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Research Paper

Gender differences in improvement of older-person-specific quality of life after hearing-aid fitting

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ABSTRACT

Background: Age-related hearing loss is the third most common reason for disability in the world and has a significant impact on quality of life (QoL) amongst older adults.
Objective: To determine how the QoL assessment in older-person-specific domains differs between older men and women with age-related hearing loss before and after hearing-aid fittings.
Methods: The present study was carried out with 105 hearing-impaired outpatients (aged $\geq$ 60 years) before and after hearing-aid fittings at the University Hospital Olomouc, Czech Republic. The instrument used was the World Health Organization Quality of Life-Older Adults module (WHOQOL-Old). It was completed before hearing-aid fittings and after the first check-up hearing-aid adjustment. The Wilcoxon paired test multiple logistic regression was used to evaluate changes in the QoL after hearing-aid fittings. The distributions of men a women into three subgroups, improved, unchanged, and worsened in each domain, were compared using Fisher's exact test.
Results: A significant QoL improvement when fitting a hearing-aid in the area of *Sensory abilities* was confirmed in both men and women ($p < 0.001$). In *Autonomy*, a significant improvement was recorded only amongst men ($p = 0.010$). In *Past, present and future activities* and *Social participation*, a significant improvement was only recorded amongst women ($p = 0.029$; $p = 0.001$). Significant differences were revealed between men and women in changes for *Sensory Abilities* ($p = 0.019$), *Social Participation* ($p = 0.036$) and *Intimacy* ($p = 0.002$).
Conclusions: The findings of this study suggest that there are gender differences in QoL improvement amongst people with age-related hearing loss after hearing-aid fitting.
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Hearing impairment is an increasingly important public health problem which leads to reduced quality of life (QoL) of an individual, isolation, dependence and frustration in both developed and developing counties.[1] Age-related hearing loss is a progressive, bilateral and symmetric hearing deficit, primarily at high frequencies. It is an extremely common hearing impairment and its prevalence will increase considerably over the following decades since the number of elderly people is increasing worldwide.[2] Age-related hearing loss is the third most common reason for disability in the world.[3] In Europe, about 30% men and 20% women aged 70 + suffer from a pure-tone average (PTA) hearing loss of 30 dB (dB) or more in the better ear. In the age category 80+, it is as high as 55% men and 45% women.[4] The impact of age-related hearing loss on QoL for older adults is significant. The consequent functional and cognitive impairments are sources of ongoing frustration which dampen mood and communication.[5] It causes social isolation, loneliness, dependence, and

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frustration[1,6] a decline in the instrumental activities of daily living,[7] increasing reliance on the community or family support[8] and a decline in psychological well-being.[9] Age-related hearing loss has a significant impact on QoL amongst older adults.[6]

The subjectively perceived impact of hearing loss on QoL is highly individual and there are more contributing factors. Campos states that there are differences between men and women in the assessment of different QoL domains.[10] Tajvar et al. also confirm that evidence of gender differences has been reported regarding assessment of health-related QoL (HRQoL).[11] The impact of age-related hearing loss on QoL can be reduced with the help of hearing-aids.[12,13] Hearing handicap perceptions by older adults improve significantly after hearing-aid fittings, although certain social and emotional limitations remain.[14] When using a hearing-aid, the assessment of improvement in different QoL domains may differ according to gender. A study by Niemensivu et al. claims that using a hearing-aid leads to improvement in the domain of "hearing" in both genders. However, the overall HRQoL change revealed a certain gender effect with a change recorded only in female participants. Additionally, there was only a marginal but statistically significant overall change in HRQoL among participants with better hearing sensitivity and speech discrimination scores.[15] Across cultures and ages, there are differences in values between sexes: women value relationships more than men, whereas men value autonomy more than women.[16] In the area of social participation, the assessment between men and women differs as well. A study from southern Taiwan by Li et al. determined that social interaction was significantly linked to QoL assessment by young-old women. The authors' explanation lies in the changes in gender roles and social context across different generations. They assume that young-old women were raised with more exposure to Western cultural values, such as Feminism and gender equality, and that these values may affect their realization of the importance of social activity.[17] Lee et al. confirm, based on the results of their research that the relationship between social participation and self-rated health became stronger with age and is greater in women than in men.[18] The influence of social participation in women is greater than in men and is highest for elderly women. Men and women play different social roles, which in turn shape their lifestyles in different ways. Social participation and social support plays a larger role in relation to the health status of women than men. Szaflarski found out that women's health depends on marital happiness, whereas men's health is shaped by employment status. Married women socialize with their friends, relatives, and neighbors somewhat less than their unmarried counterparts. However, marital status makes no difference in men's social participation.[19] Additionally, Szaflarski's study discovered that women are more socially isolated than men because of housework and family responsibilities — though not necessarily child care. Men, on the other hand, continue participating in social gatherings after they are married.

