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Gender difference in the association between volunteering and health-related quality of life among hearing-impaired older adults in China

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Abstract

Background The present study aims to assess the relationship between volunteering and health-related quality of life (HRQoL) among older adults with hearing impairment, as well as the gender difference in this association.

Methods We use data from the sixth Health Service Survey of Shandong Province, China. The survey interviewed 35,264 respondents, from which a total of 1,457 hearing-impaired older adults were included in the study. Tobit regression models were used to identify the association between volunteering and HRQoL and gender difference in the relationship.

Results The prevalence of volunteering in men and women was 24.05% and 22.20%, respectively. Women had higher EQ-5D utility valuesand VAS scores than men. After controlling potential confounders, participating in volunteering had a significant and positive association with higher HRQoL among older women, while this relationship was not significant for men. The regression model showed the interaction term of gender and volunteering had a significant association with HRQoL.

Conclusion The findings suggest volunteering is significantly associated with HRQoL among older adults with hearing impairment, and the association differed by gender. Gender differences should be considered when implementing targeted and appropriate interventions to improve HRQoL among hearing-impaired older adults.

Keywords Productive engagement, Quality of life, Hearing impaired, Gender

Background

Because it is less apparent and progresses over time, hearing impairment has appeared as a common problem of aging that has not received due attention. With approximately 20% of the world's population suffering from hearing impairment [1], the growing aging population faces severe challenges in the field of hearing.

The world's greatest older adult population is currently found in China. By the end of 2021, 267 million people in China aged 60 or above, accounting for 18.9% of the total population. China's population is expected to reach a severe aging stage by 2035 when it would number more than 400 million [2]. In China, about 11% of older adults

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are diagnosed with hearing impairment [3]. Hearing impairment leads to reduced hearing sensitivity in older adults and severely impacts their social interactions [4], which negatively affects the health-related quality of life (HRQoL) of older adults [5].

HRQoL has been recognized as an indicator of self-assessed health that is more valuable than many objective health assessment indicators of morbidity prediction and complements the use of mortality indicators [6]. The ultimate objective of increasing older adults' quality of life by improving social engagement and empowering older adults, China has adopted healthy aging as a national strategy for responding to population aging. Previous studies showed that socioeconomic status, lifestyle choices, and chronic diseases were all risk factors affecting the quality of life [7–9]. Hearing impairment becomes a chronic condition and worsens over time [1]. leading to a deteriorating quality of life. In an aging society with a large number of hearing issues, preventive measures are mainly restricted to the family system and cannot address the current needs. A study on older adults with sensory impairment in China has also suggested the need to extend interventions beyond the family system [10]. Therefore, it is important to identify the potential social intervention strategies to improve HRQoL among older adults.

Taking on the obstacles of aging, researchers have shifted the focus of their research from older adults' dependency to their contributions to society [11]. The productive aging framework proposed that a productive role in later life, whether paid or unpaid, providing goods or services was advantageous for both older individuals and society [12]. Volunteering, as a form of social engagement, was regarded as the cornerstone of productive aging [13]. Volunteering may provide opportunities for older adults to maintain physical and cognitive activity in older age, resulting in lives that are healthier and more satisfying [14]. And volunteering generally through some form of physical activity in which older adults play volunteer roles increasing social networks, all of which may have a more positive impact on health [15]. Some studies show that volunteering can improve the quality of life of older adults [16, 17]. A cohort research in the UK showed that volunteering was associated with improved HRQoL and that older adults were more positively affected by volunteering than younger adults in terms of their health [18]. However, most previous studies about volunteering were about social activities common in Western countries, with few addressing the Asian sociocultural context. The relationship between volunteering and HRQoL of older adults with hearing impairment in China remains unclear.

