

Effects of Impaired Hearing on Perceived Health and Life Situation

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ABSTRACT *The aim of this study was to determine the association between level of hearing loss (HL) and perceived health and life situation. A population sample of 343 outpatient adults who consulted a university hospital in Norway for hearing aids and rehabilitation was studied. Health and life situation was assessed by self-reported measures of general health, anxiety, participation in social activities, and life satisfaction. Level of HL was estimated by mean hearing threshold in the better ear, and categorized according to international standards. Subjects with normal hearing in the better ear were used as reference. Explanatory health and life situation variables were dichotomized and analysed using logistic regression models. The results showed that perception of good health was negatively affected by increasing HL before and after adjustment for potential confounders (p for trend <0.05). Compared with non-impaired individuals, the odds of perceiving their health as “not good”, were four times higher for the most severely affected subjects ($p <0.05$). The odds for reporting anxiety, of abstaining from participation in social activities, and of being generally dissatisfied increased for patients with moderate and higher levels of HL. In conclusion, perception of health was negatively associated with increasing HL, while anxiety, participation in social activities, and perceived life satisfaction did not significantly correlate with the level of loss. Thus, degree of HL seems to be of quite limited importance when consequences of HL are judged.*

Hearing loss (HL) affects daily life and “strikes at the very heart of human life” (Jones, Kyle & Wood 1987). It is estimated that approximately 16% of 20–80-year-olds are affected by HL (Davis 1989). The prevalence and severity of HL increase with age (Møller 1981, Davis 1989, Pedersen, Rosenhall & Møller 1989, Jönsson & Rosenhall 1998, Karlsmose, Lauritzen & Parving 1999). The vast majority (90%) of HL is of the irreversible sensorineural type (Arlinger 1989) and it makes conversation difficult (Smootenburg 1992, Kramer, Kapteyn, Festen & Tobi 1996). Hearing aids (HA) cannot restore hearing-impaired individuals’ hearing, but may, by and large, enable them to use their hearing more efficiently. Still, the majority of adults with HL tend not to fit any HA (Sorri et al. 2001). This makes impaired hearing a public health issue.

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A new bio-psychosocial conceptual framework is represented by the World Health Organization (WHO) in the International Classification of Functioning, Disability and Health (ICF, WHO 2001). In that framework, an individual's functional state within a specific domain (e.g. in hearing) is viewed as a complex and dynamic relationship between health components (body function, anatomical structure, activity and participation) and environmental and personal factors (WHO 2001). Participation refers to engagement in social life situations (WHO 1998, 2001) and, consequently, participation restriction implies the problems an individual may experience in that sense. Participation restriction may be further categorized (WHO 2001) and for adults with HL it may, for instance, concern involvement in interpersonal relationships and community, social and civic life (Stephens & Kerr 2000, Stephens, Vetter & Lewis 2003, Danermark 2005, Kramer 2005). Participation in interpersonal relationships has been extensively assessed through qualitative (e.g. Hallberg & Barrenäs 1993, Héту, Jones & Getty 1993, Hallberg 1999a) and quantitative research (e.g. Mulrow et al. 1990, Resnick, Fries & Verbrugge 1997, Hallberg 1999b). On the other hand, reports of social life involvement in terms of participation in organized activities outside the family are quite limited and quantitative reports hardly exist. In addition to participation restriction, reduced well-being, alternatively expressed as general satisfaction in life or quality of life, has been theoretically outlined as a potential consequence of impairment in general (WHO 2001, Bowling 2001, Wahl & Hanestad 2004) and for hearing impairment in particular (Stephens & Héту 1991, Danermark 1998). Still, studies of quality of life are sparse among adults with HL (Ringdahl & Grimby 2000) and rather few have reported general satisfaction by degree of HL (Bess 2000, Dalton et al. 2003, Tambs 2004).