Therefore, when assessing the domains of QoL among older adults, there is a need to draw attention to gender differences. The differences in evaluation by older men and women with age-related hearing loss in older-person-specific domains of the World Health Organization Quality of Life-Older Adults Module (WHOQOL-Old) have not been thoroughly investigated as yet. Our aim was to determine how the QoL evaluation changes in older-person-specific domains between older men and women with age-related hearing loss before and after hearing-aid fittings.

Methods

Study design and sample

A cross-sectional prospective study using the Czech version of WHOQOL-Old was conducted. A WHOQOL-Old questionnaire was created for measuring the quality of life with older adults.[20] At present, it has been translated into more than 20 languages, including Czech, and has been rated as a questionnaire with a good reliability and validity.[21] It consists of 24 items rated on a five-point Likert scale and produces six domain QoL scores: Sensory abilities (SAB); Autonomy (AUT); Past, present and future activities (PPF); Social participation (SOP); Death and dying (DAD); and Intimacy (INT). The five-point Likert scales express the intensity, capacity or satisfaction of the elderly. Instead of sociodemographic data, the questionnaire included items focusing on the type of hearing-aid end frequency of use. The study protocol was conducted in accordance with the 1975 Helsinki Declaration, as revised in Brazil 2013. The study was approved by the Ethics Committee of the Faculty of Health Sciences, Palacký University Olomouc, Czech Republic. Informed consent to participate was obtained for the study contents, purposes and protocols, data confidentiality and anonymity procedures. The participants' freedom to discontinue the study was explained. All subjects signed informed consent before enrollment.

The research sample consisted of outpatients from the Phoniatric Clinic of the University Hospital in Olomouc who were prescribed their first hearing-aid during the period from March to July 2014. The inclusion criteria were age $\geq$60 years and signed informed consent. The inclusion age threshold was set at 60 and higher, similarly to the development of the WHOQOL-Old[20] and its Czech version. This is the age when patients are considered geriatric in the Czech health care system and older adults are eligible for most financial benefits from the age of 60. Our research was carried out in two stages. In the first stage, a research nurse assisted the patient with filling out the questionnaire in the Phoniatric Clinic of the University Hospital in Olomouc, after a hearing-aid was prescribed based on a tone and speech audiometry examination. The second stage took place in the same clinic when patients arrived for the first check-up of the hearing-aid and setting adjustment (usually three months after the hearing-aid was prescribed). This period makes it possible for an individual with age-related hearing loss to evaluate the effect of wearing a hearing-aid on their QoL.[22]

Statistical processing

Data analysis was performed based on a gross score and medians in each of the WHOQOL-Old domains in the first and second stage of the research (before using a hearing-aid and with a hearing-aid). Data normality was verified using the Shapiro-Wilk test. The Wilcoxon paired test was used to evaluate changes in domains of QoL after hearing-aid fittings. The distributions of men and women into three subgroups (improved, unchanged and worsened) in each domain were compared using Fisher's exact test. Multiple logistic regression was used to find significant predictors for the improvement of the Global QoL. Statistical package IBM SPSS Statistics version 22 was used to analyze the data. A significance level below 0.05 was considered statistically significant ($p < 0.05$).

Results

Participants

During the research period, the Phoniatric Clinic at the University Hospital in Olomouc prescribed hearing-aids to 131 outpatients aged $\geq$ 60 years based on a tone and speech audiometry examination. Out of the 131 patients approached, 107 older adults agreed to take part in the study, signed the informed consent form and completed the questionnaire with the help of a research nurse. Two participants did not return for the check-up three months later due to their general health deterioration. The total of 105 older (80.15%

of the total number approached) adults completed the questionnaire in both stages of the research. The sample comprised 49 (46.7%) women and 56 (53.3%) men. The average age of the outpatients who completed the research was 74.9 (SD 8.2; range from 60 to 90 years of age), as shown in Table 1. There was no significant age difference between women and men. 66.7% participants lived in a household with another person, most often a partner. There was a significantly higher number of women who lived without a partner (44.9% women vs. 23.2% men; $p = 0.010$).

