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The impact of hearing ability on depression among retired middle-aged and elderly individuals in China: the chain mediating role of self-rated health and life satisfaction

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Abstract

Background The present study explored the relationship between hearing ability, self-rated health, life satisfaction, and depression among retired middle-aged and older adults in China.

Methods The research was based on data from the 2018 China Health and Retirement Longitudinal Study (CHARLS). By applying linear regression models, we delved into the key factors influencing depression in middle-aged and elderly individuals. We utilized Spearman's rank correlation analysis techniques to reveal the interconnections among hearing ability, depression, self-rated health status, and life satisfaction. Additionally, we employed SPSS software tools to examine the potential mediating effects of self-rated health status and life satisfaction between hearing ability and depression.

Result There was a significant positive correlation between hearing ability and self-rated health status as well as life satisfaction ($r>0$, $P<0.01$), while a significant negative correlation with depression was observed ($r<0$, $P<0.01$). Self-rated health status also showed a positive correlation with life satisfaction ($r>0$, $P<0.01$) and a negative correlation with depression ($r<0$, $P<0.01$). Furthermore, life satisfaction exhibited a negative correlation with depression ($r<0$, $P<0.01$). Further analysis revealed that self-rated health status and life satisfaction play a significant chain mediating role between hearing ability and depression.

Conclusion In summary, our investigation underscores the pivotal mediating influence of self-rated health and life satisfaction in the nexus between hearing ability and depressive symptoms in retired middle-aged and older adults. The findings of this study contribute to a deeper understanding of the relationship between hearing and depression, providing valuable insights for alleviating depression in middle-aged and older adults.

Keywords Retirement, Hearing, Depression

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Introduction

Depression is a widespread emotional disorder marked by enduring sadness, a diminished interest or enjoyment in activities, and a range of physical and cognitive symptoms [1]. Data from the 2018 China Family Panel Studies (CFPS) indicated that the estimated prevalence of depression among individuals aged 45 and older across the nation is 23.61% [2]. In middle-aged and older adults, depression can lead to numerous detrimental effects, including physical health complications, cognitive deterioration, decreased social interaction, a lower quality of life, and an elevated risk of suicide [3, 4]. Moreover, depression may intensify the symptoms of chronic illnesses, contribute to poor adherence to medication regimens, and increase the demand for healthcare services [5]. Additionally, depressive states can negatively impact the dietary habits and sleep patterns of middle-aged and older adults, further undermining their physical well-being [6, 7]. The challenge of depression in middle-aged and older adults is notably different from that in other age demographics. Firstly, retired middle-aged and older adults undergo significant lifestyle and role transitions, shifting from full-time employment to retirement, which can evoke feelings of loss and diminished self-worth [8]. Secondly, as individuals age, the decline in physical capabilities and the rise in chronic health conditions further elevate the risk of depression [9]. However, despite the well-documented prevalence and adverse effects of depression in this population, there remains a significant gap in understanding the underlying mechanisms that contribute to the development of depression in middle-aged and older adults.

Hearing ability serves as a fundamental pillar of human communication and cognitive development [10]. Proficient hearing abilities can significantly enhance our comprehension of the environment and elevate the quality of interpersonal interactions [11]. The incidence of auditory impairments among middle-aged and elderly populations escalates with advancing age. Data reveals that nearly one-third of individuals aged 65 and above experience varying degrees of hearing loss [12]. In accordance with the stress-coping framework, an individual's response to stress and their coping mechanisms in the face of health challenges can profoundly influence their psychological well-being [13]. Chronic health conditions may serve as enduring stressors, leading to resource depletion and potentially precipitating depressive episodes. There is an increasing body of evidence linking auditory loss with depressive disorders [14]. Studies indicate that individuals with hearing impairments may be more susceptible to feelings of loneliness and social seclusion, thereby heightening the risk of depressive symptoms [15]. Moreover, middle-aged and older adults experiencing hearing loss are more inclined to report depressive symptoms compared to their hearing-competent counterparts [16]. Auditory impairments can hinder everyday communication, resulting in heightened stress and a deterioration in quality of life, all of which may be interconnected with the emergence of depressive states [17]. Therefore, we propose the hypothesis that hearing ability will have a significant impact on depression (Hypothesis 1:Hearing ability → depression).