For some time, socio-cultural models have identified impairment as significant predictors of self-reported general health (Fylkesnes & Førde 1992, Moum 1992). In an audiological context, anxiety has been outlined theoretically as a potential consequence of particular interest, since HL may cause isolation and stigmatization (Stephens & Héту 1991, Héту 1996). The evidence of associations between HL and anxiety is diverse. In a review of publications dealing with emotional disturbances it was assumed that anxiety of more than a transitory nature does associate with HL, but that treatment may reduce it (Jakes 1988). A recent study showed that the mental health of adults with bilateral, severe HL was more pronounced than in the general population, but less so than it has sometimes been suggested (de Graaf & Bijl 2002). Another recent study related degree of HL to anxiety and general satisfaction, but the association with degree of HL decreased with age. And deficits that were observed only in the middle and higher frequencies were not associated with anxiety and general satisfaction (Tambs 2004).

Thus, the evidence of a correlation between degree of HL and anxiety is equivocal. At the same time, studies of the correlation between degree of HL and perception of health, participation in community life and general life satisfaction, regardless of age, are still sparse.

We report here data from a cohort of hearing-impaired adults who consulted for HA fitting and rehabilitation at the outpatient facilities of a university hospital in Norway. The aim was to study whether degree of HL was associated with self-reported general health and anxiety. We also explored how the patients perceived their life situation in terms of general satisfaction in life and participation in organized, non-family social activities. We hypothesized that health and life situation differed due to demographic and audiological characteristics other than HL and, accordingly, studied any such associations under control for relevant confounding factors.

Material and Methods

Subjects

Study subjects were recruited from consecutive patients on the waiting list for audiological examination and medical consultation during a period of 1 year (May 2002 to April 2003) at the Department of Audiology, St Olavs University Hospital, Trondheim, Norway. In total, 474 patients were asked to participate, but, of these, 50 patients did not need or want treatment, 59 were excluded because of severe illness or language difficulties, and 22 did not want to participate. Thus, the study sample consisted of 343 individuals (188 males and 155 females) between 21 and 94 years of age (mean = 69 years, SD = 13.8 years) with no significant difference in age between genders. Furthermore, 311 subjects (91%) had a sensorineural HL, 5 (1%) a conductive HL and 27 (8%) a mixed one.

Measurements

Hearing measurement. Pure-tone audiometry, was performed following recommended procedures and standards (Helvik, Jacobsen, Wennberg, Arnesen, Ringdahl & Hallberg 2006). The pure-tone thresholds at 0.5–1–2–4 kHz in the better ear form the basis for the mean threshold and degree of HL. Furthermore, the degree of HL was categorized according to the EU Work Group on Genetics of Hearing Impairment (Martini 1996) as mild ($20 \text{ dB} < \text{MTH} < 40 \text{ dB}$), moderate ($40 \text{ dB} \leq \text{MTH} < 70 \text{ dB}$) or severe/profound ($70 \text{ dB} \leq \text{MTH}$). $\text{MTH} \leq 20 \text{ dB}$ in the better ear is considered normal (Martini 1996) and was used as a reference level in the comparative analyses. In addition to degree of HL, information about previous HA experience (yes or no), tinnitus (i.e. ringing or buzzing in the ears; yes or no) and perceived duration of HL (low = 1 year or less, middle = 2–4 years, high = 5 years or more) was recorded.

Self-report measurements. These included questions about perceived health and life situation. They were constructed for adult participants of all ages and health conditions in the Nord-Trøndelag Health Study (Holmen et al. 1990, 2003). In addition, we recorded level of education (low = up to and including

10 years, middle = 11–13 years, high = more than 13 years) and whether the participants were living with their spouse or any other significant persons (yes or no).

Perceived health. “Perception of health” was measured by asking: “How is your present state of health?” on a four-point response scale which included the following options “very good”, “good”, “not so good” and “poor”.

