

Auditory rehabilitation of older people from the general population — the Leiden 85-plus Study

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SUMMARY

Background: Very few older people with severe hearing loss use hearing aids to reduce the negative consequences of reduced hearing in daily functioning.

Aim: Assessment of a screening test and a standardised auditory rehabilitation programme for older people from the general population with untreated severe hearing loss.

Design of study: Intervention study and qualitative exploration.

Setting: Leiden 85-Plus Study, a prospective population-based study of 85-year-old inhabitants of Leiden, the Netherlands.

Method: Hearing loss was measured by pure-tone audiometry in 454 subjects aged 85 years. Subjects with hearing loss above 35 dB at 1, 2, and 4 kHz who did not use hearing aids were invited to participate in a standardised programme for auditory rehabilitation. In-depth interviews were held with participants to explore arguments for participating in this programme.

Results: Of the 367 participants with severe hearing loss (prevalence = 81%), 66% (241/367) did not use a hearing aid. Three out of four of these participants ($n = 185$) declined participation in the auditory rehabilitation programme. The most common reason given for not participating was the subjects' feeling that their current hearing loss did not warrant the use of a hearing aid. Subjects who participated in the programme were found to suffer from more severe hearing loss and experienced more hearing disability. Those who did not participate in the programme felt they could cope with their disabilities and considered a hearing aid unnecessary.

Conclusion: Untreated hearing loss is prevalent among older people from the general population. The majority of older people decline auditory rehabilitation. For these people the use of a hearing aid is not perceived as necessary in order to function on a daily basis. Older people who have expected benefits from a hearing aid have already obtained them, marginalising the benefits of a rehabilitation (and screening) programme.

Keywords: auditory rehabilitation; hearing loss; disability; intervention study; older people.

Introduction

THE prevalence of severe hearing loss in the general population rapidly increases with age, to approximately 80% in those aged over 85 years.¹⁻⁵ Hearing loss has negative effects on various aspects of everyday life, such as daily functioning, socialising, and wellbeing.⁶⁻⁹ Auditory rehabilitation, including the selection and fitting of a hearing aid, is currently the only appropriate treatment for older people with hearing loss.

Although the use of a hearing aid can markedly reduce the negative consequences of hearing loss in daily life,¹⁰⁻¹³ it is remarkable that only a minority of older people with severe hearing loss make use of hearing aids.^{1,14-16} It is still unclear why the majority of older people with severe hearing loss remain untreated. Factors identified by those who suffer from severe hearing loss as influencing the decision to seek help are: the severity of hearing loss, the perceived degree of disability of hearing loss in daily life, the negative connotations associated with hearing aids, and coping strategies.¹³⁻²¹

Within the Leiden 85-Plus Study (a population-based study of the most elderly), an intervention study was performed to measure the effects of offering a standardised auditory rehabilitation programme to older subjects with untreated hearing loss. Common arguments that were found to influence the decision to participate in auditory rehabilitation programmes were explored through in-depth interviews.

Method

Leiden 85-Plus Study, baseline measurements

Participants and procedure. The Leiden 85-Plus Study is a population-based study of all 85-year-old inhabitants of Leiden, the Netherlands. For a more extensive description, the design of the Leiden 85-Plus Study is outlined by von Faber and colleagues.²² Briefly, from 1997 to 1999 all members of the 1912-1914 birth cohort ($n = 705$) were enrolled in the month of their 85th birthday. There were no *a priori* exclusion criteria. All those eligible were informed about the study by post and contacted by telephone, or were visited at home to ask for informed consent. When the subjects were severely cognitively impaired, informed consent was obtained from a guardian. The Medical Ethical Committee of the Leiden University Medical Centre approved the study.

A total of 599 inhabitants (397 women, 202 men) of Leiden participated in the baseline measurements of the Leiden 85-Plus Study (response rate = 87%). During home visits, extensive baseline data were gathered relating to health,

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HOW THIS FITS IN*What do we know?*

It is unclear why few older people with severe hearing loss use hearing aids to reduce the negative consequences in daily functioning.

What does this paper add?

