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AGE-RELATED HEARING LOSS AS A RISK FACTOR FOR DEPRESSION AND DEMENTIA: MECHANISMS, SOCIAL CONSEQUENCES, AND HEARING REHABILITATION

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ABSTRACT

Age-related hearing loss (ARHL), or presbycusis, is one of the most common sensory disorders affecting older adults and may have consequences extending beyond impaired auditory perception. This narrative review aimed to examine the associations of ARHL with depression and cognitive decline, including dementia, with particular attention to underlying mechanisms, psychosocial consequences, and the potential role of hearing rehabilitation. Relevant literature was identified through searches of PubMed and Google Scholar, with priority given to systematic reviews, meta-analyses, longitudinal studies, and randomized controlled trials. Current evidence indicates that ARHL is associated with social withdrawal, loneliness, reduced independence, depressive symptoms, and cognitive decline. Proposed mechanisms linking ARHL with cognitive impairment include increased cognitive load during effortful listening, sensory deprivation and neuroplastic changes, and reduced social and cognitive stimulation. These processes may interact, creating a bidirectional cycle involving hearing impairment, social isolation, depression, and cognitive deterioration. Despite these consequences, ARHL remains frequently underdiagnosed and undertreated. Hearing rehabilitation can improve communication and social functioning, while evidence regarding prevention of depression and cognitive decline remains inconclusive. ARHL should therefore be regarded as a potentially modifiable component of healthy ageing. Early recognition and appropriate rehabilitation may reduce its psychosocial and functional consequences, while further research is required to determine whether hearing interventions can modify long-term depression and dementia risk.

Methodology: This narrative literature review examines the relationship between age-related hearing loss (ARHL), depression, social isolation, cognitive decline, and dementia, as well as the potential role of hearing rehabilitation. Relevant publications were identified through searches of PubMed and Google Scholar. Peer-reviewed systematic reviews, meta-analyses, cohort studies, randomized controlled trials, and selected observational and qualitative studies were included, with preference given to recent evidence. World Health Organization publications were additionally used where appropriate. The literature was synthesized narratively, with particular attention to proposed mechanisms, psychosocial consequences, and the potential effects of hearing rehabilitation.

KEYWORDS

Age-Related Hearing Loss; Presbycusis; Depression; Dementia; Cognitive Decline; Social Isolation; Hearing Aids; Hearing Rehabilitation

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Introduction

Age-related hearing loss (ARHL), also known as presbycusis, is the most common sensory disorder among the elderly. According to researchers, the first symptoms may appear as early as around age 50, and this condition affects up to 40% of people over the age of 65. [1] ARHL is usually progressive and irreversible, and in its early stages primarily involves a decline in the ability to hear high-frequency sounds.

Age-related hearing loss is a much broader issue than simply a decline in hearing ability. Its consequences can affect an older adult's physical, mental, social, and cognitive functioning. Difficulties in understanding speech can lead to problems in interactions with family, friends, and healthcare providers. As a result, people with untreated hearing loss may gradually limit their social activities, avoid gatherings and conversations, and experience feelings of loneliness. [4] Long-term social isolation can negatively affect well-being and increase the risk of depressive symptoms. [4; 16] A person with hearing difficulties may misinterpret information regarding their health status, treatment recommendations, or medication instructions. This issue is particularly significant in healthcare settings, where effective communication between patients and staff is a fundamental component of successful treatment. [8] A person with hearing loss must expend more effort to understand auditory information, and at the same time may limit their social interactions and intellectual activities. These factors can contribute to a decline in cognitive function and increase the risk of developing

dementia. [11; 6] For this reason, hearing assessment should be an integral part of comprehensive geriatric care [20,21]. In clinical practice, greater attention is often paid to cardiovascular diseases, cancers, or other chronic conditions, while hearing disorders may remain undiagnosed [7,20]. Meanwhile, early diagnosis of hearing loss allows for the use of appropriate compensatory measures, such as hearing aids or, in select cases, cochlear implants [20,21]. Healthcare professionals may observe early signs of hearing loss, such as frequent requests to repeat information, difficulty following instructions, or inappropriate responses to questions. Effective communication, ensuring the patient has a suitable environment for conversation, and referring them for further evaluation can significantly improve the quality of care [8].

Evidence from longitudinal studies and meta-analyses indicates that hearing loss is associated with an increased risk of depression in older adults [2,14,15]. Age-related hearing loss is a complex process influenced by factors such as the aging body, oxidative stress, chronic inflammation, mitochondrial dysfunction, and genetic predisposition [1]. Progressive hearing loss can lead to difficulty understanding speech and limit the ability to participate freely in conversations and social life [4,16]. As a result, people with ARHL may gradually limit their interpersonal interactions, which contributes to feelings of loneliness and social isolation [4]. Limited communication can also cause frustration, lower self-esteem, and a sense of dependence on others [11,16]. It is also important to note that ARHL is associated with neurobiological changes occurring within the auditory system and the central nervous system, which may affect cognitive and emotional functioning [10,11,13]. The risk of depressive symptoms may be further increased by coexisting chronic conditions, reduced physical activity, loneliness, and decreased social engagement [11,14,16]. The severity of hearing loss is also a factor, as greater difficulty in perceiving sounds can lead to more significant problems in daily communication and functioning [2]. A large cohort study involving 254,466 participants found a significant association between hearing loss and the incidence of new-onset depressive disorders (compared with no hearing loss; aHR: 1.11; 95% CI: 1.01–1.21; $p = 0.033$). The association was stronger among individuals younger than 65 years (aHR: 1.29; 95% CI: 1.12–1.50; $p < 0.001$) than among those aged 65 years or older (aHR: 1.15; 95% CI: 1.01–1.30; $p = 0.032$) [2]. These findings support an association between hearing impairment and the subsequent development of depressive disorders, although the magnitude of this association may differ between age groups [2].

Hearing impairment has also been associated with an increased risk of dementia. A systematic review and meta-analysis by Readman et al. reported an increased dementia risk among individuals with hearing loss and identified hearing impairment as a potentially modifiable risk factor [3]. Several mechanisms may contribute to this association. Hearing loss can impair the perception and understanding of auditory information, requiring greater allocation of cognitive resources during everyday communication. Increased listening effort may therefore reduce the cognitive resources available for other processes, including memory and information processing [10,11,13]. At the same time, hearing loss may contribute to reduced social interaction and social isolation, representing another potential pathway linking hearing impairment with cognitive decline [4,6,11].