WHOQOL-old

Before hearing-aid fitting (phase one) better QoL was found in women in the domain *Past, present and future activities* ($p = 0.008$) and *Social participation* ($p = 0.021$), whereas in men better QoL was in the domain *Death and Dying* ($p = 0.033$). After three months with a hearing-aid (phase two) better QoL was found amongst women in the domain *Past, present and future activities* ($p = 0.005$), *Social participation* ($p = 0.002$). Amongst men better QoL was in domain *Intimacy* ($p = 0.037$). Neither men nor women differed significantly in global score of QoL in the phase one and two (Table 2).

Table 3 lists the medians for each domain of the WHOQOL-Old. A significant improvement in QoL when wearing a hearing-aid was confirmed among both men and women in the domain *Sensory abilities* ($p < 0.001$). In *Autonomy*, there was a significant improvement in men only ($p = 0.010$). In the domains *Past, present and future activities* and *Social participation*, a significant improvement was only confirmed in women ($p = 0.029$; $p = 0.001$).

Table 4 lists the percentages of women and men who reported improvement (A), no change (B) or worsening (C) in each of the QoL domains when wearing a hearing-aid. Significant differences were revealed between men and women in changes in *Sensory Abilities* ($p = 0.019$), *Social Participation* ($p = 0.036$) and *Intimacy* ($p = 0.002$). In these domains, there was a significant improvement amongst women.

Multiple logistic regression shows that the predictors of changes in QoL when wearing a hearing-aid were gender, age, type of hearing-aid, household and reported hearing-aid usage. Significant predictors of improvements of QoL among older adults when wearing a hearing-aid was gender and age. The chance for improvement of QoL in men was 0.318 times smaller compared to women. The chance of improvement of QoL per unit increasing of age (i.e. about 1 year) is 1.071 higher (Table 5).

Discussion

The results of this study focused on changes in QoL assessment amongst elderly who were first prescribed a hearing-aid indicate differences between men and women. Significant predictors of improvements of QoL among older adults when wearing a hearing-aid was gender and age. A significant improvement in the *Sensory abilities* was confirmed in both men and women. Our results are in agreement with a Finnish study which also described a positive change in the mean hearing-specific scores in adults with hearing impairment as a result of hearing-aid rehabilitation.[15]

In *Autonomy*, there was significant improvement in men only. In contrast, Klink states that no changes were observed in the autonomy domain amongst respondents with a cochlear implant. However, these German participants were much younger (average age 49.6) than our respondents and Klink's sample had a majority of women (81.8%). In Klink's study, autonomy was defined in terms of self-confidence, self-reliance and independence from social norms.[23] The Autonomy domain – as defined in the WHOQOL-Old questionnaire our study is based on – includes items about freedom to make own decisions; feeling in control of one's future, the ability to do things one would like to; people around are respectful of one's freedom. The reason our research did not reveal a significant improvement in the Autonomy domain amongst women may be related to the fact that more than half of them lived alone. The Czech Republic ranks first among post-Communist countries in Europe in the rate of elders living alone. The elderly perceive personal autonomy as autonomy inside a family supporting network and therefore the alone living women did not necessarily perceive hearing improvement as a significant change in relation to their own autonomy.

In the domains *Past, present and future activities and Social participation*, a significant improvement was recorded in women. In a Brazilian study, Carvalho-Loures confirmed that these areas are extremely important for women.[24] Li et al. states that social activity among women in Taiwan was significantly linked with QoL assessment only in young-old women (aged 64–75). These findings may reflect changes in gender roles and the social context across different generations. There is a similar factor manifested in Chinese culture.[17] In contrast, Lee et al. claims that the relationship between social participation and self-rated health was maximized in elderly women.[18] A Lebanese cross-sectional study also confirmed gender differences in the effect of social support on

Table 1
Descriptive characteristic of participants.