Previous evidence demonstrates the positive impact of volunteering on the health of older adults, but gender difference in the association between volunteering and health are inconclusive. Previous research showed that women were more enthusiastic about volunteering and had higher public awareness than men [19]. A Swiss study of persons with disabilities found that moderate participation in volunteering led to a better quality of life for women [20]. However, studies in Taiwan have found that the association between volunteering and quality of life is weaker among women than among men [21]. Gender role expectations, gender norms and stereotypes were identified as common causes of gender inequality in volunteering [22]. A Chinese proverb says, "The man goes out to work while the woman looks after the house." In China, traditional culture holds that women need to take on more internal family matters, and that participation in volunteerism is a men's responsibility. This may reduce the positive impact of volunteering and limit the participation of older women in volunteering in China. Gender difference has also been identified in hearing impairment among older adults. Clinical studies indicated that estrogen might protect against hearing impairment to some extent [23]. In older adults with hearing impairment, a thorough understanding of the gender difference in the relationship between volunteering and HRQoL helps implement targeted interventions. Therefore, we hypothesize a gender difference in the relationship between volunteering and HRQoL among older adults with hearing impairment.

The objectives of this study were (1) to investigate the association between volunteering and HRQoL among older adults with hearing impairment, and (2) to further explore the gender difference in this relationship. The findings of this study will have important implications for improving the quality of life of older adults with hearing impairment in China.

Methods

Study design and setting

The sixth Health Services Survey of Shandong Province, China, which was a component of the National Health Services Survey (NHSS), a nationally representative survey run by the National Health Commission, provided the data for this study. Since 1993, the NHSS has been carried out every five years to evaluate and comprehend the health situations of Chinese inhabitants. The study sample was chosen using a multi-stage whole-group sampling technique. First, 20 counties within Shandong Province were selected at random from a total of 137 counties. Second, 2 sample villages were chosen randomly from each township, and 5 townships were chosen randomly from each county. Third, at least 60 households in each sample village were included. A total of 35,264 respondents from 12,938 houses in 200 villages of 100 townships were interviewed. Face-to-face interviews

were used to collect data between September and October 2018. All household members were interviewed by trained enumerators using a standard questionnaire. Our analysis included respondents aged 60 years and older. A self-reported approach was used to identify the hearing impairment population, and any lack of hearing clarity was classified as hearing impairment. We excluded 261 participants with dementia and 57 with missing values on key variables from the 8,903 older adults surveyed and 7,128 with non-hearing impairment. Finally, 1,457 older adults were included in this study.

Health-related quality of life(HRQoL)

The HRQoL was measured by the Chinese version of the EQ-5D-3 L instrument [24], and was used to measure the quality of life. This is a generic preference-based instrument that includes a five-dimensional health classification system (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression). Participants were asked to rate each item on three levels of response (no problems, moderate problems, and extreme problems). A visual analog scale (VAS) was used to determine the respondents' perceptions of their general health on a scale with a total score that ranged from 0 to 100. A utility scoring function based on the temporal weighting method is used in this Chinese health classification system [25]. The utility weights for the 243 different health states described by this system of health classification range from −0.149 to 1. Greater utility values correspond to higher HRQoL levels.

Volunteering

According to the China Longitudinal Aging Social Survey (CLASS), elderly volunteering was determined based on the eight types of volunteer activities. Volunteering was assessed using the following question: "Have you been involved in community policing patrol, caring for other older people (e.g., helping with shopping, personal care, etc.), protecting environmental health, mediating disputes, accompanying chat, volunteer services that require professional skills (e.g., volunteer clinic), assisting with child care, and others?" Respondents who participated in any of these activities were defined as having volunteered, otherwise considered not having volunteered [26, 27].

Covariates

Our analysis had sociodemographic characteristics, health behaviors, and health status related to HRQoL as covariates. Sociodemographic characteristics included age, marital status (single; unmarried, divorced, and widowed; married), educational attainment (illiterate, primary, secondary, and above), and per capita household income (four categories by quartile, being the lowest in Q1 and the richest in Q4). Lifestyle behaviors included smoking status (never/past, present), and alcohol consumption status (never/past, present). Participants' physical health status was assessed by asking about their chronic diseases. According to the number of chronic diseases, the option was classified into three categories: no chronic disease, one chronic disease, and multiple chronic diseases. According to the Working Group on Obesity in China, BMI was divided into three categories: underweight (BMI < 18.50); normal weight (18.5 ≤ BMI < 24.0); overweight and obese (24.0 ≤ BMI) [28].