The relationship between hearing loss and dementia is nevertheless complex and may involve multiple interacting pathways and shared risk factors rather than a single direct causal mechanism [3,10,11,13]. Importantly, hearing loss can be identified and rehabilitated, providing an opportunity to improve communication and potentially address one of the modifiable factors associated with cognitive decline [18,20,27]. Hearing assessment and appropriate management may therefore represent an important component of comprehensive care for older adults [18,20].

Social participation and social isolation

People with age-related hearing loss are at risk of a range of consequences associated with this condition, which often go unnoticed by both the patients themselves and those around them. Hearing loss is not limited solely to difficulty in perceiving sounds; it can significantly impact communication, interpersonal relationships, social engagement, and overall quality of life [4,11]. Based on a systematic review of studies examining the relationship between hearing loss, loneliness, and social isolation, it has been demonstrated that people with hearing loss are more likely to experience reduced social contact and an increased sense of loneliness [4]. This relationship is particularly significant for older adults, for whom maintaining social relationships is a vital component of healthy functioning and mental well-being [4,16]. One of the first and most noticeable consequences of ARHL is difficulty communicating. A person with hearing loss may have trouble understanding what others say, especially when a conversation takes place in a noisy environment, during group meetings, or when the speaker is at a greater distance [4,16]. The need to frequently ask others to repeat themselves can cause frustration and embarrassment. Patients may also fear that their difficulties will be

viewed negatively by others. As a result, some people begin to avoid situations that require intensive communication, such as family gatherings, social events, visits to larger groups, or phone calls [4,16]. Shukla et al. point out that hearing loss may be associated with both loneliness—understood as a subjective sense of a lack of fulfilling relationships—and social isolation, that is, an objective limitation in the number and frequency of interactions with other people [4]. These two phenomena can reinforce each other [4,16]. Initial communication difficulties can lead to a reduction in social activity, and fewer social contacts can, in turn, deepen feelings of loneliness [4,16]. This can create a sort of “cascade” of negative consequences, in which hearing loss becomes the trigger for a gradual withdrawal from social life [4,16].

Reduced social contact can also have consequences for mental health and cognitive functioning [5,6,16]. Maintaining relationships with others provides not only emotional support but also daily cognitive stimulation [5,6]. A person who, due to hearing loss, participates less and less in conversations and social activities may be deprived of some of these stimuli [5,6]. Prolonged isolation can contribute to a decline in well-being, an increased sense of dependence on others, and a reduced quality of life [4,11,16]. Another interesting aspect highlighted in the literature is the possibility of gender-related differences. Shukla et al. (2020) indicate that the association between hearing loss and loneliness and social isolation may be stronger in women than in men [4]. This may suggest that the consequences of ARHL are not the same for all patients and should be considered in light of their individual social and psychological circumstances [4].

It is worth emphasizing that the consequences of hearing loss can extend beyond the realm of communication. Limited ability to communicate freely can hinder access to information, participation in social life, and independent functioning [7,11,16]. Therefore, ARHL should be viewed as a health issue with broad social and functional implications, rather than merely as a disorder of the hearing organ [11,16].

Hearing rehabilitation and interventions supporting social participation may help reduce loneliness and social isolation and improve social functioning [5,24]. A comprehensive approach to ARHL should therefore include not only improving hearing ability but also measures aimed at preserving social relationships, activity, and psychological well-being in older adults [5,11,24]. Large-scale studies have shown that social activity has a significant mediating effect on the relationship between hearing loss and cognitive decline (estimated value = -0.004 ; 95% CI: -0.007 to -0.001). Furthermore, more severe negative effects of hearing loss were observed in individuals with lower levels of social activity, indicating the important role of interpersonal contact in the functioning of older adults [5]. Hearing loss can make it difficult to carry on conversations, participate in gatherings, and freely establish and maintain relationships with others. As a result, people with hearing loss may gradually limit their social activity, which reduces the number of daily interactions and opportunities to participate in social life [4,5]. Limited social contact, in turn, can exacerbate feelings of loneliness, isolation, and reduced mental well-being [4,5]. Researchers note that social activity may play a significant role in the link between hearing loss and the decline in cognitive function and mental health among older adults [5,6]. Regular interaction with others provides cognitive stimulation, supports emotional engagement, and helps maintain a sense of belonging to a group and society [5,6].

If hearing loss leads to withdrawal from social activities, an older adult may be deprived of some of these beneficial stimuli, which may represent one of the pathways linking hearing impairment with cognitive decline [5,6]. This may create a vicious cycle in which worsening hearing contributes to reduced social activity, while the resulting isolation may further exacerbate psychological and cognitive difficulties [5,6,16]. The situation may be particularly challenging for individuals who, even before the onset of hearing loss, had a limited social network or rarely participated in social life. For this reason, counteracting social isolation and supporting interpersonal engagement should be an important component of comprehensive care for older adults with hearing loss, as it can help mitigate its negative consequences for mental health and cognitive function [6]. A Meta-analysis from 2024 showed that the overall risk ratio for developing dementia as a result of hearing loss was 1.21 (95% CI: 1.11–1.31; $p = 0.002$). There is, therefore, a significant association between the onset of cognitive impairment and dementia and hearing loss [7]. It is important to be aware of how to effectively counteract the negative effects of ARHL, particularly its social and psychological consequences.

Appropriately selected interventions may help reduce social isolation and loneliness and improve social participation among older adults with hearing loss [24]. One of the primary treatment approaches is auditory rehabilitation, which aims not only to improve hearing ability but also to facilitate everyday communication [20]. Hearing aids play an important role by improving access to auditory information and communication and may contribute to better social functioning [20,24]. In individuals with severe hearing loss who derive insufficient benefit from conventional hearing aids, cochlear implants may be considered, while assistive hearing technologies can further facilitate communication in specific situations [20,24].

A 2026 systematic review indicates that interventions aimed at improving hearing may yield beneficial results in terms of social functioning and reducing loneliness [29]. Of particular interest are the findings regarding group hearing rehabilitation, which, in addition to hearing-related exercises, allows patients to interact directly with others in similar situations. Participation in a group may help reduce isolation, facilitate the exchange of experiences, and foster social interaction [29]. In this way, group rehabilitation may simultaneously address difficulties related to hearing loss and its psychological and social consequences [29]. It should be emphasized, however, that improved hearing alone is not always sufficient to completely eliminate loneliness or social isolation; therefore, therapeutic interventions should be tailored to the patient's individual needs [29; 24]. It is particularly important to encourage older adults to actively participate in family, social, and community life and to provide them with appropriate support during adaptation to hearing aids [20,24]. A comprehensive approach combining auditory rehabilitation, appropriately selected technologies, and interventions supporting social engagement may therefore help mitigate the broader consequences of ARHL [20,24, 29].