Of the 85-year-old participants of the Leiden 85-Plus Study, 81% were found to suffer from severe hearing loss. Of those found to suffer from hearing loss, 66% were receiving no treatment. In this intervention study the vast majority of older people with untreated hearing loss declined an invitation for auditory rehabilitation. Older people who had expected benefits from a hearing aid had already purchased one, thus marginalising the effect of a rehabilitation (and screening) programme in the general population.



daily functioning, social activities, cognitive functioning and overall wellbeing.²² Annual home visits were scheduled to observe changes in any of these areas.

Measurements. Demographic characteristics were collected from all participants. Income was categorised as low in cases of minimal state pension. Education was categorised as low in cases of no schooling or only primary school education. Some health characteristics were used; the Mini-Mental State Examination (MMSE) measured the overall cognitive function.²³ Subjective health (good versus poor) and feelings of loneliness experienced (absent versus present) were assessed among all participants. In all persons with MMSE scores above 18 points, depressive symptoms were measured with the short Geriatric Depression Scale (GDS-15).²⁴ A GDS score of four points or above indicates the presence of depression.

The baseline interview included questions about difficulties experienced with one-to-one conversations, difficulties with conversation within groups, and the current use of hearing aids.

Hearing study

Participants and procedure. Within the first year after the baseline measurement, all participants were invited to participate in the current hearing study. During an additional home visit by a trained physician or a trained assistant, audiological tests were performed and questionnaires on hearing loss were administered.

Measurements. Hearing loss was measured using pure-tone audiometry with a portable Diagnostic Audiometer AD 28 (Interacoustics). Air conduction thresholds were obtained separately for the left and right ear at frequencies of 250, 500, 1000, 2000, 4000, and 8000 Hz. When necessary, masking was added to the non-tested ear. Special attention was paid to reducing possible effects of background noise. Hearing loss was estimated as the average hearing loss in dB at 1000, 2000 and 4000 Hz for the best ear (High Fletcher Index).²⁵ Severe hearing loss was defined as a hearing loss above 35 dB, in line with the Dutch health authorities'

definition.

The disability subscale of the Hearing Handicap and Disability Inventory — short version (HHDI) was administered to measure subjective complaints of hearing loss in daily life.¹⁸ The questionnaire consisted of 10 questions (Box 1) and answers ranging from '(almost) never' (score 1 point) to '(almost) always' (score 4 points). The total score can range from 10 points to 40 points. Severe hearing disability was considered present with a HHDI score above 17 points.

Auditory rehabilitation programme. All participants with untreated hearing loss, defined as those with a hearing loss above 35 dB who did not use hearing aids, were offered a standardised auditory rehabilitation programme. This programme consisted of information about the opportunities of auditory rehabilitation, advice on hearing tactics, and selection and fitting of hearing aids. All components of the programme were performed during home visits. To estimate the effect of the auditory rehabilitation programme, the use of hearing aids was evaluated after one year.

In-depth interviews. A random selection of participants with untreated hearing loss were interviewed to unravel the decision-making process around the participation in the auditory rehabilitation programme. These in-depth interviews, performed by a medical anthropologist (MvF), lasted about two hours and concentrated on topics such as ageing, health, functioning, and hearing problems.

Analyses

Owing to the skewed nature of the distribution, the outcomes of audiometric testing were presented in medians and corresponding interquartile ranges (IQRs), representing the 25th and 75th percentiles of the distribution. Data were compared using the Mann-Whitney test, a test that does not assume a normal distribution of data. All analyses were performed using SPSS, version 11.

All in-depth interviews were recorded and transcribed. Dimensions of statements and influencing factors were noted individually. The results of the interviews were then analysed to find common patterns in the various arguments put forward for participating in the rehabilitation programme.

Results**Participants**

In total, 454 of the 599 participants of the Leiden 85-Plus

- Do you notice your hearing loss in quiet surroundings?
- Do you notice your hearing loss in noisy surroundings?
- Do you notice your hearing loss within a group of persons?
- Do you notice your hearing loss when making a telephone call?
- Do you notice your hearing loss while at the theatre?
- Do you notice your hearing loss watching television?
- Do you notice your hearing loss in a busy shop?
- Do you notice your hearing loss while dining with a group?
- Do you have difficulty hearing the doorbell ring?
- Do you have difficulty hearing something from behind you?