Data analysis

Stata 14.0 was used for all statistical analyses. The confidence intervals (CI) were calculated at the 95% level. *P*-values less than 0.05 were considered statistically significant. The dependent variables, EQ-5D utility score and EQ-5D VAS, are censored (EQ-5D utility score: -0.149 to 1.000; EQ-5D VAS: 0–100), and the data were skewed, and many observations were at the upper limit. Tobit regression model was employed in our study based on the above reasons, which was appropriate to evaluate factors related to HRQOL measured by the EQ-5D utility value as discussed in many studies [29, 30]. First, we compared the individual sociodemographic characteristics of adult men and women in descriptive statistics. Second, EQ-5D utility values and VAS scores were compared between genders for volunteering and non-volunteering using one-way ANOVAs and post-hoc tests. Three asymptotic models were assessed to investigate the relationship between volunteering and HRQoL. Model 1 was unadjusted; after accounting for influential sociodemographic and health factors, Model 2 Model 2 was controlled sociodemographic characteristics (age, marital status, education and household income per capita), health behaviors (smoking status and alcohol drinking status), and health status (BMI, chronic disease, and functional limitations), which assessed the relationship between volunteerism and HR quality levels using Tobit regression models, men and women's EQ-5D utility values are used as variables, respectively. Model 3 examined the gender difference in the relationship between volunteering and HRQoL by adding an interaction term between gender and volunteering in the regression model.

Results

Characteristics of participants

Table 1 shows the characteristics of all respondents. Of the 1,457 adults with hearing impairment, men and women accounted for 57.68% and 42.35%, separately. The proportion of men (24.05%) who participated in volunteer activities was higher than women (22.20%). Compared with women, most men with hearing impairment

Table 1 Demographic characteristics of older adults, the sixth Health services Survey of Shandong Province, China (2018)

Variables	Total 1457(16.97)	Male 840 (57.65)	Female 617 (42.35)	*P*-value
Age				
60–70	825(56.62)	484(57.62)	341(55.27)	0.098
71–80	473(32.46)	277(32.98)	196(31.77)	
> 81	159(10.91)	79(9.40)	80(12.97)	
Marital status				0.989
Single/divorced/widowed	234(16.06)	135(16.07)	99(16.05)	
Married	1223(83.94)	705(83.93)	518(83.95)	
Education				0.405
Illiteracy	456(31.30)	271(32.26)	185(29.98)	
Primary school	469(32.19)	259(30.83)	210(34.04)	
Middle school or above	532(36.51)	310(36.90)	222(35.98)	
House income per capita				0.739
Q1	288(19.77)	164(19.52)	124(20.10)	
Q2	253(17.36)	147(17.50)	106(17.18)	
Q3	278(19.08)	168(20.00)	110(17.83)	
Q4	638(43.79)	361(42.98)	277(44.89)	
Smoking status				< 0.001
Never/past	987(67.74)	406(48.33)	581(94.17)	
Current	470(32.36)	434(51.67)	36(5.83)	
Alcohol drinking status				< 0.001
Never/past	953(65.41)	368(43.81)	585(94.81)	
Current	504(34.59)	472(56.19)	32(5.19)	
BMI categories				0.740
Underweight < 18.5)	85(5.83)	49(5.83)	36(5.83)	
Normal weight (18.5–24.0)	817(56.07)	478(56.90)	339(54.94)	
(Overweight& Obese (> 24.0)	555(38.09)	313(37.26)	242(39.22)	
Chronic disease				0.016
No chronic condition	629(43.17)	384(45.71)	245(39.71)	
One chronic condition	573(39.33)	327(38.93)	246(39.87)	
Multimorbidity	255(17.50)	129(15.36)	126(20.42)	
Functional limitations				0.747
No	1156(79.34)	664(79.05)	492(79.74)	
Yes	301(20.66)	176(20.95)	125(20.26)	
Volunteering				0.411
No	1118(76.73)	638(75.95)	480(77.80)	
Yes	339(23.27)	202(24.05)	137(22.20)	
EQ-5D, mean ± SD	0.88 ± 0.18	0.88 ± 0.18	0.88 ± 0.19	0.860
VAS, mean ± SD	72.74 ± 18.24	72.43 ± 18.60	73.18 ± 17.74	0.437