Somatic health and interaction with healthcare

ARHL can negatively affect not only patients' mental health but also their physical well-being. Hearing loss may impede patients' ability to manage their own health, understand and follow medical advice, communicate with healthcare providers, and access medical information [7,8]. Communication barriers associated with hearing impairment may consequently complicate the management of chronic diseases and access to preventive healthcare [7,8]. Studies have shown that patients with hearing loss are significantly more likely to report unmet medical needs (OR = 1.85; 95% CI = 1.29–2.66) [7]. Communication difficulties may also create barriers during interactions with healthcare professionals and contribute to difficulties accessing appropriate care [7,8]. Furthermore, the likelihood of not filling a prescription was significantly higher among individuals with hearing loss than among those without hearing loss (OR = 1.81; 95% CI = 1.27–2.59) [7].

Patients with age-related hearing loss are particularly prone to difficulties in communicating with healthcare professionals [8]. Effective communication between patients and healthcare providers is one of the fundamental elements of ensuring safe and effective care. For people with hearing loss, however, communication can be significantly impaired, which may affect their understanding of information regarding their health status, treatment recommendations, and next steps [7,8]. An analysis of the experiences of patients with ARHL identified a number of factors that may contribute to communication problems during interactions with medical staff [8]. One of the difficulties frequently reported by patients was an inability to understand what healthcare professionals were saying [8]. People with hearing loss may have difficulty not only perceiving individual words but, more importantly, understanding the complete message being communicated [8]. Communication may become particularly challenging when healthcare professionals speak rapidly or quietly, do not face the patient directly, or communicate while simultaneously performing other tasks [8]. Environmental factors, including the presence of other people, noise from medical equipment, and background conversations, may create additional barriers [8]. Under such conditions, patients may perceive speech without being able to fully understand the information being communicated [8]. Another problem is the use of specialized terminology by medical staff. For an older adult who also has hearing difficulties, complex medical concepts can be particularly difficult to understand. If information is not appropriately adapted to the patient's communication needs, misunderstandings regarding diagnosis, treatment, or recommendations may arise [8]. As a result, patients may leave a healthcare encounter with an incomplete understanding of information concerning their health and subsequent care [8].

Attention has also been drawn to a lack of awareness among healthcare professionals regarding communication difficulties associated with hearing loss. Patients may feel that staff do not always recognize their hearing limitations or implement appropriate communication strategies [8]. This may contribute to frustration and dissatisfaction with communication during healthcare encounters [8]. Importantly, patients may not always disclose their hearing difficulties to healthcare professionals, making recognition of communication needs more challenging [8].

At the same time, relatively simple strategies may improve communication with patients with ARHL [8]. These include rephrasing or clarifying information, repeating important points, and confirming that the patient has correctly understood the information provided [8]. Written information can complement verbal communication and provide patients with material that can be reviewed after the consultation [8]. Creating an appropriate communication environment is also important. Reducing background noise and other distractions may facilitate communication for individuals with hearing impairment [8]. Healthcare professionals should

address the patient directly, maintain visual contact, and speak clearly at an appropriate pace [8]. Such relatively simple adaptations may facilitate more effective communication between healthcare professionals and older adults with hearing loss [8].

Communication difficulties experienced by people with ARHL when interacting with medical staff can pose a significant barrier to providing safe and effective care [7,8]. Rephrasing and repeating information, using written materials, and ensuring a calm and quiet environment may help patients understand the recommendations being conveyed [8]. Adapting communication to the needs of people with hearing loss should therefore be considered an important component of patient-centered care [8].

Hearing impairment may also be associated with increased healthcare utilization. Genther et al. found that mild and moderate hearing impairment was associated with a 17% higher annual rate of hospitalization compared with normal hearing [9]. These findings suggest that the consequences of hearing loss may extend beyond communication difficulties and be associated with broader healthcare utilization among older adults [9].

The mechanisms underlying this association remain uncertain. Communication difficulties may interfere with the exchange of health-related information between patients and healthcare professionals [7,8], while hearing impairment may coexist with other age-related health and functional problems that independently increase hospitalization risk [9]. Therefore, the observed association between hearing loss and hospitalization should not necessarily be interpreted as evidence that hearing impairment directly causes hospitalization.

Nevertheless, recognition and appropriate management of ARHL may improve communication and address some of the functional consequences of hearing impairment [20]. Early identification, appropriate hearing rehabilitation, and communication adaptations may therefore represent important components of comprehensive care for older adults with hearing loss [8,20].

Mechanisms linking ARHL with cognitive decline and dementia

The association between age-related hearing loss (ARHL) and cognitive decline is increasingly well documented; however, the mechanisms underlying this relationship remain incompletely understood. Several complementary hypotheses have been proposed, including increased cognitive load associated with effortful listening, sensory deprivation and subsequent structural and functional brain changes, reduced social and cognitive stimulation, and common pathological processes affecting both auditory and cognitive systems. These mechanisms are not mutually exclusive and may interact over many years, particularly in older adults exposed simultaneously to multiple age-related risk factors. [11]

One of the most frequently proposed explanations is the cognitive load, or effortful listening, hypothesis. Hearing impairment reduces the quality and clarity of auditory information reaching the central nervous system. Consequently, understanding speech, particularly in environments with background noise, may require substantially greater attention and cognitive effort. Cognitive resources that would normally be available for memory formation, executive function, or processing of contextual information must instead be redirected toward decoding an incomplete auditory signal. In everyday situations, an older person with hearing loss may therefore successfully understand a conversation but have fewer resources available to encode and retain its content. When this increased listening effort persists over many years, it has been hypothesized that continuous redistribution of cognitive resources may contribute to cognitive vulnerability and accelerate the manifestation of cognitive deficits. This mechanism is sometimes referred to as the resource allocation hypothesis and represents an important potential link between peripheral hearing impairment and higher-order cognitive function. [12]

A second proposed mechanism is sensory deprivation. Chronic reduction in auditory stimulation may lead to functional and structural reorganization within the central auditory system and brain regions involved in higher cognitive processing. Hearing loss decreases the amount and quality of sensory input received by the brain, potentially affecting neural networks that depend on regular auditory stimulation. Neuroimaging studies have reported associations between hearing impairment and reductions in brain volume, including changes involving temporal regions that participate in auditory processing, memory, and language. [13]

Long-term sensory deprivation may therefore contribute to cortical reorganization and potentially accelerate age-related neural changes. The relationship is likely to be complex, however, because observed brain abnormalities may represent both consequences of reduced auditory input and manifestations of broader neurodegenerative processes.