“Perception of anxiety” was assessed by asking: “Over the last two weeks, have you been troubled by anxiety?” Four response categories from “no”, “somewhat”, “much” to “very much” were employed. In order to apply logistic regression and increase the study power these responses were dichotomized as “good” or “not good” for health and as “yes” or “no” for anxiety (Table 1).

Perceived life situation. “Participation in social activities outside the family” was assessed by asking: “How often do you usually take part in social activities like, for instance, sports or political, religious or other organizations?” Again, the subjects indicated participation on a four-point scale (i.e. “never or only a few times a year”, “one to two times a month”, “about once a week” and “more than once a week”).

“General satisfaction in life” was measured by asking: “When you think about your present situation, are you on the whole satisfied or not satisfied with your way of life?” There were seven response categories that ranged from “extremely satisfied”, to “extremely dissatisfied”.

Again, for analytical purposes both variables were dichotomized. In the latter case, the “dissatisfied” category also included the middle, neutral response (Table 1).

Procedure

The patients were informed in a letter about the overall purpose of the study and requested to participate. They were asked to attend 30 minutes before their scheduled appointment for further information and inclusion in the study. To reduce potential bias and before handing over the questionnaires to the patients, it was explained to the patients that the answers would not influence the outcome of the audiological consultation or the type of treatment they might be offered. They were further instructed to answer the questions based on their own experiences and with as little assistance as possible from others. Further details about the procedure are available (Helvik et al. 2006). The study was approved by the Regional Committee for Medical Research Ethics in Mid Norway.

Statistics

All analyses were performed using SPSS, version 11.5 (SPSS, Chicago, IL, USA). Description of study data made use of analysis of variance (ANOVA)

Table 1. Self-report measurement of perceived health and perceived life situation among patients seeking hearing aid fitting, St Olav's University Hospital, Trondheim.

Perceived health	Response categories	
	Recorded	Analysed
Perceived Health		
Perception of health		
Question asked:	- Very good (1)	- Good (1–2)
- <i>How is your present health?</i>	- Good (2)	vs
	- Not so good (3)	- Not good (3–4)
	- Poor (4)	
Perception of anxiety:		
Question asked:	- No (1)	- No (1)
- <i>During the last two weeks, have you felt troubled by anxiety?</i>	- Somewhat (2)	vs
	- Much (3)	- Yes (2–4)
	- Very much (4)	
Perceived life situation		
Participation in social activities outside the family		
Question asked:	- Never, or only a few times a year (1)	- No (1)
- <i>How often do you usually take part in social activities, such as, e.g. a sports club, a political, religious or other organization?</i>	- 1–2 times a month (2)	vs
	- About once a week (3)	- Yes (2–4)
	- More than once a week (4)	
General satisfaction in life		
Question asked:	- Extremely satisfied (1)	- Satisfied (1–3)
- <i>When you think about your situation at the moment, are you on the whole satisfied with your way of life or are you on the whole dissatisfied with your way of life?</i>	- Very satisfied (2)	vs
	- Quite satisfied (3)	- Dissatisfied (4–7)
	- Both satisfied and dissatisfied (4)	
	- Fairly dissatisfied (5)	
	- Very dissatisfied (6)	
	- Extremely dissatisfied (7)	

and χ^2 statistics for continuous and categorical data, respectively. *p*-values below 0.05 were considered statistically significant.

The outcome variables (perceived health and life situation) were dichotomized in order to use logistic regression and normal hearing in the better ear was used as regression reference level for both crude and adjusted models. Adjusted analyses, which controlled for potential and actual confounders were performed and explored with the lowest level as reference. Independent variables that were viewed as relevant and included in the final adjusted model were based on a change in the odds ratio (OR) greater than 0.2. Age was grouped in four strata (20–49, 50–69, 70–79 and 80+ years). Test for trend was examined by use of the Wald statistics.