Self-rated health represents a subjective evaluation that individuals make regarding their health status, grounded in personal perceptions and experiences [18]. Research demonstrates that this subjective assessment often correlates with an individual's actual physiological health condition [19]. Hearing loss can significantly impair social interactions and diminish quality of life, thereby influencing one's self-evaluation of health [20, 21]. For example, hearing impairment may result in communication challenges, heightened feelings of social isolation, and adverse effects on mental health, leading individuals to report a poorer health status [22]. Self-rated health is a vital health metric; an individual's subjective assessment not only mirrors their physiological health level but is also intricately connected to their psychological well-being [23]. Positive self-rated health is generally linked to reduced psychological stress, enhanced life satisfaction, and improved emotional health. In contrast, negative self-rated health may indicate elevated levels of anxiety and depression, as well as diminished psychological resilience [24]. Hearing loss can create communication obstacles and foster feelings of social isolation, further impacting an individual's self-rated health and increasing the likelihood of reporting a poorer health status [22]. Poor self-rated health is associated with heightened levels of depression, reflecting not only an individual's physiological health status but also their psychological condition [25]. Consequently, We infer that hearing ability affects depression through self-rated health (Hypothesis 2:Hearing ability → self-rated health → depression).

Life satisfaction is a subjective evaluative metric that reflects an individual's sense of happiness and psychological well-being [26]. It is noteworthy that there exists a strong correlation between auditory ability and life satisfaction [27]. Good hearing facilitates more effective communication and social engagement, thereby enhancing overall quality of life [28]. Conversely, hearing impairments can lead to communication difficulties, increased feelings of social isolation, and subsequently, a negative impact on life satisfaction [29]. Research indicated that individuals with hearing loss often face greater psychological stress and social challenges, which may diminish their life satisfaction [30]. Therefore, maintaining good hearing ability is crucial for enhancing life satisfaction. The influence of life satisfaction on depression should not be overlooked. Generally, high life satisfaction is

associated with lower levels of depressive symptoms, while low life satisfaction may elevate the risk of depression [31]. Life satisfaction encapsulates an individual's overall assessment and emotional response to quality of life, encompassing satisfaction with personal economic status, health, work, family relationships, and social activities [32]. When individuals feel fulfilled in these areas, they are more likely to experience positive emotions and mental states, thereby reducing the occurrence of depressive feelings [33]. Conversely, if an individual feels dissatisfied across multiple life domains, they may experience heightened stress and negative emotions, potentially leading to or exacerbating depressive symptoms. Thus, enhancing life satisfaction is a key aspect of preventing and alleviating depression. Consequently, We infer that hearing ability affects depression through life satisfaction (Hypothesis 3:Hearing ability → life satisfaction → depression).

Moreover, a research study concentrating on middle-aged and older adults in China has uncovered a significant bidirectional association between self-rated health and life satisfaction [34]. Numerous investigations have also explored the relationship between life satisfaction and depression [33, 35]. Consequently, We infer that hearing ability affects depression through self-rated health and life satisfaction (Hypothesis 4:Hearing ability → self-rated health → life satisfaction → depression).

Previous research has independently examined the correlations among hearing ability, self-rated health, life satisfaction, and depression. However, there is a scarcity of studies investigating whether self-rated health, life satisfaction, or their combination serve as mediating factors in the relationship between hearing impairment and depression. Despite these studies producing valuable insights, a considerable gap persists in comprehending how these variables interact collectively, rather than merely in isolation. Consequently, the primary objective of this study is to explore the chain mediation effects of self-rated health and life satisfaction in the association between hearing impairment and depression (Fig. 1).

Methods

Study subjects

This study used data from the China Health and Retirement Longitudinal Study (CHARLS) with a cross-sectional study design.The CHARLS is a nationwide longitudinal survey targeting individuals aged 45 and older in China, encompassing 150 counties across 29 provinces (including autonomous regions and municipalities) and 450 communities (villages). The baseline of the study commenced in 2011, with follow-up assessments conducted biennially. The CHARLS database comprises seven modules: demographic information, household data, health status and functionality, healthcare and insurance, employment, retirement and pensions, income, expenditures, and assets, as well as housing conditions. This research has received approval from the Biomedical Ethics Review Committee of Peking University (Ethics Approval Number: IRB00001052-11015) [36], and all participants provided informed consent. The data for this study was derived from the 2018 China Health and Retirement Longitudinal Study [37]. Individuals aged 45 and older were included, while those with incomplete primary research variables and non-retired individuals under 45 were excluded. A total of 19,816 middle-aged and older adults were selected as the target population, and after excluding 17,017 non-retirement samples, 240 cases with missing values across various variables, and 2 samples aged under 45 years, 2,557 individuals were ultimately included in the analysis.