The effects of ARHL on cognition may also operate through a social pathway. Communication difficulties frequently make conversations more demanding and less rewarding, which can encourage

individuals with hearing impairment to reduce their participation in social activities. Progressive withdrawal may decrease the number and diversity of interpersonal interactions and consequently reduce opportunities for cognitive stimulation. Conversation itself is a complex cognitive activity requiring attention, memory, language processing, rapid interpretation of social cues, and formulation of appropriate responses. Regular social engagement may therefore contribute to cognitive reserve, whereas prolonged reduction in social interaction may remove an important source of cognitive stimulation. Social isolation has consequently been proposed as a mediator of the association between hearing impairment and subsequent cognitive decline. Importantly, however, available evidence suggests that social isolation explains only part of this relationship, indicating that additional pathways are likely involved. [7]

An alternative explanation is provided by the common-cause hypothesis. According to this concept, hearing loss may not itself be the sole cause of cognitive decline. Instead, both conditions may partly result from shared age-related pathological processes. Vascular disease, microvascular injury, chronic inflammation, oxidative stress, mitochondrial dysfunction, and generalized neurodegeneration may simultaneously affect the cochlea, auditory pathways, and cerebral structures responsible for cognitive functions. Under this model, ARHL may function partly as a marker of biological aging and neurological vulnerability. This possibility is particularly important when interpreting observational studies, because an association between hearing impairment and dementia does not necessarily establish a direct causal relationship. [14]

Mechanisms linking ARHL with depression

Age-related hearing loss (ARHL) has been associated with an increased risk of depressive symptoms and depression in older adults. A systematic review and meta-analysis of 35 studies involving 147,148 participants demonstrated that hearing loss was associated with higher odds of depression in older adults (OR = 1.47; 95% CI: 1.31–1.65). Importantly, the association remained significant when cohort studies were analyzed separately, suggesting that hearing impairment may precede the development of depressive symptoms rather than simply coexist with them. More recent evidence supports this association: a 2024 systematic review and meta-analysis of 24 cohort studies found that hearing loss was associated with a 35% increase in the odds of depression (OR = 1.35; 95% CI: 1.27–1.44), while the association among older adults remained significant (OR = 1.33; 95% CI: 1.21–1.45). Nevertheless, the mechanisms underlying this relationship are complex and probably multifactorial. Communication difficulties, social withdrawal and loneliness, loss of independence, restrictions in meaningful activities, and the emotional burden associated with progressive sensory impairment may interact and progressively increase psychological vulnerability in older adults with ARHL. [15; 16]

One of the most important potential pathways involves communication difficulties and their psychological consequences. Progressive hearing impairment can make ordinary conversations increasingly demanding, particularly in environments with background noise, during group discussions, or when speech is rapid or originates from several speakers. Repeated misunderstandings and the need to ask others to repeat themselves can produce frustration, embarrassment, and anxiety about future interactions. Individuals with ARHL may become concerned about responding inappropriately, misunderstanding a question or joke, or being perceived as inattentive or cognitively impaired. Some may attempt to conceal their hearing impairment by pretending to understand what has been said, remaining silent during conversations, or avoiding communication-intensive situations altogether. Thus, hearing impairment may gradually transform communication from a spontaneous and rewarding activity into a source of stress and psychological effort. [17; 12]

These communication difficulties may subsequently promote social withdrawal and loneliness. However, this pathway involves more than a simple reduction in the number of social contacts. An older individual with hearing impairment may continue to attend family gatherings or social events while being unable to participate fully in conversations. Consequently, physical presence does not necessarily guarantee meaningful social interaction. Difficulties following conversations may weaken an individual's sense of connection and belonging even when family members or friends remain physically available. Over time, repeated unsuccessful interactions may encourage avoidance of socially demanding situations, further increasing the risk of loneliness. Because this social pathway has been discussed extensively in relation to ARHL, it should be regarded as one component of a broader mechanism linking hearing impairment with depression rather than as its sole explanation. [5; 17]

Another potentially important mechanism is progressive loss of independence and perceived self-efficacy. Hearing is essential not only for interpersonal relationships but also for independent functioning in everyday life. Telephone conversations, medical appointments, shopping, administrative matters, and the use

of public services frequently depend on the rapid and accurate exchange of verbal information. An older person who previously performed these activities independently may increasingly rely on a spouse, adult child, or caregiver to facilitate communication. Hearing impairment can therefore alter established social roles: an autonomous individual may gradually become dependent on others in situations that were previously routine. Such changes may be psychologically significant, particularly when they are interpreted as evidence of declining competence or ageing. Reduced perceived control over everyday life, increasing dependence, and impairment of activities of daily living may contribute to helplessness, reduced self-esteem, and ultimately depressive symptoms. [12; 17]

ARHL may also contribute to depression by restricting access to pleasurable and meaningful activities. Hearing is involved in numerous experiences that contribute to quality of life, including listening to music, watching television, attending cultural or religious events, participating in group activities, and communicating with friends, partners, children, and grandchildren. As auditory perception deteriorates, such activities may require increasing effort while providing less enjoyment. An individual may therefore gradually abandon activities that previously provided pleasure, stimulation, social contact, or a sense of purpose. This narrowing of everyday activity is potentially relevant to the development of depressive symptoms because reduced engagement in rewarding experiences can further promote withdrawal and decrease opportunities for positive emotional reinforcement. In addition, reduced mobility and impairment in activities of daily living have been identified as possible pathways linking hearing impairment with late-life depression. [12; 17]

The emotional response to progressive sensory loss itself should also be considered. ARHL is generally gradual and irreversible, and recognition of deteriorating hearing may contribute to an individual's perception of ageing and declining health. Hearing difficulties can generate frustration and irritability, particularly when communication failures occur repeatedly despite attempts to compensate for them. Stigma associated with hearing impairment or hearing-aid use may additionally influence self-perception and discourage individuals from openly acknowledging their difficulties. Consequently, some patients may delay seeking professional assistance and continue functioning with untreated hearing impairment. Prolonged exposure to communication-related stress combined with reluctance to seek support may further increase psychological burden. [17]