Results

Characteristics of Study Sample

MTH for the whole sample was 43.4 dB (SD 16.7). Separately, MTH was 42.0 dB (SD 16.6) for men and 45.0 dB (SD 16.8) for women. The subjects were further described by level of HL (Table 2). That level increased with increasing mean age ($p < 0.001$), and there was a statistically significant relation between level of HL on the one hand, and level of education ($p < 0.05$) and previous HA experience ($p < 0.001$) on the other. Thus, there were significant correlations between HL level and level of education as well as between HL level and previous HA experience.

Effect of Level of HL on Perceived Health

Perception of general health was affected by level of HL in both crude and adjusted models (Table 3). After control for age, HA experience and tinnitus, the most severely affected subjects had a four times higher odds than the reference population to perceive their health as “not good” ($p < 0.05$). In

Table 2. Characteristics of St Olav’s study sample ($n = 343$) by level of hearing impairment

	Normal	Mild	Moderate	Severe/profound	Total
Males	13	72	87	16	188
Females	11	46	87	11	155
Total	24	118	174	27	343
Living with spouse	18	88	113	14	233
Education [¶]					
<10 years	8	50	101	15	174*
10–13 years	7	36	46	9	98
>13 years	9	32	25	3	69
Age (years)					
Mean	56.7	65.7	73.3	66.4	69.0 [†]
SD	11.4	11.8	12.4	20.7	13.8
MTH					
Mean	15.9	31.7	49.5	82.1	43.4
SD	3.6	5.2	7.8	10.1	16.7
HA experience	1	30	114	25	170 [§]
Tinnitus	14	42	56	6	118

*Pearson’s $\chi^2 = 16.046$, $df = 6$, $p < 0.05$.

[†]ANOVA: $F = 16.955$; $df = 3$, $p < 0.001$.

[§]Pearson’s $\chi^2 = 87.344$, $df = 3$, $p < 0.001$.

[¶]Numbers for this variable do not total 343 because of missing data.

MTH = mean threshold of hearing; HA = hearing aid.

Table 3. Effect of mean threshold (MTH) level on perceived health and life situation ($n=343$)

Health and life situation			Unadjusted		Adjusted*	
	Yes	No	OR	95% CI	OR	95% CI
Perceived Health						
Perception of Health as “Not good”						
Hearing						
Normal	6	18	1	Reference	1	Reference
Mild HI	47	71	1.986	(0.734–5.370)	1.652	(0.589–4.633)
Moderate HI	84	90	2.800	(1.061–7.391)	2.671	(0.910–7.835)
Severe/profound HI	14	13	3.250	(0.967–10.922)	4.317	(1.125–16.569)
Wald statistics			5.674, $p=0.017$		6.333, $p=0.012$	
Anxiety						
Hearing						
Normal	3	20	1	Reference	1	Reference
Mild HI	20	94	1.418	(0.384–5.236)	1.214	(0.311–4.737)
Moderate HI	41	125	2.187	(0.618–7.738)	1.425	(0.350–5.806)
Severe/profound HI	8	17	3.137	(0.717–13.727)	1.831	(0.348–9.629)
Wald statistics			3.969, $p=0.046$		0.655, n.s.	
Perceived Life Situation						
No participation [†] in social activity outside the family						
Hearing						
Normal	10	14	1	Reference	1	Reference
Mild HI	52	66	1.103	(0.453–2.684)	1.015	(0.390–2.642)
Moderate HI	83	91	1.277	(0.538–3.031)	1.290	(0.472–3.527)
Severe/profound HI	15	12	1.750	(0.576–5.316)	2.226	(0.605–8.189)
Wald statistics			1.329, n.s.		1.835, n.s.	
Dissatisfaction[‡] in life						
Hearing						
Normal	6	18	1	Reference	1	Reference
Mild HI	24	93	0.774	(0.277–2.162)	1.255	(0.415–3.790)
Moderate HI	37	136	0.816	(0.302–2.203)	1.477	(0.456–4.781)
Severe/profound HI	9	18	1.500	(0.442–5.092)	3.233	(0.742–14.090)
Wald statistics			0.613, n.s.		2.131, n.s.	