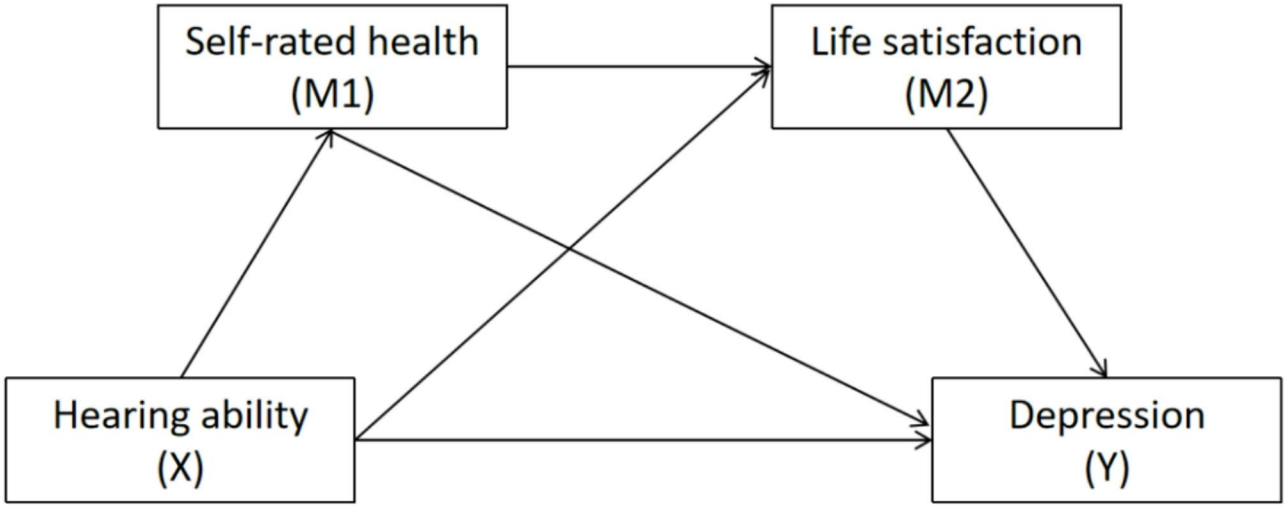

Fig. 1 Hypothesized relationships between hearing ability, self-rated health, life satisfaction and depression

Research variables

Sociodemographic factors

This study considered the impact of factors such as gender, age, marital status, place of residence, and educational level on depression. For categorical variables, we employed dummy variable coding for processing. Age and gender were coded as (0 = women, 1 = men), (1 = 45–59, 2 = 60–74, 3 = ≥ 75), marital status as (0 = not married, 1 = married), residence as (0 = urban, 1 = rural), and educational attainment as (1 = not enrolled in school, 2 = elementary school, 3 = middle school, 4 = high school and above).

Explanatory variables

Hearing ability was measured using the question, "How is your hearing?" with response options including "excellent, very good, good, fair, poor," assigned values of 5, 4, 3, 2, and 1 respectively, making it an ordinal variable where higher scores indicated better hearing levels among middle-aged and older adults.

Mediating variables

The mediating variables in this study were self-rated health and life satisfaction, determined through the questionnaire item, "How do you perceive your current health status?" with responses including "very good," "good," "fair," "poor," "very poor," assigned values of 5, 4, 3, 2, and 1 respectively, making it an ordinal variable where higher scores reflected better self-rated health levels among middle-aged and older adults. Life satisfaction was assessed through the question, "How do you feel about your current life?" with response options of "extremely satisfied," "very satisfied," "somewhat satisfied," "not very satisfied," "not satisfied at all," assigned values of 5, 4, 3, 2, and 1 respectively, also an ordinal variable where higher scores indicated greater life satisfaction among middle-aged and older adults.

The dependent variable

Depressive symptoms, was assessed using the short version of the Center for Epidemiological Studies Depression Scale (CESD-10) from the CHARLS dataset. This scale employs a 4-point Likert scoring system, with responses categorized as "not at all or rarely" (0 points), "occasionally or seldom" (1 point), "sometimes or moderately" (2 points), and "often or always" (3 points). The maximum score is 30, with a CESD-10 score of ≥ 10 indicating the presence of depressive symptoms; higher scores reflected an increased risk of depression [38]. The instrument exhibited strong reliability and validity among Chinese older individuals, evidenced by a Cronbach's α coefficient of 0.78 [38].