Importantly, the relationship between hearing impairment and depression may become bidirectional once depressive symptoms develop. ARHL may initially promote communication difficulties, withdrawal, loss of independence, and reduced participation in meaningful activities. Emerging depression can subsequently intensify these problems by reducing motivation, energy, and willingness to interact with others. A depressed individual may become even less likely to participate in social activities, seek audiological assessment, consistently use hearing aids, or engage in hearing rehabilitation. Reduced activity may then increase isolation and further limit opportunities for successful communication. ARHL and depression may therefore become components of a self-reinforcing cycle rather than representing a simple unidirectional relationship. Evidence from meta-analytic research examining sensorineural hearing loss, depression, and anxiety also supports the possibility of bidirectional associations between hearing impairment and psychological disorders. [18]

Nevertheless, the association between ARHL and depression should not be interpreted as proof of a direct causal relationship. Both conditions become increasingly prevalent with advancing age and may share numerous determinants, including chronic somatic disease, functional impairment, reduced mobility, socioeconomic disadvantage, cognitive decline, and other manifestations of biological ageing. Studies also differ considerably in how hearing impairment and depressive symptoms are assessed. Some rely on self-reported hearing difficulties, whereas others use objective audiometric measurements; similarly, depression may be defined using screening questionnaires, clinical diagnoses, or medical records. These methodological differences contribute to heterogeneity between studies. Although the association between hearing loss and depression is supported by large meta-analyses, evidence specifically addressing ARHL remains less uniform, particularly when longitudinal studies are considered. The available evidence should therefore be interpreted as supporting ARHL as a potentially modifiable contributor to psychological vulnerability rather than establishing hearing impairment as an independent and direct cause of depression. [16]

Taken together, current evidence supports a multifactorial model in which ARHL may contribute to depression through interacting social, functional, and psychological pathways. Communication difficulties can increase emotional distress and promote withdrawal; reduced participation can contribute to loneliness; loss of independence may undermine self-efficacy; and withdrawal from meaningful activities may decrease opportunities for pleasure and social reinforcement. Once depressive symptoms emerge, they may further reduce motivation and social engagement, potentially amplifying the functional consequences of hearing impairment. This reciprocal relationship provides an important rationale for considering hearing assessment and rehabilitation as part of a broader approach to preserving mental well-being in older adults.

ARHL, depression, social isolation and dementia: a tragic vicious cycle

The relationships between age-related hearing loss (ARHL), social isolation, depression, and cognitive decline should not be viewed as a simple unidirectional sequence. Rather, available evidence suggests the existence of several interacting pathways through which these conditions may reinforce one another over time. Hearing impairment can contribute to communication difficulties and reduced social participation, increasing vulnerability to loneliness and depressive symptoms. Depression and social disengagement may subsequently reduce cognitive stimulation and participation in everyday activities, while emerging cognitive impairment can further compromise communication, independence, and the ability to compensate effectively for hearing loss. ARHL may therefore initiate or intensify a self-reinforcing cycle involving sensory, psychological, social, and cognitive deterioration. [17; 19]

The cycle may begin with progressive communication difficulties caused by hearing impairment. As speech becomes more difficult to understand, conversations require greater effort and may increasingly result in misunderstandings, frustration, or embarrassment. Individuals may consequently avoid group discussions, social gatherings, telephone conversations, or other situations in which successful communication is uncertain. Over time, repeated avoidance can reduce both the frequency and quality of interpersonal interactions. Importantly, this process may occur gradually and may initially be interpreted simply as a preference for quieter environments or reduced interest in social activities. Eventually, however, communication-related withdrawal may contribute to shrinking social networks and increasing loneliness. [5; 17]

Social isolation and loneliness may then increase vulnerability to depression, while depressive symptoms can in turn intensify social withdrawal. An individual who develops low mood, anhedonia, fatigue, reduced motivation, or decreased self-confidence may become even less willing to initiate conversations and participate in social activities. Consequently, the social consequences initially triggered by hearing impairment may become increasingly independent of the auditory deficit itself. Even when opportunities for interaction remain available, depression can reduce the motivation necessary to use them. The relationship can therefore become reciprocal: hearing impairment contributes to social withdrawal and depressive symptoms, whereas depression further limits the individual's willingness and ability to remain socially engaged. [15; 17]

This interaction is particularly important in relation to cognitive decline, because social engagement provides repeated opportunities for cognitive stimulation. Conversation requires simultaneous use of attention, language, memory, processing speed, and executive functions. Participation in family, community, and leisure activities may similarly expose an individual to new information, decisions, and cognitively demanding situations. Progressive withdrawal from such activities may therefore decrease the amount and diversity of cognitive stimulation experienced in everyday life. Evidence from longitudinal studies supports social isolation as a potential mediator of the association between hearing loss and cognitive outcomes, although it appears to explain only part of the relationship. This suggests that social disengagement operates alongside other mechanisms, including increased cognitive load and sensory deprivation, rather than functioning as the sole pathway from hearing impairment to dementia. [7; 13]

Depression may constitute an additional intermediate pathway between hearing impairment and cognitive deterioration. Depressive symptoms in older adults are associated with reduced activity, poorer concentration, decreased social participation, and impaired cognitive performance. In a study of 8,094 adults aged 65 years and older, Cao et al. demonstrated that depressive symptoms partially mediated the association between hearing loss and cognitive impairment. Moreover, social relationships modified both direct and indirect components of this association, illustrating that psychological and social factors may interact rather than act as independent pathways. These observations support a model in which ARHL may contribute to depressive symptoms through communication and functional limitations, while depression subsequently adds another potential route toward poorer cognitive functioning. [20]

The interaction becomes even more complex once cognitive impairment develops. Declining memory, executive functioning, attention, and processing speed may make it increasingly difficult for an older person to compensate for reduced hearing. Successful use of hearing aids requires a number of cognitive and practical abilities, including remembering to use the device, maintaining it, adjusting it appropriately, and adapting to amplified auditory information. Cognitive deterioration may therefore reduce the effectiveness of compensatory strategies and increase dependence on relatives or caregivers. At the same time, difficulty interpreting speech may become greater when both auditory and cognitive processing are impaired. The combined presence of ARHL and cognitive decline can consequently make communication progressively more challenging, potentially promoting further withdrawal from interpersonal interactions. This represents an important potential feedback mechanism: hearing impairment may contribute to conditions associated with

cognitive decline, while cognitive decline can subsequently magnify the functional consequences of hearing impairment. [17]

The coexistence of hearing impairment, depression, and cognitive deterioration may also compromise self-care and treatment-seeking behavior. A patient experiencing depressive symptoms may have less motivation to undergo hearing assessment or persist with auditory rehabilitation, while a patient with cognitive impairment may experience difficulty learning how to use hearing devices or following recommendations. Untreated or insufficiently compensated hearing loss may then continue to interfere with communication and participation, sustaining the original source of social and psychological difficulty. In this way, barriers to hearing rehabilitation may themselves become part of the vicious cycle. Importantly, this mechanism does not imply that depression or dementia inevitably follows untreated ARHL, but rather that the coexistence of these conditions can produce mutually reinforcing functional consequences.