Box 1. Questions from the HHD disability subscale.

Table 1. Baseline characteristics of the participants (n = 454).

Characteristics	
Demographics	
Age (years)	85
Females n (%)	298 (66)
Married n (%)	157 (35)
Independent living n (%)	260 (57)
Low income n (%)	72 (16)
Low educational level n (%)	284 (63)
Health	
Cognitive function	
Good (MMSE 28–30) n (%)	179 (39)
Moderate (MMSE 19–27) n (%)	230 (51)
Poor (MMSE 0–18) n (%)	45 (10)
Good subjective health n (%)	330 (73)
Depression ^a n (%)	92 (23)
Feelings of loneliness ^a n (%)	100 (24)
Hearing	
Difficulties in one-to-one conversation n (%)	10 (2)
Difficulties in group conversation n (%)	182 (40)
Current use of hearing aid n (%)	125 (28)

^aOnly for subjects with MMSE score above 18 points.

Study participated in the hearing study (Table 1). The main reasons for not participating were death before invitation (n = 20), refusal (n = 51), severe illness (n = 5), and severe cognitive impairment (n = 34). Only 2% of the participants had difficulties in following a one-to-one conversation, while 40% had difficulties in following a group conversation. Twenty-eight per cent of the participants used hearing aids at baseline.

Hearing loss and associated disability

The hearing loss among participants increased with higher frequencies; at 250 Hz the median hearing loss was 38 dB (IQR = 28 to 49), at 8000 Hz it was 80 dB (IQR = 78 to 83) (Figure 1). The median High Fletcher Index was 50 dB (IQR = 38 to 58); in total, 367 participants (81%) were found to have had severe hearing loss (High Fletcher Index >35 dB).

The median score on the HHDI was 15 points (IQR = 12 to 20 points). In total, 165 participants (36%) reported severe hearing disability, using a cut-off value of 17 points. More than half of the participants with severe hearing loss did not report severe hearing disability in daily life (207/367).

In total, 126 of the 367 participants (34%) with severe hearing loss made use of a hearing aid at baseline, leaving the majority of participants with severe hearing loss untreated (241/367 = 66%). There were no differences in demographics and health characteristics between participants who made use of hearing aids and those who did not. The median hearing loss (48 dB versus 60 dB, Mann–Whitney $P < 0.001$) as well as the median level of disability (14 points versus 20 points, Mann–Whitney $P < 0.001$) was lower in participants who did not use hearing aids at baseline.

Auditory rehabilitation programme

All 241 participants with untreated severe hearing loss were invited to participate in the standardised auditory rehabilitation programme; 56 people (23%) participated in the programme whereas 185 people (77%) did not. There were no

differences found in demographic and health characteristics between those who participated and those who did not. Among those who participated, both the median hearing loss (55 dB versus 48 dB, Mann–Whitney $P < 0.001$) and the median hearing disability (19 versus 13 points, Mann–Whitney $P < 0.001$) were higher.

By performing this screening and intervention study, the number of subjects with untreated hearing loss decreased from 241 (66%) to 185 (50%). After a one year follow-up, 48 of the 56 participants of the rehabilitation programme were visited again. Nineteen participants (40%) were found to be using their new hearing aid on a regular basis while 29 (60%) were not.

In-depth interviews

In total, 13 participants with untreated severe hearing loss, all women, were invited for in-depth interviews. Those who participated in the auditory rehabilitation programme (n = 5) and those who had decided not to participate (n = 8) mentioned similar factors as being important for their decision relating to participation in the auditory rehabilitation programme.

All of the women felt competent to make decisions for themselves regarding their health and the necessity of a hearing aid. This was indicated in two ways. First, all women were conscious of their limited hearing and offered several solutions as to how they had successfully coped with the negative consequences of hearing loss in daily life. Women who had decided to participate in the rehabilitation programme considered the problems of hearing loss in daily life to be more serious. They also envisaged more situations in which a hearing aid could be helpful. Several women mentioned that they required more time to become accustomed to the fact that they suffered from such severe hearing loss and that a hearing aid might be useful. Second, women who had decided not to participate in the auditory rehabilitation programme felt that improvements in other aspects of daily functioning were more important than improvements in their hearing. An example of this was found with regard to two women, one who was busy arranging a move to another house and another who was waiting for eye surgery to correct a cataract.