Numbers for some variables do not total 343 because of missing data.

*All effect variables were adjusted for age strata, tinnitus and previous hearing aid (HA) experience.

[†]In addition “participation” was adjusted with gender and duration.

[‡]In addition “dissatisfaction” was adjusted for gender and education.

HI =hearing impairment; OR =odd’s ratio; CI =confidence interval; n.s. =not significant.

subjects with moderate or mild HL, the odds increased less and not significantly ($p >0.05$). Nevertheless, there was a significant test for trend by increasing degree of HL ($p <0.05$).

Perception of anxiety also seemed to be associated with HL level. Thus, after correction for age, HA experience and tinnitus we observed that the odds for reporting anxiety was more than one and a half times higher among

subjects with severe/profound HL, while the increase in odds was less for subjects with lower levels of HL. Still, we found no significant trend with increasing HL in the adjusted model.

Effect of Level of HL on Perceived Life Situation

After correction for age, HA experience, duration of HL, tinnitus and gender, participation in social activities outside the family seemed to be influenced negatively by increasing levels of HL (Table 3). Subjects with severe/profound HL had approximately twice the odds for “non-participation” compared with subjects with normal hearing in the better ear. Patients with moderate HL had 20% higher odds for non-participation while the mild HL group did not differ from the reference group and there was no significant trend by increasing level of HL.

Even with an apparent and consistent pattern, we found no significant association between general life satisfaction and HL level after adjustment for age, gender, education and HA experience and there was no significant trend ($p > 0.05$). Still, subjects with severe/profound HL had approximately three times the odds for reporting that they felt dissatisfied compared with those with normal hearing in the better ear.

Discussion

We studied perceived health and life situation in adults with HL who consulted a university clinic for HA fitting and rehabilitation. With adjusted logistic regression modelling we observed that subjects with the highest degree of HL had a four times higher odds than the reference subjects of reporting that their health was “not good”. The most severely impaired individuals also had odds of reporting that they felt anxious that were more than one and a half times higher, odds of refraining from social activities outside their family that were approximately twice as high, and odds of reporting that they were generally dissatisfied that were three times as high. Except for the significant trend between HL and perceived health, all other correlations were consistent, but statistically non-significant.

Association Between HL and Health and Life Situation

In order to explore any associations with the objectively measured level of HL, the present study used a wide, but accepted concept to describe perception of health (Idler & Benyamini 1997). In a socio-cultural model self-reported health may be explained by impairment (Moum 1992). According to this model and supported by epidemiological research, demographic variables may contribute to explain the perception of health (Fylkesnes & Førde 1992). Furthermore, it has been reported that when sufficient medical information is available, demographic and socio-cultural variables contribute less to self-assessment of health (Moum 1992). However, we found that age correlated both with degree of HL and self-reported health

and influenced the correlation between level of HL and perception of health. As expected and in addition to age, the information about previous HA experience influenced how our subjects perceived their health. Furthermore, tinnitus, which frequently accompanies HL and adds to the impairment had an individual impact on how the subjects viewed their health. In order to study the “pure” association between level of HL and general health those three characteristics were classified as confounders and controlled for. Still, we found that subjects with severe/profound HL more often experienced their health as “not good”. Thus, it seems that HL has a general impact on health perception that goes beyond the consequences that are strictly related to difficulties in hearing spoken words and messages. Even if our results are in line with the socio-cultural model of self-reported health, we are quite aware that in a public health perspective HL and its consequences often add to any other negative health effects associated with increasing age. In addition, clinicians have experienced that subjects with HL also have shoulder and neck tensions, headache and feel tired which others have documented as related to hearing difficulties (Danermark & Coniavitis Gellerstedt 2004). Thus, we cannot rule out that these conditions have influenced our results. Regardless of this and consistent with our findings, it has been reported that hearing-impaired women 65 years and over were more likely to use community health services than women without HL (Ward, Lord, Williams & Anstey 1993) and it has also been reported that HL in the elderly is associated with a functional reduction (Cacciatore et al. 1999).