The importance of this multidimensional relationship is further illustrated by the 2024 Lancet Commission on dementia prevention, intervention, and care. Hearing loss, depression, and social isolation are identified as separate potentially modifiable risk factors for dementia. Their simultaneous presence in the same individual may therefore be particularly relevant, because ARHL could theoretically contribute to dementia risk both through hearing-related mechanisms and indirectly by increasing exposure to other adverse psychosocial conditions. However, these risk factors overlap considerably, and their effects cannot simply be added together. Instead, they should be understood as components of an interconnected network of vulnerabilities that may influence cognitive ageing throughout later life. [19]

Nevertheless, the concept of a vicious cycle should be interpreted as a conceptual model rather than proof of a single causal sequence. Most studies examining the relationships among hearing impairment, depression, isolation, and cognition are observational, and mediation analyses demonstrate statistical pathways rather than definitive biological causation. Shared determinants such as advanced age, cardiovascular disease, frailty, reduced mobility, socioeconomic disadvantage, and neurodegenerative processes may influence several components of the proposed cycle simultaneously. Reverse causation is also possible: early cognitive deterioration may contribute to reduced social engagement and difficulties with complex auditory processing before dementia is clinically diagnosed. Therefore, the available evidence supports an interacting and potentially bidirectional model, but does not establish that every patient progresses through the same sequence. [7; 20]

Overall, ARHL, social isolation, depression, and cognitive decline may form a dynamic and self-reinforcing network rather than a linear chain of consequences. Hearing impairment can make communication difficult and promote withdrawal; reduced social engagement may increase loneliness and depressive symptoms while decreasing cognitive stimulation; depression may further diminish motivation and participation; and cognitive deterioration may ultimately impair the ability to compensate for hearing loss and remain socially independent. Recognition of these reciprocal relationships is clinically important because interventions directed at a single component of the cycle—particularly hearing rehabilitation, maintenance of social engagement, and identification of depressive symptoms—may potentially influence several interconnected dimensions of healthy ageing.

Underdiagnosis and undertreatment of age-related hearing loss

Despite its high prevalence and substantial consequences for everyday functioning, age-related hearing loss (ARHL) remains frequently unrecognized or insufficiently treated. This represents an important public health issue, particularly because hearing impairment is one of the potentially modifiable factors associated with cognitive decline, depression, and loss of independence in older adults. According to the World Health Organization (WHO), more than 25% of people aged over 60 years are affected by disabling hearing loss. At the same time, access to effective hearing rehabilitation remains limited. WHO estimates that more than 400 million people worldwide could benefit from hearing aids, yet only approximately 17% actually use them. Thus, a substantial discrepancy exists between the number of individuals who experience clinically relevant hearing impairment and those who receive appropriate rehabilitation. [21; 23]

One important reason for underdiagnosis is the gradual and insidious progression of ARHL. Unlike sudden hearing loss, presbycusis usually develops slowly over many years, allowing individuals to adapt progressively to deteriorating auditory function. Early impairment predominantly affects higher frequencies and may initially manifest as difficulty understanding speech rather than an obvious reduction in the perception of sound. Patients may therefore report that other people are “mumbling,” that speech has become unclear in noisy environments, or that television dialogue is increasingly difficult to understand without recognizing these

experiences as manifestations of hearing impairment. Compensatory behaviors, such as increasing television volume, relying on visual cues, positioning oneself closer to the speaker, or avoiding noisy environments, may allow the problem to remain unnoticed for a considerable period. Family members may consequently recognize deterioration in hearing before the affected individual considers it clinically significant. [22]

Another barrier to diagnosis is the tendency to perceive hearing deterioration as an inevitable and relatively harmless consequence of ageing. Both patients and healthcare professionals may give hearing impairment lower priority than cardiovascular disease, diabetes, cancer, mobility problems, or other chronic conditions frequently encountered in older adults. As a result, hearing difficulties may receive limited attention during routine medical encounters unless the patient actively reports them. This is problematic because individuals who have gradually adapted to hearing impairment may underestimate its severity and may not spontaneously seek assessment. WHO therefore emphasizes systematic identification of hearing loss in populations at increased risk, including older adults, and identifies early detection as an essential component of effective hearing care. [22]

The consequences of underdiagnosis may be particularly important in patients evaluated for depression or cognitive impairment. Hearing difficulties can alter the apparent behavior of an older patient during clinical assessment. Failure to hear or accurately understand a question may result in an inappropriate response, delayed response, or apparent inability to follow instructions. Similarly, information that was never adequately perceived cannot subsequently be recalled, potentially creating the impression of a memory deficit. Hearing impairment may therefore complicate the interpretation of cognitive testing, particularly when assessment tools depend heavily on verbal instructions and auditory presentation of information. Conversely, cognitive impairment may make it more difficult for a patient to recognize, report, or compensate for hearing problems. For this reason, hearing status should be considered when assessing older adults presenting with apparent cognitive deterioration, social withdrawal, or depressive symptoms.

Even when hearing loss is identified, however, diagnosis does not necessarily result in effective treatment. A systematic review examining hearing-aid uptake among older adults identified numerous barriers, including underestimation of hearing impairment, stigma, doubts regarding the expected benefit of hearing aids, cost, unrealistic expectations, cognitive and functional limitations, and individual coping strategies. Therefore, the treatment gap cannot be explained exclusively by lack of access to audiological services. Some individuals who have undergone assessment and have been advised to use hearing aids still decide not to obtain or regularly use them. [24]

Stigma and attitudes toward ageing may contribute substantially to reluctance to seek hearing rehabilitation. Hearing aids may be perceived as visible indicators of disability, dependence, or old age. Individuals who have spent years attempting to conceal their hearing difficulties may consequently be reluctant to adopt a device that makes the impairment more apparent to others. Underestimation of the problem may have a similar effect. Because ARHL develops gradually, patients may consider their hearing “good enough,” particularly if they remain able to communicate successfully in quiet one-to-one conversations. However, this perception may underestimate difficulties encountered in more complex listening environments and the broader consequences of hearing loss for social participation and independence. [24]