Notwithstanding the arguments of important loved ones, such as a spouse, children, or friends, prior negative experiences of persons in the direct social network, with regard to the use of hearing aids, had a high impact on participation in the rehabilitation programme. The most frequently mentioned negative experiences were undesired simultaneous amplification of voices and background noise, and difficulties in handling the small switches of the hearing aid.

The anticipated stigmatisation of using a hearing aid was almost absent. The participants saw the hearing aid as an expected consequence of the decline in hearing capacity, and, to a certain extent, as part of the normal ageing process. Among all other visible signs of ageing, the stigmatisation of a hearing aid was felt to be minimal. Financing a hearing aid did not appear to be a major problem, but all participants did consider the costs and the effectiveness.

Social isolation caused by severe hearing loss was mentioned as the most important reason for obtaining a hearing aid, especially when experiencing difficulties in

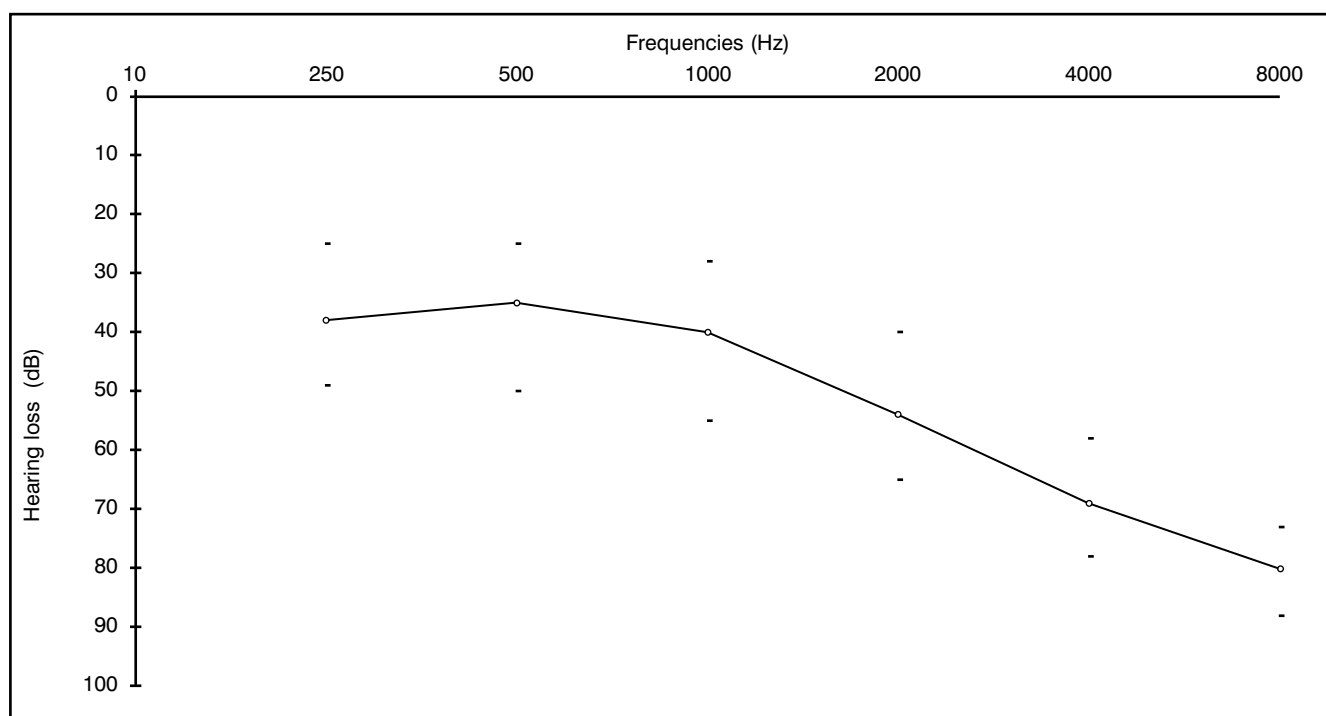


Figure 1. Median hearing loss and corresponding interquartile ranges over all measured frequencies for the 454 participants aged 85 years.

communication with important loved ones, such as children and grandchildren.