Statistical methods

Data cleaning, organization, and statistical analysis were conducted using SPSS version 26.0. Continuous data were expressed as mean ± standard deviation, while categorical data were presented as counts or percentages. Conduct a regression analysis on the factors affecting depression. Spearman's rank correlation analysis was employed to explore the relationships between variables. The PROCESS 3.4 macro was utilized to establish a mediation effect model, analyzing the mediating role of life satisfaction in the relationship between hearing ability and depresion among middle-aged and older adults. A Bootstrap method with 5,000 resamples was applied to test the significance of the mediation effect.

Result

The results of the linear regression analysis on the demographic characteristics of participants and their impact on depression

The depression rate among middle-aged and elderly people in retirement is 24.05%. The R-squared value of the model was 0.028. An F-test conducted on the model yielded $F = 15.553$, with $p < 0.001$. To assess multicollinearity in the model, the Variance Inflation Factor (VIF) was examined, and all VIF values were found to be less than 5, indicating no multicollinearity issues. Additionally, the Durbin-Watson (D-W) value was 2.002, suggesting the absence of autocorrelation in the model. In conclusion, the model demonstrates good performance. Through linear regression analysis, we identified that gender, age, marital status, place of residence, and education level significantly impact depression, as outlined in Table 1.

Spearman's rank correlation analysis

The results of the Spearman's rank correlation analysis indicated that hearing ability is negatively correlated with self-rated health and life satisfaction ($r < 0$, $P < 0.01$), and was also negatively correlated with depression ($r < 0$, $P < 0.01$). Self-rated health showed a positive correlation with life satisfaction ($r > 0$, $P < 0.01$) and a negative correlation with depression ($r < 0$, $P < 0.01$). Additionally, life satisfaction was negatively correlated with depression ($r < 0$, $P < 0.01$). Refer to Table 2 for further details.

Mediation effect analysis

Using depression as the dependent variable, hearing ability as the independent variable, and self-rated health and life satisfaction as mediating variables, a chain mediation analysis was conducted, with results illustrated in Fig. 2. Hearing ability, self-rated health, and life satisfaction negatively predicted depression (β = -0.0599, -0.2841, -0.2774, $P < 0.001$). Please refer to Table 3. The bootstrap analysis, which was conducted to assess the mediating

Table 1 Linear regression analysis results of demographic characteristics and their impact on depression ($n = 2557$)

Variables	*n* (%)	β	t	*p*
Gender		-0.104	-4.822	< 0.001
Men	1359(53.15)			
Women	1198(46.85)			
Age(Y)		0.014	0.630	0.529
45~59	579(22.64)			
60~74	1505(58.86)			
≥ 75	473(18.50)			
Marriage		-0.041	-1.980	0.048
Married	361(14.12)			
Not married	2196(85.88)			
Residence		0.071	3.467	0.001
Rural	466(18.22)			
Urban	2091(81.78)			
Education		-0.099	-4.935	< 0.001
Not enrolled in school	358(14.00)			
Elementary school	608(23.78)			
Middle school	766(29.96)			
High school and above	825(32.26)			

Table 2 Correlation between hearing ability, self-rated health, life satisfaction, and depression among middle-aged and elderly individuals (r values)

	Variable	1	2	3	4
1	Hearing ability	1.000			
2	Self-rated health	0.309**	1.000		
3	Life satisfaction	0.130**	0.249**	1.000	
4	Depression	-0.200**	-0.379**	-0.352**	1.000

Note: * indicates $p < 0.05$; ** indicates $p < 0.01$; *** indicates $p < 0.001$

effects of hearing ability on self-rated health, life satisfaction, and depression, reveals significant findings as presented in Table 4.