Obtaining a hearing aid also does not guarantee successful long-term hearing rehabilitation. Older adults may encounter practical difficulties related to device handling, maintenance, comfort, sound quality, or adaptation to amplified auditory input. Functional limitations affecting vision or manual dexterity can make insertion, cleaning, battery replacement, or adjustment of small devices challenging. Cognitive impairment may create additional difficulties with learning new routines and consistently maintaining the device. Unrealistic expectations can also contribute to discontinuation: hearing aids improve access to auditory information but do not restore normal hearing, and difficulties understanding speech in complex acoustic environments may persist. Appropriate counselling, device fitting, follow-up, and auditory rehabilitation are therefore important components of treatment rather than optional additions to the provision of a hearing aid. [24]

At the healthcare-system level, availability, affordability, and accessibility of hearing services remain important determinants of treatment. The global treatment gap is particularly pronounced in settings where audiological services and trained professionals are limited. WHO has emphasized the need for models of hearing-aid provision that can increase access while maintaining appropriate assessment, fitting, education, and follow-up. The problem is therefore not simply technological: effective management requires a pathway from recognition and diagnosis to selection of an appropriate intervention and continued support. [23]

Underdiagnosis and undertreatment are especially relevant in the context of the proposed relationship between ARHL, depression, social isolation, and dementia. Individuals experiencing the greatest consequences of hearing impairment may paradoxically encounter additional barriers to obtaining treatment. Socially isolated individuals may have less family support to recognize hearing deterioration and facilitate audiological assessment. Depression may reduce motivation to seek help or persist with rehabilitation, while cognitive impairment may interfere with adaptation to hearing devices. Consequently, the psychological and cognitive conditions potentially associated with untreated ARHL may themselves make successful hearing rehabilitation more difficult. This creates another possible feedback mechanism through which untreated hearing loss and its functional consequences can persist over time.

The large discrepancy between the prevalence of hearing impairment and the use of hearing rehabilitation highlights an important opportunity for intervention. ARHL is generally irreversible, but its functional consequences can be addressed through hearing aids, assistive listening technologies, auditory rehabilitation, communication strategies, and, in appropriately selected patients with severe hearing loss, cochlear implantation. Early recognition is therefore important not because the underlying age-related degeneration can necessarily be reversed, but because prolonged communication difficulties and their social and functional consequences may potentially be reduced. Screening and hearing assessment should consequently form part of comprehensive care for older adults, particularly when patients present with social withdrawal, depressive symptoms, loss of independence, or suspected cognitive deterioration. [21; 22]

Thus, underdiagnosis and undertreatment represent a critical component of the broader burden associated with ARHL. The problem does not end with detection of an elevated hearing threshold: effective care requires recognition of hearing difficulties, access to audiological assessment, acceptance of treatment, appropriate selection and fitting of hearing devices, and continued support during rehabilitation. Reducing this treatment gap may help preserve communication, independence, and social participation in older adults and provides the rationale for investigating whether hearing rehabilitation can also modify the longer-term psychological and cognitive consequences associated with ARHL.

Can hearing rehabilitation modify the risk of depression and dementia?

Because age-related hearing loss (ARHL) is potentially treatable, considerable attention has been directed toward whether hearing rehabilitation can reduce not only communication difficulties but also the broader psychological and cognitive consequences associated with hearing impairment. Available interventions include hearing aids, cochlear implants, assistive listening technologies, auditory rehabilitation, and communication training. These approaches primarily aim to improve access to auditory information and everyday communication, but they may also influence social participation, emotional well-being, and cognitive functioning. Nevertheless, evidence regarding their ability to modify the long-term risk of depression or dementia remains heterogeneous, and the distinction between improvement in functional outcomes and prevention of neuropsychiatric disease is important. [22]

The most commonly used intervention for mild-to-moderate ARHL is the hearing aid. By amplifying and processing auditory signals, hearing aids can improve speech perception and reduce the communication burden associated with hearing impairment. Their potential psychological benefit is biologically and socially plausible. Easier communication may reduce embarrassment and frustration, facilitate participation in conversations and social activities, and decrease dependence on family members. In this way, hearing rehabilitation may interrupt several of the pathways previously described between ARHL, social withdrawal, loneliness, and depression. Evidence from recent systematic reviews also suggests that hearing aids and cochlear implants are associated with improved social functioning and social quality of life in adults with hearing loss. [25]

The effect of hearing rehabilitation on depressive symptoms appears promising, although the available evidence is less consistent than the effect on hearing-related functioning. Observational studies frequently report lower levels of depressive symptoms among hearing-aid users, and some intervention studies have also demonstrated improvement in mood after treatment. In the Baltimore HEARS pilot study, a low-cost hearing intervention delivered to older adults resulted in fewer social and emotional consequences of hearing loss and fewer depressive symptoms after three months compared with the control condition. Although the study was small and designed primarily as a feasibility intervention, its findings support the possibility that improving auditory communication may also influence psychological well-being. [26]

Randomized evidence concerning depression is still limited. Brewster et al. conducted a 12-week double-blind pilot randomized controlled trial among older adults with ARHL and depressive disorders,

comparing active hearing aids with low-amplification sham devices in addition to usual psychiatric treatment. The study included only 13 participants and was primarily designed to assess feasibility. Nevertheless, preliminary results suggested greater improvement in depressive symptoms, hearing-related functioning, general functioning, and some cognitive measures in the active-treatment group. Because of the very small sample size and difficulties maintaining blinding, these findings cannot establish a definitive antidepressant effect of hearing aids, but they provide support for larger randomized studies. [26]

The possibility that hearing rehabilitation may influence cognitive decline and dementia risk has generated even greater interest. Observational evidence has generally been favourable. A systematic review and meta-analysis by Yeo et al. found that use of hearing restorative devices, including hearing aids and cochlear implants, was associated with an approximately 19% lower risk of long-term cognitive decline compared with untreated hearing loss. Improvements in short-term cognitive test scores were also observed after use of hearing restorative devices. However, these findings were largely based on observational studies, and therefore they cannot determine whether the devices themselves produced the apparent protective effect. [27]

The interpretation of observational studies is complicated by the possibility of healthy-user bias and residual confounding. Individuals who obtain and consistently use hearing aids may differ substantially from non-users. They may have higher educational attainment or socioeconomic status, better access to healthcare, greater health literacy, stronger family support, and greater motivation to participate in preventive care. They may also be healthier or more socially active at baseline. These characteristics are themselves associated with cognitive outcomes. Consequently, a lower incidence of dementia among hearing-aid users does not necessarily mean that the hearing aid alone is responsible for the difference. Randomized controlled trials are therefore particularly important for determining whether hearing treatment directly modifies cognitive trajectories.

