs is not restricted to workplaces where background noises are hazardous. The vast majority of employees in the present project were employed in places where hearing protection was not required. Despite that, barriers in the workplace had interfered with effective job performance.

Even though this program may be regarded as a step forward in the management of people with hearing loss who experience problems at work, there is still room for improvement. For example, tests examining a person's cognitive and linguistic capacities are not included in the protocol yet. There is growing evidence of the importance of cognitive- and linguistic abilities in determining a person's auditory capacity (Gatehouse et al, 2006; George et al, 2007; Rudner et al, 2007).

Furthermore, a drawback of a multidisciplinary approach is that none of the team members may feel final responsibility for the patient. One team member has to fulfill the role of a case manager who monitors the process from the very beginning to the very end and who facilitates communication among professionals and with the patient.

Another limitation of the present project is that the findings so far cannot be generalized to other groups of employees with hearing impairment. The proportion of recommendations can be totally different in other groups of patients, with different types of hearing loss, different types of backgrounds, and different types of jobs.

Finally, no scientific evidence is available for the effectiveness and efficiency of the recommendations proposed. Empirical research should investigate the short- and long-term effectiveness of the multidisciplinary approach and to what extent each of the recommendations significantly reduces barriers at work, enhances wellbeing, and improves occupational performance. Also, variables affecting the effect (i.e. age, gender, degree of hearing loss) should be systematically examined in future studies.

## Acknowledgements

The development of the protocol as described in this paper is a joint collaboration of four organizations in the Netherlands. These organizations constitute the Expertise Center for Hearing and Work:

1. The Netherlands Center for Occupational Diseases, Amsterdam, represented by Dr. B. Sorgdrager, Dr. D. Spreeuwiers, Prof. Dr. F.J.H. van Dijk.
2. The Audiological Center of the Academic Medical Center, Amsterdam, represented by Prof. Dr. Ir. W.A. Dreschler.
3. The Audiological Center of the VU University medical center, Amsterdam, represented by, Dr. S.T. Goverts, Dr. D.J. Bruinvels, Dr. S.E. Kramer, Prof. Dr. Ir. J.M. Festen.
4. The audiological Center of the Leiden University Medical Center, Leiden, represented by Dr. Ir. J.A.P.M. de Laat.

The paper was presented at the conference entitled: From signal to dialogue: Dynamic aspects of hearing, language, and cognition. September 7–8, 2007, Linköping, Sweden.

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