Table 3 Direct effect test of hearing ability, self-rated health, life satisfaction, and depression

Path	B	β	SE	95%CI	*P*
X→M1	0.3065	0.3059	0.0189	0.2695 ~ 0.3435	< 0.001
X→M2	0.0512	0.0691	0.0149	0.0221 ~ 0.0804	< 0.001
X→Y	-0.3256	-0.0599	0.1076	-0.5365~-0.1146	< 0.01
M1→M2	0.1729	0.2336	0.0148	0.1438 ~ 0.2020	< 0.001
M1→Y	-1.6523	-0.2841	0.1099	-1.8679~-1.4367	< 0.001
M2→Y	-2.1803	-0.2774	0.1429	-2.4605~-1.9001	< 0.001

Notes: SE = standard error; Boot LLCI = bootstrapping lower limit confidence interval; Boot ULCI = bootstrapping upper limit confidence interval; X = hearing ability; M1 = self-rated health; M2 = life satisfaction; Y = depression

Dicussion

This study explores the relationship between hearing ability and depression among retired middle-aged and older adults, with a particular focus on the mediating roles of self-rated health and life satisfaction. The research reveals three significant findings. First, there is a notable positive correlation between hearing ability and depression. Second, self-rated health and life satisfaction serve as critical mediating factors between hearing ability and depression. Finally, hearing ability indirectly influences depression in retired middle-aged and older adults through the chain mediation of self-rated health and life satisfaction.

In this study, we found a significant positive correlation between hearing ability and depression among retired middle-aged and older adults. Thus, Hypothesis H1 is supported. When individuals experience poorer hearing, they are likely to exhibit higher levels of depression. This finding is consistent with previous research that has also identified a connection between hearing and depression [39]. Deterioration in hearing ability may lead individuals to face challenges in social interactions, resulting in feelings of isolation and exclusion; such social barriers may

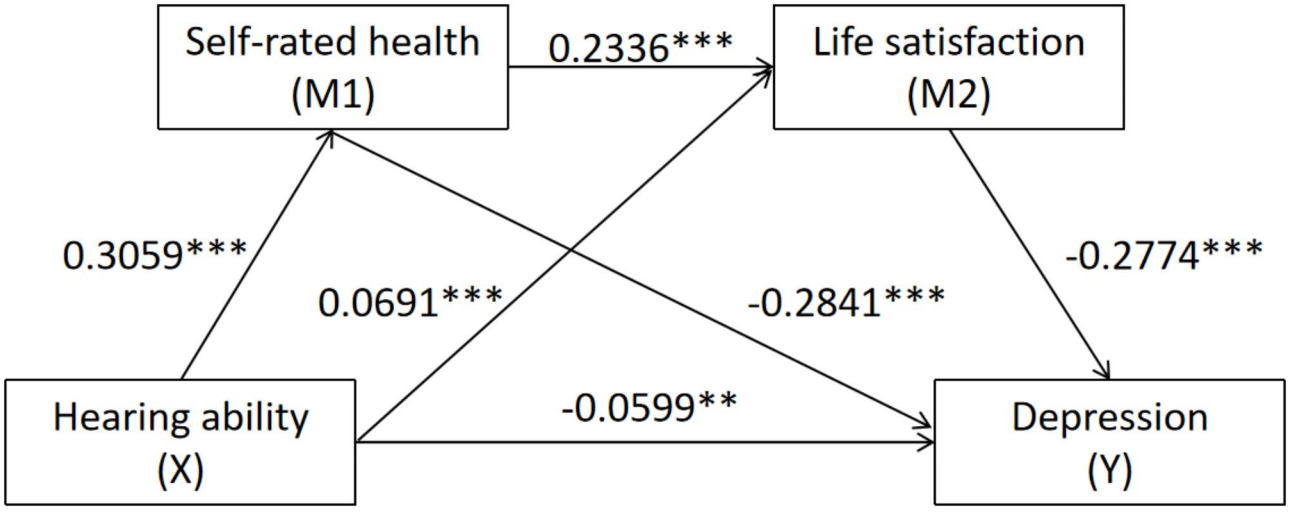

Fig. 2 The chain mediating effect of hearing ability and depression

Table 4 Bootstrap analysis of mediation effects of hearing ability, self-rated health, life satisfaction, and depression