Discussion

Within the Leiden 85-Plus Study, 66% of the 85-year-old participants with severe hearing loss were untreated. Furthermore, only one out of four participants with severe untreated hearing loss accepted the invitation to participate in the standardised auditory rehabilitation programme. In this respect the population screening for untreated hearing loss and the following auditory rehabilitation programme met with limited success; the percentage of untreated hearing loss only fell from 66% to 50%.

Those who participated in the auditory rehabilitation programme had more severe hearing loss and a higher level of hearing disability. Those who suffered a great deal due to the negative effects of hearing loss on daily life felt compelled to participate in the programme. However, the majority of participants of the screening declined to participate in the rehabilitation programme, stating that a hearing aid was not necessary. In other words, when coping mechanisms continue to suffice, older people with untreated severe hearing loss are not willing to participate in auditory rehabilitation programmes. It points to the classical difference between diagnosing 'disease' from a medical perspective (hearing loss as measured in dB) and experiencing 'disability' from a patient (consumer) perspective. The possibility of having difficulties in communicating with loved ones was the most important argument for obtaining a hearing aid in the future.¹⁰

As expected,¹⁻⁵ severe hearing loss was found to be common among those aged 85 years. The older people themselves who see the decline in hearing capacity, to a certain

extent, as a part of the normal ageing process, acknowledged the prevalence of hearing loss among the most elderly. The data in this study were in line with the recently published study on the prevalence of reduced hearing, and ownership and use of hearing aids in people aged 75 years and over in the United Kingdom, which concluded that reduced hearing among older people is common, and provision of hearing aids inadequate.¹ The authors concluded: 'a major source of morbidity in older people could be alleviated by improvements in detection and management of reduced hearing'. Following the results of our intervention study, it can be seen that optimal detection and management of hearing loss of the most elderly will only have a marginal effect on the percentage of people with untreated hearing loss.

It can be argued that offering auditory rehabilitation to sufferers of hearing loss before the age of 85 years may meet with greater success in preventing untreated hearing loss. It may be the case that people over the age of 85 years are more likely to become accustomed to disabilities in daily life and are not eager to invest heavily in alternatives to try to circumvent the problem (known as the 'disability paradox').^{26,27} However, the results of this study do not support this reasoning. Most older people who did not participate in the auditory rehabilitation programme were at the same time concerned with trying to improve other aspects of their functioning. Furthermore, it was discovered that older people tend to report disabilities and handicaps less often, compared with young adults who suffer from a similar level of hearing loss.^{16,21,28} In all likelihood, older people are less inclined to participate in auditory rehabilitation programmes for these reasons than younger persons.^{19,20}

This study was the first to investigate the effects of an

intervention study to treat untreated hearing loss among the most elderly. The qualitative explorations of the arguments that play a role in the process of decision making gave insight into the results of the study. One possible limitation of the intervention study is that sufferers of hearing loss underestimate the beneficial effects of offering auditory rehabilitation. This may be because participants with untreated severe hearing loss were required to decide upon participation in the programme within four months of the diagnosis of hearing loss. The in-depth interviews showed that old people need sufficient time to become accustomed to the idea that a hearing aid might be necessary for them. As it is known that this change of self-image may take more than a year,¹⁵ the timing of the rehabilitation schedule may have been too tight. Some old people declined the offer but might have participated if allowed more time. However, the effect of offering the auditory rehabilitation programme could also be overestimated, because this programme contained fewer obstacles when compared with the standard care in the Netherlands. For instance, all elements of the programme were performed during home visits by the same committed investigators, and so hospital visits were not necessary.

In conclusion, untreated severe hearing loss is highly prevalent among most older people. The great majority of older people with untreated hearing loss declined auditory rehabilitation. Older people who expected benefits from a hearing aid were likely to have purchased one already, thus rendering the benefits of a screening and rehabilitation programme in the general population marginal.

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