Notes. SD, standard deviation; Quartile 1(Q1) was the poorest and Quartile 4(Q4) was the richest; BMI: body mass index. EQ-5D: EuroQOL-5 Dimensions; VAS: visual analogue scale

were married, had higher education, had higher household incomes, and were smokers and drinkers. The proportion of women with reduced function (20.26%). And the proportion of men with one or more chronic diseases was 54.29%, slightly lower than that of women (60.29%). The mean (SD) EQ-5D utility values and VAS scores in women were higher than in men.

Composition of EQ-5D dimensions

Table 2 shows that pain/discomfort has the highest number of older adults with moderate or extreme problems, with 31.67% men and 29.82% women, followed by mobility, with 18.69% men having moderate or extreme problems, and 16.2% women. The best of the five dimensions for the older adults is in anxiety/depression, with only 7.03% men having difficulties in self-care, compared to 4.38% women.

Comparison of HRQoL between different volunteering-hearing impairment groups

Table 3 contrasts the VAS scores for men and women who participated in volunteering separately as well as

Table 2 Composition of EQ-5D dimensions by gender

	Mobility	Moderate problems	Extreme problems
Male			
Mobility	683(81.31)	144(17.14)	13(1.55)
Self-care	759(90.36)	58(6.9)	23(2.74)
Usual activities	725(86.31)	77(9.17)	38(4.52)
Pain/Discomfort	574(68.33)	240(28.57)	26(3.10)
Anxiety/Depression	781(92.98)	54(6.43)	5(0.60)
Female			
Mobility	517(83.79)	93(15.07)	7(1.13)
Self-care	574(93.03)	33(5.35)	10(1.62)
Usual activities	545(88.33)	45(7.29)	45(7.29)
Pain/Discomfort	433(70.18)	173(28.04)	11(1.78)
Anxiety/Depression	590(95.62)	23(3.73)	4 (0.65)

Table 3 Observed EQ-5D utility value and VAS scores in the different volunteering-hearing impairment groups

	Volunteering		*P*-value
	No	Yes	
Male			
EQ-5D utility value, mean ± SD	0.887 ± 0.173	0.875 ± 0.196	0.399
VAS scores, mean ± SD	72.556 ± 18.671	72.015 ± 18.421	0.718
Female			
EQ-5D utility value, mean ± SD	0.871 ± 0.202	0.923 ± 0.134	0.005
VAS scores, mean ± SD	72.933 ± 18.179	74.029 ± 16.125	0.524

Notes. SD, standard deviation; EQ-5D: EuroQOL-5 Dimensions; VAS: visual analogue scale

Table 4 Association between volunteering and health-related quality among hearing-impaired older adults in Shandong, China. (*N* = 1457)

Model	Male	Female	Interaction: Gender × Volunteering
	Coefficient (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)
Model 1			
No	Ref	Ref	
Yes	-0.031 (-0.091,0.029)	0.123 (0.039,0.206)**	
Model 2			
No	Ref	Ref	
Yes	-0.029 (-0.069,0.012)	0.077 (0.014,0.140)*	
Model 3			
No			Ref
Yes			0.107 (0.036,0.179)**

Notes. 95%CI = 95% confidence interval. Model 1 was unadjusted; Model 2 adjusted for age, marital status, education, household income per capita, smoking status, alcohol drinking status, BMI, chronic disease, and functional limitations; Model 3 adding an interaction term between gender and volunteering in the regression model. *$p<0.05$; **$p<0.01$; ***$p<0.001$

the EQ-5D utility values for each. Both mean utility values and VAS scores were different by gender. The results revealed that positively association between volunteering and HRQoL in men. Men who participated in volunteering had a lower mean EQ-5D utility value (0.887 ± 0.173) than those who did not (0.875 ± 0.196). The opposite is true for women. The mean EQ-5D utility values of women participating in volunteering were 0.923 ± 0.134, which was higher than others ($P=0.005$). Similar results were also found in VAS scores. Both the mean EQ-5D utility values and VAS scores in women were higher than in men.