Effect	Point of estimate	SE	95%CI	*P*	Relative mediation effect (%)
Direct effect	-0.3256	0.1076	-0.5365~-0.1146	< 0.001	30.74%
Indirect effect	-0.7336	0.0646	-0.8627~-0.6102	< 0.001	69.26%
Total effect	-1.0592	0.1134	-1.2815~-0.8369	< 0.001	100%
X→M1→Y	-0.5064	0.0488	-0.6055~-0.4127	< 0.001	47.81%
X→M2→Y	-0.1117	0.0363	-0.1849~-0.0443	< 0.001	10.55%
X→M1→M2→Y	-0.1155	0.0165	-0.1492~-0.0842	< 0.001	10.90%

increase the risk of depressive symptoms [40, 41]. The stress-buffering hypothesis suggests that social resources can prevent or mitigate the impact of stress on health [42]. Hearing impairments may diminish an individual's capacity to access such support, thereby affecting mental health [43]. Retired middle-aged and older adults may encounter issues related to declining hearing ability, which not only impacts their daily lives but may also exacerbate depressive symptoms. Therefore, it is essential to focus on the hearing health of this demographic, providing necessary support and assistance to enhance their quality of life. Creating a supportive social environment, conducting regular hearing assessments, and minimizing prolonged exposure to noisy environments may aid retired middle-aged and older adults in the early identification and alleviation of hearing issues, thereby mitigating their depression and preventing subsequent psychological complications [44].

Self-rated health plays a mediating role in the relationship between hearing ability and depression among middle-aged and elderly retirees, thereby confirming hypothesis H2. This reveals that poor hearing ability may make individuals more susceptible to self-rated health issues, which in turn can exacerbate depression. Previous research has identified self-rated health status as a significant factor influencing depressive symptoms, and it has been associated with hearing loss, which aligns with the findings of this study [45]. Stress theory suggests that hearing impairments can elevate an individual's daily stress levels. Prolonged exposure to stress may adversely affect both physical and mental health, leading to a decline in self-rated health status and an increased risk of depressive symptoms [13, 46]. Self-rated health refers to an individual's subjective evaluation of their health condition. When a person perceives their health as poor, it can negatively impact daily life, reduce social activities, and even lead to avoidance behaviors. This shift in psychological state can heighten the risk of depressive symptoms [25]. Therefore, assisting middle-aged and older adults in establishing a positive health perspective through health education and chronic disease management, while enhancing their self-rated health status, is crucial for the prevention and alleviation of depressive symptoms, improvement of quality of life, and promotion of overall physical and mental well-being.

The relationship between life satisfaction and the hearing ability of middle-aged and older adults in retirement plays a mediating role in the context of depression. Therefore, the hypothesis H3 has been confirmed. The findings indicate that an enhancement in hearing ability is likely to contribute to increased life satisfaction, which may subsequently aid in the reduction of depressive symptoms. Previous research indicates that among middle-aged and older adults with hearing impairments, life satisfaction may be enhanced through the improvement of cognitive function and depressive symptoms, suggesting a close interrelationship among the three variables [47]. Life satisfaction reflects an individual's overall evaluation and feelings about their life circumstances. Firstly, a decline in hearing ability may lead to communication barriers, increasing social difficulties, which can affect an individual's level of social participation and social support—key factors influencing life satisfaction [32]. Higher life satisfaction is typically associated with lower levels of depression, while lower life satisfaction may increase the risk of depression [48]. Individuals with higher life satisfaction often exhibit more positive emotional states and better psychological adaptability [49]. Given the mediating role of life satisfaction in the relationship between hearing ability and depression, targeted strategies that focus on enhancing life satisfaction are necessary. Increasing social activities, health management, and psychological support strategies may contribute to improving life satisfaction among middle-aged and older adults in retirement, thereby enhancing overall mental health levels [50].

The research reveals that hearing ability plays a mediating role in the chain linking self-rated health and life satisfaction, indirectly affecting the depressive moods of retirees. Consequently, Hypothesis H4 has been confirmed. As individuals transition into retirement, hearing typically declines gradually. This change may lead to challenges in their daily lives [51]. Hearing loss is particularly prevalent among the elderly, and retirees with poor hearing often rate their health status lower [46]. They may perceive their physical and mental conditions as inferior to previous times, leading to a negative view of their

health. This poor self-rated health can further impact their life satisfaction [34]. When individuals believe their health is subpar, they may experience a decline in quality of life, resulting in dissatisfaction. A decrease in life satisfaction can lead to emotional issues, such as the onset of depression [52]. Therefore, hearing loss in the retired population not only affects their daily lives but may also increase their risk of depression through the mediating effects of self-rated health and life satisfaction. The findings of this chain mediation model underscore the importance of addressing not only the impact of hearing ability in the development of mental health interventions but also the role of mediating factors. The findings of this study not only illuminate the intricate relationship between hearing ability and depression but also provide a scientific foundation for healthcare providers to design intervention strategies. By prioritizing auditory health and enhancing self-rated health and life satisfaction, healthcare providers can more effectively improve the mental health status of middle-aged and older adults in retirement, thereby enhancing their quality of life. Future research should further investigate targeted intervention strategies to better support the physical and mental well-being of this population.