	Total	Men	Women	p
Sample				
N(%)	105 (100)	56 (53.3)	49(46.7)	
Age				
average ± SD;	74.8 ± 8.18;	74.5 ± 7.82;	76.0 ± 8.65;	0.875
range	60–90	60–90	60–89	
Household, N(%)				
Lives alone	35(33.3)	13(23.2)	22(44.9)	0.010
Lives with a partner	51(48.6)	35 (62.5)	16 (32.7)	
Lives with other people	19(18.1)	8 (14.3)	11 (22.4)	
Type of HA prescribed, N(%)				
Behind the ear	84(80.0)	48 (85.7)	36(73.5)	0.145
In the ear	21(20.0)	8 (14.3)	13 (26.5)	
Reported HA usage, N(%)				
More than 8 h/day	9(8.6)	4(7.1)	5(10.2)	0.801
5–8 h/day	23(21.9)	12(21.4)	11(22.4)	
1–4 h/day	44(41.9)	23(41.1)	21(42.9)	
Sometimes (more than 1 h/week, less than 1 h/day)	25(23.8)	13(23.2)	12(24.5)	
Rarely (less than 1 h/week)	4(3.8)	4(7.1)	0(0.0)	
Never	0(0.0)	0(0.0)	0(0.0)	

Table 2
QOL score of respondents before using a hearing-aid and after three months with a hearing-aid (Phase one and two).

QoL score – Phase one median (range)	Total	Men	Women	p
Global score	85.0 (48–106)	85.0 (48–100)	85.0 (56–106)	0.465
SAB	11.0 (6–17)	11.0 (8–17)	11.0 (6–16)	0.405
AUT	16.0 (6–20)	16.0 (6–20)	15.0 (9–20)	0.356
PPF	14.0 (8–20)	13.0 (8–17)	14.0 (11–20)	**0.008**
SOP	15.0 (7–19)	14.0 (8–19)	15.0 (7–18)	**0.021**
DAD	17.0 (7–20)	18.0 (8–20)	16.0 (7–20)	**0.033**
INT	15.0 (6–20)	13.5 (6–17)	15.0 (8–20)	0.053
QoL score – Phase two median (range)				
Global score	88.0 (51–108)	87.0 (51–101)	59.0 (62–108)	0.113
SAB	13.0 (8–18)	13.0 (8–17)	13.0 (9–18)	0.238
AUT	16.0 (6–20)	16.0 (6–20)	16.0 (9–20)	0.457
PPF	14.0 (8–20)	14.0 (8–17)	15.0 (11–20)	**0.005**
SOP	15.0 (7–20)	14.0 (8–19)	16.0 (7–20)	**0.002**
DAD	16.0 (8–20)	18.0 (8–20)	16.0 (8–20)	0.092
INT	15.0 (6–20)	13.5 (6–17)	15.0 (8–20)	**0.037**

HA = hearing-aid; p – Fisher's exact test (qualitative parameters)/Mann-Whitney *U* test (quantitative parameters).

health related QoL in old age.[25] Hajek et al. claim that women's high social ties over the course of life might lead to a faster compensation for the loss of social support in old age.[26]

In the *Intimacy* domain, there was no significant improvement amongst either men or women, although women had a higher score than men. This corresponds with the findings by Bilgili and Arpazi who also state that elderly women had higher average scores in the intimacy sub-scales.[27] The domain Intimacy includes the following items: experiencing love in your life, opportunities to love and opportunities to be loved. Emotional security for an aged person is often provided by his/her life partner or children. These are the closest people who know the person intimately and demonstrate their affection regardless of the person's hearing impairment. For this reason, the effect of fitting a hearing-aid in improving hearing impairment is not necessarily seen as a factor which would increase the opportunity to love and be loved. However, there is a significant improvement among women in our research compared to men. This may be due to the fact that almost half the women lived alone. Improvement in hearing might be connected with higher chances of making new acquaintances which would provide opportunities to love and opportunities to be loved. This is also confirmed by a significantly higher improvement amongst women in the domains *Social Participation* and *Intimacy* compared to men.