Hétu (1996) explained how anxiety and withdrawal from social interaction in theory are effects of stigmatization of hearing-impaired individuals. According to Stephens (1980) subjects with HL have increased levels of anxiety and introversion. Yet another study showed a significant correlation between anxiety and speech recognition in hearing-impaired subjects (Eriksson-Mangold & Carlsson 1991). Correspondingly, we reported that subjects with severe/profound HL had higher odds for feeling anxious, even if it did not reach the stated level of statistical significance. A population study of approximately 50,000 subjects found a moderate and clear effect of the measured HL on anxiety that decreased with age, but only for hearing losses also affecting outside the middle and/or higher frequency thresholds (Tambs 2004). The present study had a large proportion of elderly and characterized degree of HL in line with international standards (Martini 1996). Unlike the comprehensive population study by Tambs (2004), we controlled for previous HA experience, which may have modified the mental effect of HL further (Jakes 1988). Our results may support the conclusion of de Graaf and Bijl (2002) that a mental consequence of HL may exist, but that it is less pronounced than sometimes suggested. Thomas (1984) concluded that when audiological measured HL exceeded 70 dB in the better ear it could discriminate regarding consequences of HL. Degree of HL as the main measure seems to be of minor importance when anxiety as a consequence of HL is studied. Thus, focus should rather be on the complex relationship between environmental factors and personal resources as recommended by the ICF (WHO 2001).

WHO (2001) has classified several aspects of participation restriction that may develop due to hearing impairment. We explored participation in organized community life and found higher odds for non-participation in social activities outside the family for subjects with advanced HL, even if the finding was not statistically significant. Others have reported that elderly women avoided going to the cinema or theatre to a degree that correlated with their HL (Espmark, Rosenhall, Erlandsson & Steen 2002), but relatively few studies have shed light on this particular phenomenon. Even so, it has not been firmly established that degree of HL plays an important role in participation restriction in general. We have nevertheless found in a previous study that coping variables explained most of the variance in participation restriction while audiological factors played a minor role and degree of HL no role at all (Helvik, Jacobsen & Hallberg, *in press* (a)).

We explored a variable called general satisfaction and dichotomized it for statistical purposes. Others have used the term well-being (Krokstad, Johnsen & Westin 2002) or characteristics of quality of life (QL) (Tambs 2004) for the same phenomenon. We found again a consistent, but not statistically significant pattern in our study population. Subjects with severe/profound HL had higher odds to report that they felt a general dissatisfaction with life than the reference group. Differences in QL among individuals, who suffer from tinnitus, have partly been explained by degree of HL (Erlandsson & Hallberg 2000) while others have reported that degree of HL was also associated with QL (Bess et al. 1989). Tambs (2004) studied low-frequency hearing and observed an association between HL and general satisfaction, but the effect decreased with age and no association was found among subjects with HL only in the middle- or high-frequency thresholds. The study by Tambs (2004) tapped general satisfaction with the same, single question as we did. Still, others who used a comprehensive QL inventory could not replicate or explain the reported decrease in QL or well-being by degree of HL (Hallberg, Pässe & Jansson 1999, Parving, Parving, Erlandsson & Christensen 2001, Helvik, Jacobsen & Hallberg, *in press* (b)). Danermark and Coniavitis Gellerstedt (2004) indicated recently that well-being was unrelated to the clinically diagnosed severity of HL.