Gender difference in the association between Volunteering and HRQoL

Based on Tobit regression models, Table 4 summarizes the results of the association between volunteering and HRQoL by gender. In Model 1, the volunteer group reported significantly higher HRQoL in women ($\beta=0.123$, $P=0.004$) after adjusting for potential covariates. Model 2 shows that participating in volunteering had a significant positive association with HRQoL in women ($\beta=0.077$, $P=0.016$), but the relationship was not significant in men. Model 3 shows a significant relationship between volunteering and HRQoL for the interaction term of gender. ($\beta=0.107$, $P=0.003$).

Discussion

China has a large number of older adults with existing or potential hearing impairment. This number is increasing as the population ages rapidly. The COVID-19 pandemic has emphasized to people the vital need to protect older adults and improve their HRQoL [31]. Historically, older adults have turned to volunteering to help ease the transition from full-time work to retirement [32]. The impact of volunteering on the health of older adults has also received widespread attention, but research in non-Western settings is scarce. To the best of our knowledge, this is the first study to explore the relationship between volunteering and HRQoL and gender difference in this association among older adults with hearing impairment. Our results indicated that greater participation in volunteering was beneficial for HRQoL in older women with hearing impairment. However, this relationship was not significant for men.

The findings suggest a positive association between volunteering and HRQoL in the older population with hearing impairment, consistent with previous studies [18]. Volunteering has been shown to improve older people's physical and mental health [13] and reduce mortality [33]. Physiologically, Volunteering is beneficial by activating the caregiving system in the medial preoptic area of the hypothalamus (MPOA) [34] and health-promoting hormones (salivary cortisol) to buffer the stressor [35].

According to the sociological role theory framework, role enhancement through volunteering means more resources, wider social networks, greater power, and prestige [36], which improves physical and mental health [37]. Moreover, participation in voluntary activities can maintain a more regular schedule [38], and the resulting psychological satisfaction and moderate fatigue improve sleep quality, which contributes to improving quality of life [39]. Volunteering can also improve happiness, promoting volunteering, thus achieving a healthy [15].

Interestingly, we also found that the level of HRQoL was higher among older women with hearing impairment who volunteered than those who did not, while men had the opposite. These findings differ from previous studies, which showed that women had generally worse HRQoL than men [40–42]. One possible explanation is older men may progressively lose their social status and identity as they retire, and participation in social activities such as volunteering can maintain a social connection or self-identity [43]. However, men with hearing impairment have a greater sense of stigma [44] and are more likely to experience depression, anxiety, and other adverse psychosocial consequences [45, 46]. Meanwhile, the perceived loss of image, relationship and personal identity caused by hearing impairment may diminish the positive effects of men's participation in volunteer activities.

The interaction term between gender and volunteering has a significant association with HRQoL. Women's participation in volunteering had a positive association with HRQoL, but this was not observed in men. One possible explanation is that Shandong, the birthplace of Confucianism, was influenced by the Confucianist value that "men are the primary workers while women are the primary caregivers." Most Chinese women devote their lives to taking care of the family and their social circle has little intimacy outside of it. As the size of the Chinese family has shrunk, women are more willing to volunteer to make new friends and broaden their social circle [47]. Secondly, the "Tend and Befriend" theory of stress and coping contends that women typically cope with stress by taking care of others and forming friendships [48], and can derive self-esteem and happiness from it. Even facing physical or cognitive loss, women may make more concerted efforts than men to maintain their social attachments through participating in social activities [49]. It possibly experiences more support from social interaction. Thirdly, because men are exposed to more detrimental shocks as well as their smoking and drinking habits [50, 51], they are at greater risk of hearing impairment than women. Moreover, hearing impairment leads to communication problems in social interaction, which limits the enthusiasm and effectiveness of individuals to participate in social activities [52]. In addition, men are more conscious of their social image [53], they may be less willing to participate in volunteering to prevent reputational damage from hearing impairment, and lack of proactive involvement can be a predictor of poorer quality of life.