The strongest randomized evidence currently comes from the Aging and Cognitive Health Evaluation in Elders (ACHIEVE) trial. ACHIEVE enrolled cognitively healthy older adults with untreated hearing loss and randomly assigned them to a comprehensive hearing intervention or a health-education control intervention. The hearing intervention included bilateral hearing aids, appropriate fitting, counselling, and continued audiological support. Over three years, the intervention did not significantly reduce cognitive decline in the overall study population. However, the effect differed substantially between the two populations recruited into the trial. Among participants drawn from a pre-existing cardiovascular cohort, who had more baseline risk factors for cognitive decline, hearing intervention was associated with significantly slower cognitive deterioration. In contrast, no clear cognitive benefit was observed among healthier community volunteers. [28]

The ACHIEVE findings are important because they suggest that the cognitive consequences of hearing rehabilitation may depend on the baseline vulnerability of the patient. Hearing intervention may have limited measurable effect in relatively healthy older adults with a low short-term risk of cognitive deterioration, whereas individuals with greater vascular, cognitive, or functional vulnerability may have more to gain. This interpretation is consistent with the multifactorial model linking ARHL with dementia. If hearing loss contributes only one component of overall cognitive risk, treating it may be most effective when the auditory deficit represents a meaningful additional burden in an individual already approaching the limits of cognitive compensation. Nevertheless, subgroup findings should be interpreted cautiously and require confirmation in longer-term studies.

Importantly, hearing rehabilitation may affect cognition through several indirect pathways even if it does not directly prevent neurodegeneration. Improved auditory input can reduce listening effort and facilitate participation in conversations. Better communication may encourage social engagement, decrease loneliness, and increase access to cognitively stimulating activities. Improved hearing may also facilitate communication with healthcare professionals and support more effective management of chronic diseases. Thus, hearing rehabilitation could theoretically influence several components of the vicious cycle connecting ARHL, social isolation, depression, and cognitive decline. These indirect effects may be clinically meaningful even if the intervention does not alter the underlying neuropathological processes responsible for disorders such as Alzheimer's disease.

The potential role of cochlear implantation should also be considered in individuals with severe hearing impairment who derive insufficient benefit from conventional hearing aids. Cochlear implants can substantially improve auditory communication in appropriately selected patients and may thereby restore access to social interactions and meaningful activities. Observational studies and meta-analyses have reported

cognitive improvements following hearing-restorative interventions, including cochlear implantation, but the available evidence remains limited by heterogeneity, selection bias, and relatively short follow-up periods. Therefore, cochlear implantation should currently be considered primarily a treatment for severe hearing impairment and its functional consequences rather than an established intervention for prevention of dementia. [27]

Hearing rehabilitation should therefore be understood as a multicomponent process rather than simply the provision of a device. Appropriate assessment, fitting, counselling, communication training, and continued follow-up are necessary to obtain meaningful benefit. The World Health Organization similarly describes rehabilitation for hearing loss as encompassing hearing technologies such as hearing aids and cochlear implants together with training and other strategies aimed at improving communication. This broader approach may be especially relevant in older adults, for whom the consequences of hearing impairment are influenced by cognitive status, physical functioning, social circumstances, and the availability of family support. [22]

Current evidence therefore supports a cautious but clinically important conclusion. Hearing rehabilitation clearly improves auditory functioning and can facilitate communication and social participation, while some studies also suggest improvements in mood and quality of life. Observational evidence further indicates an association between hearing-device use and lower risk of cognitive decline, but these findings are vulnerable to confounding. The ACHIEVE randomized trial did not demonstrate a universal cognitive protective effect across all older adults with hearing loss, although clinically meaningful benefit was observed in participants at higher baseline risk of cognitive decline. Consequently, it would be premature to state that hearing aids or cochlear implants prevent depression or dementia. A more appropriate interpretation is that hearing rehabilitation represents a modifiable intervention capable of reducing several functional and psychosocial consequences of ARHL and may, particularly in vulnerable older adults, contribute to preservation of cognitive health. Longer follow-up and additional randomized studies are required to determine the magnitude and durability of these potential effects.

Conclusions

Age-related hearing loss should not be considered solely an inevitable sensory consequence of ageing. Its effects extend far beyond impaired auditory perception and may influence social participation, emotional well-being, independence, management of physical health, and cognitive functioning. Evidence increasingly supports an association between hearing impairment and both late-life depression and cognitive decline, although the mechanisms underlying these relationships are complex and cannot be reduced to a single causal pathway.

The consequences of ARHL appear to develop through several interconnected mechanisms. Communication difficulties may lead to embarrassment, withdrawal from social activities, loneliness, and loss of meaningful interpersonal relationships. Reduced independence and disengagement from previously rewarding activities may further increase vulnerability to depression. At the same time, increased cognitive demands associated with effortful listening, reduced auditory stimulation, changes in social and cognitive activity, and shared age-related pathological processes may contribute to the association between ARHL and cognitive decline. These factors can reinforce one another, creating a vicious cycle in which hearing impairment promotes social isolation and depressive symptoms, while depression and emerging cognitive impairment further reduce social engagement and the ability to compensate effectively for hearing difficulties.

This relationship is particularly important because ARHL is potentially modifiable, yet remains substantially underdiagnosed and undertreated. Hearing rehabilitation can improve communication, social functioning, independence, and quality of life. Observational evidence additionally suggests that treatment may be associated with better cognitive outcomes, while randomized evidence indicates that cognitive benefits may be particularly relevant to older adults at increased baseline risk of cognitive decline. Nevertheless, current evidence is insufficient to conclude that hearing aids, cochlear implants, or other forms of hearing rehabilitation directly prevent dementia or depression.

Early recognition and appropriate management of ARHL should therefore form an important component of comprehensive geriatric care. Hearing assessment may be particularly relevant in older adults presenting with social withdrawal, depressive symptoms, loss of independence, or suspected cognitive deterioration. Future longitudinal and randomized studies are needed to clarify causality, identify patients most likely to benefit from early intervention, and determine whether effective hearing rehabilitation can produce sustained reductions in the risk of depression and cognitive decline. Regardless of its ultimate effect on dementia prevention, addressing ARHL represents an important opportunity to preserve communication, social participation, and quality of life in an aging population.

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