Several others have reported about consequences of HL in line with WHO's original conceptual framework that used the handicap concept (WHO 1980) including emotional and social consequences of HL (Stephens & Héту 1991). Studies that used the handicap concept have reported different degrees of correlation (moderate or weak) between degree of HL and perceived handicap (reviewed by Erdman & Demorest 1998), but there is little evidence that degree of HL is closely related to measures of handicap (Brainerd & Frankel 1985). Our results regarding anxiety, restricted participation in community life, and general satisfaction were consistent with the results obtained by use of the handicap concept (WHO 1980). Furthermore, our results are in line with the new conceptual framework of WHO (WHO 1998, 2001) which point out that an individual's functional state should rather be viewed as a complex and dynamic relationship between health components and environmental and personal factors (WHO 2001). Thus, use of the

cognitive stress and coping theory (Lazarus & Folkman 1984) in order to study the individual's experience of anxiety, participation in community life, and general satisfaction in relation to HL may give us a more comprehensive understanding.

Limitations and Strengths

Limitations of our study may be the way we dichotomized the effect variables, the relatively few reference subjects, and the use of subjects with a normal hearing in one ear. Firstly, dichotomous effect variables may have reduced the nuances and contrasts in the patients' responses and influenced the study power negatively. Even though our study included unselected adult patients over 1 year ($n = 343$), the number may still have been inadequate for some estimates and their precision. That could also be said about the rather limited contrast between subjects with hearing deficit in one or both ears. However, investigations of long-term effects of unilateral HL did not support the presence of non-auditory effects (Colletti, Fiorino, Carner & Rizzi 1988). A reference group – recruited elsewhere – with normal hearing in both ears and matched for gender and age could have replaced the actual one. On the other hand, a reference population selected at random may have given rise to new limitations.

Another potential limitation is that we assessed perceived health and life situation by single items. Still, Idler and Benyamini (1997) reviewed almost 30 studies of self-reported health, and all used that approach. The wording of the item about perceived health varied between studies and it may be discussed how well each of them tapped such a complex and multidimensional phenomenon as health. However, the question we used has been accepted, used frequently and found to be sensitive in epidemiological studies by other Norwegian research groups (Holmen et al. 1990, Fylkesnes & Førde 1992, Krokstad, Kunst & Westin 2002a, Holmen et al. 2003). Even if a formula with only two items could tap anxiety, as represented in a complex anxiety symptom checklist (Tambs & Moum 1993), the single item approach we used may have been too restricted. Further, we have focused on an aspect of participation which was different from most other studies, and chosen a single item approach for this as well, since a comprehensive quantitative inventory to assess participation in community life was not available in Norwegian. There are several generic and psychometrically tested inventories that do assess general satisfaction or QL with high validity and reliability (Bowling 2001). Yet, some have claimed that the available quality of life inventories may be unsuitable for studies of HL (Bess 2000, Parving et al. 2001) and others have used the same single item approach as we did (Krokstad et al. 2002a, Tambs 2004),

With the above limitations, we still hold that our findings add scientific knowledge to the audiological field and that the increase in the odds for perception of health among patients with severe/profound HL is of interest. Yet, further studies of the perception of health should be performed before firmer conclusions can be drawn and the implications for clinical rehabilita-

tion discussed. The degree of HL seems to have limited value when the consequences of the impairment such as perceived anxiety, limited participation in organized social activities, and general life satisfaction are assessed. A rehabilitation approach that may help patients to overcome such negative consequences should focus on each individual's particular needs, which must in turn be based on a systematic evaluation of the audiological and general health situation, restrictions the individual has experienced in any attempted social activities, general satisfaction and their expressed wishes.

Conclusion

Consequences of HL in terms of experienced anxiety, participation in social activities and perceived life situation were not significantly related to degree of HL. Even so, perception of health in general was affected by level of HL. Given the high prevalence of HL in the adult population, other studies are needed to negate, confirm, or give additional support to the finding of perceived health. Such larger studies are also deemed necessary to nuance outcome characteristics, increase the power of the estimates, control other potential confounding variables, and establish a more definite threshold or dose response relationship between degree of HL and the general health outcome under study.

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