Our findings have important implications for enhancing the quality of life among older adults, particularly older women with hearing impairment. First, health policymakers must develop and strengthen hearing loss prevention, care, and rehabilitation programs and raise public awareness of hearing prevention. Second, strategies should be developed to encourage volunteer participation. Due to dwindling opportunities for productive family involvement brought on by intergenerational cohabitation and fertility rates, it is necessary to recognize the importance of encouraging more community engagement in volunteer activities among older adults. Finally, considering the influence of gender identity and regional culture, it is necessary to create a more harmonious and close-knit living environment for hearing-impaired older adults, eliminate hearing stigma and prejudice, and improve health equity.

In this study, there are several limitations. First, the hearing impairment was obtained by self-report. On the one hand, self-reported hearing impairment is valuable in capturing people's perceptions of their functional hearing [54]. On the other hand, self-reported impairment may be subject to bias, as factors such as cognitive status, education, and age may contribute to the determination of self-reported impairment. Therefore, future study suggests testing these associations through the use of objective measures. Second, although hearing impairment has an indirect effect on self-care and usual activities in the EQ-5D, the scale lacks directly relevant dimensions, which may assessment of certain characteristics of hearing impairment people and not capture their specific needs well, which would be remedied in the follow-up study. Third, in the covariates, combining different marital statuses ("single", "divorced", and "widowed") into one unmarried category may mask subtle differences between these subgroups. The division of chronic diseases into three groups ignores the impact of specific types of chronic diseases with high prevalence on older adults. And the current study did not measure the effect of the frequency and duration of participation in support activities on HRQoL, which would be remedied in the follow-up study. In addition, the study used a cross-sectional design, which could not verify the causal relationship between participation in volunteer activities and HRQoL. Notwithstanding these drawbacks, the study's advantages are equally clear. It is the first to analyze the relationship between volunteering on HRQoL among hearing-impaired older people in a Chinese cultural context and to explore gender differences in this association. This study contributes to our understanding of productive

aging in non-Western contexts and highlights the health advantages of volunteering for older adults.

Conclusion

In this study, we found a gender difference in the relationship between volunteering and HRQoL. Participation in volunteering is beneficial to the HRQoL of older women with hearing impairment. However, the association was not significant in men. The results of the study contribute to the understanding of behaviors of hearing-impaired older adults and encourage them to actively participate in volunteering. Particularly, our study highlights the importance of social interventions that improve older women's HRQoL and emphasizes the benefits to their health from greater volunteering.

Abbreviations

HRQoL	Health related quality of life
NHSS	National Health Services Survey
CLASS	China Longitudinal Aging Social Survey
EQ-5D	EuroQOL-5 Dimensions
VAS	Visual analogue scale
BMI	Body mass index
95%CI	95% Confidence interval
SD	Standard deviation

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Author contributions

Chengchao Zhou: Conceptualization, critical revision, funding acquisition, supervision, revise the manuscript. Xueqing Wang: Data curation, performed all statistical analyses, critical revision, writing original draft preparation. Dan Zhao: revise the manuscript, formal analysis, supervision. Jingjing Luo, Xuehong Wang: supervised the data analysis, critical revision. Jingjie Sun: Acquisition of data. Zhuo Chen: Data curation, formal analysis. Final approval of the version to be published: All authors.

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Data availability

The datasets used in the current study are not publicly available due to the confidential policy but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study protoco was approved and organized by Health Commission of Shandong Province. This study was reviewed and approved by the Institutional Review Board (Academic Research Ethics Committee) of Shandong University School of Public Health. All procedures were in accordance with the ethical standards of the Helsinki Declaration. Written informed consents clarifying the study purposes were obtained from each participant.

Consent for publication

Not required.

Competing interests

The authors declare no competing interests.

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Competing interests

The authors have no competing interests to declare.

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