In the *Death and Dying* domain, our respondents had the highest score before as well as after using a hearing-aid (Table 2). Varela also demonstrates that the score for the domain *Death and Dying* was the highest among respondents. The majority reported being afraid of feeling pain in the process of death, which was also observed in other studies that used the WHOQOL-Old.[28] Similar findings can be found in a Brazilian study.[24] In our research, the domain *Death and Dying* revealed significant worsening amongst a quarter of the men. Our hypothesis is that this might be due to factors not investigated in the second phase of the research. These factors might include recent experience with an incurable illness, the death of a close person or confirmation of a diagnosis or a participant's relapse into a serious illness.[29]

Study limitations

The limitations of the present study should be mentioned when evaluating our results. This study suffers from some limitations, which need to be addressed in subsequent research. The results only cover a short period of time, the study is a cross-sectional one and thus cannot confirm the long-lasting effect of fitting a hearing-aid on QoL. Furthermore, the results in certain QoL domains may have been influenced by factors not investigated in the study, e.g. lacking information on education, income, cognitive function, disability or comorbidities. Further research is needed to explore the relationship between hearing loss and QoL, as well as the importance of various other variables affecting this relationship.

Conclusion

The findings of this study confirm that there are differences in improvement in some of the older-person-specific domains of QoL

Table 3
Change in QoL before using a hearing-aid and after three months with a hearing-aid (Phase one and two).

	Men; N = 56 (53%)			Women; N = 49 (47%)		
	Median score			Median score		
	Phase one	Phase two	***p-value***[a]	Phase one	Phase two	***p-value***[a]
SAB	11.0	13.0	<0.001**	11.0	13.0	<0.001**
AUT	16.0	16.0	0.010*	15.0	16.0	0.090
PPF	13.0	14.0	0.225	14.0	15.0	0.029*
SOP	14.0	14.0	0.390	15.0	16.0	0.001**
DAD	18.0	18.0	0.001**	16.0	16.0	0.058
INT	13.5	13.5	1.000	15.0	15.0	0.470

SAB – Sensory Abilities; AUT – Autonomy; PPF – Past, Present and Future Activities; SOP – Social Participation; DAD – Death and Dying; INT – Intimacy.
*p < 0.05; **p < 0.01.
[a] Wilcoxon Signed Rank test.

Table 4
Change in QoL in each domain after three months with a hearing-aid (Phase two) by men and women.

	Men; N = 56 (53%)			Women; N = 49 (47%)			
	Change with HA; N(%)			Change with HA; N(%)			
	A	B	C	A	B	C	Fisher's exact test
SAB	39(70)	7(12)	10(18)	45(92)	1(2)	3(6)	0.019*
AUT	16(29)	35(62)	5 (9)	15(31)	28(57)	6(12)	0.878
PPF	9(16)	42(75)	5(9)	9(18)	38(78)	2(4)	0.645
SOP	10(18)	39(70)	7(13)	20(41)	25(51)	4(8)	0.036*
DAD	1(2)	41(73)	14(25)	2(4)	39(80)	8(16)	0.461
INT	0	56(100)	0	5(10)	41(84)	3(6)	0.002**

SAB – Sensory Abilities; AUT – Autonomy; PPF – Past, Present and Future Activities; SOP – Social Participation; DAD – Death and Dying; INT – Intimacy; HA – hearing-aid; A – improvement; B – no change; C – worsening.
*p < 0.05; **p < 0.01.

Table 5
Predictors influencing the global score of QoL by elderly when wearing a hearing-aid.

Score of QoL	predictor	p	OR	95% CI for OR
Global score	gender male	0.048	0.318	0.102–0.989
	age	0.041	1.071	1.003–1.144

OR – odds ratio, CI – confidence interval.

between women and men fitting a hearing-aid. Significant differences were revealed between men and women in changes in the domain of *Sensory Abilities, Social Participation* and *Intimacy*. In these domains, there was a significant improvement amongst women. However, the existing research related to gender differences in QoL before and after following being fitted for a hearing aid is very scant. Therefore, it is necessary to continue this line of this research field.

Ethical approval

The whole study was conducted in accordance with the 1975 Helsinki Declaration, as revised in Brazil 2013. The study was approved by the Ethics Committee of the Faculty of Health Sciences, Palacký University Olomouc, Czech Republic. Informed consent to participate was obtained for the study contents, purposes, and protocols, data confidentiality and anonymity procedures, and participants' freedom to discontinue the study had been explained. All subjects signed informed consent before enrolment.

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Conflicts of interest

There are no conflicts of interest associated with this manuscript, financial or otherwise. All the authors contributed adequately to the work described in the paper. The manuscript has been read and approved by all authors.

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