Limitations

This research presents an innovative perspective on the interplay between hearing ability and depressive symptoms in retired middle-aged and older adults, investigating the mediating influences of self-perceived health and life satisfaction. Nonetheless, several limitations may hinder the generalizability and interpretability of the findings. Firstly, the sample may not sufficiently represent the retired middle-aged and older adult demographic, raising concerns about selection bias. The sample's diversity regarding geographic, cultural, and socioeconomic factors may restrict the broader applicability of the study's conclusions. Future investigations should aim to expand the sample size, particularly by including retired middle-aged and older adults from various countries and socioeconomic strata to enhance representativeness and generalizability. Secondly, the cross-sectional design utilized limits the ability to establish causal relationships. Future research could employ advanced statistical methodologies, such as bootstrapping, to strengthen the robustness of cross-sectional analyses. Additionally, a dynamic mediation model could be applied to explore how the mediating effects of self-rated health and life satisfaction on the relationship between hearing ability and depression change over time, utilizing longitudinal data. Thirdly, the instruments used for hearing, self-rated health, and life satisfaction may introduce subjective biases, potentially affecting the accuracy of the results. This highlights the necessity of integrating both subjective and objective measures to achieve a comprehensive understanding of the implications of hearing impairment. Furthermore, we stress the importance of combining self-reported metrics with clinical evaluations in future studies to enhance validity. Lastly, while this research focused on self-rated health and life satisfaction as mediating variables, other unexamined mediating factors, such as individual psychological resilience and social support systems, may also impact the relationship between hearing ability and depression. Additionally, this study did not implement or assess any specific interventions, thus it cannot directly evaluate the actual effects of improvements in hearing ability, self-rated health, and life satisfaction on depressive symptoms. Future research could design randomized controlled trials or multidimensional intervention programs, incorporating longitudinal tracking to directly assess the effects of enhancements in hearing ability, self-rated health, and life satisfaction on depressive symptoms, thereby reinforcing causal inferences and policy relevance. Ultimately, while this study employed suitable statistical methods for data analysis, there may be limitations in model specification or statistical analysis that did not fully account for all potential confounding variables. Future studies could yield more comprehensive and nuanced insights by utilizing more diverse samples, conducting longitudinal research designs, employing more precise measurement tools, considering additional mediating variables, implementing and evaluating specific interventions, and adopting alternative methodologies.

Conclusion

In summary, our investigation underscores the pivotal mediating influence of self-rated health and life satisfaction in the nexus between hearing ability and depressive symptoms in retired middle-aged and older adults. This suggests that bolstering these two dimensions can substantially mitigate depressive manifestations. This discovery not only augments theoretical discourse but also offers critical implications for healthcare practice. Specifically, healthcare practitioners can enhance auditory health through routine hearing evaluations, the advocacy of hearing assistive devices, and the execution of educational initiatives aimed at minimizing noise exposure. For middle-aged and older adults grappling with chronic health conditions, tailored health management strategies should be implemented to improve their physical health and self-perceived health status. Furthermore, promoting a variety of social engagements can fortify social support networks, thereby significantly enhancing life satisfaction. By amalgamating these multifaceted strategies, a holistic intervention framework can be developed to effectively elevate the mental health and overall well-being of retired middle-aged and older adults.

Abbreviations

CHARLS	China Health and Retirement Longitudinal Study
CFPS	China Family Panel Studies
CESD-10	The short version of the Center for Epidemiological Studies Depression Scale

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Author contributions
Juju Huang was responsible for the design of the comprehensive study, data analysis, and manuscript composition; Tengfei Liang was responsible for collecting the cohort data and ensuring its integrity; Cong Guo and Chunlin Zhang reviewed the manuscript; Hui Xie designed the study process.

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Data availability
The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
All interviewees were required to sign informed consent, and ethics approval for the data collection in CHARLS was obtained from the Biomedical Ethics Review Committee of Peking University (IRB00001052-11015). All procedures of the study were performed in accordance with approved guidelines and regulations.

Consent for publication
All authors agreed to publish the submitted version of the paper, as did the participants.

Competing interests
The authors declare no competing interests.

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