

Pragmatic Language Changes During Normal Aging: Implications for Health Care

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ABSTRACT: Normally, aging adults experience a wide range of changes in sensory abilities, cognition, and language. Pragmatic language ability, or social use of language, declines primarily as a result of the aging of the right cerebral hemisphere of the brain. This commentary will describe the consequences of pragmatic language decline in older adults and how it can damage communication with conversation partners. Aspects of both production and comprehension of pragmatic language can be impaired, including facial expressions, gestures, and figurative language, among others. Older adults also tend to have vital relationships with health care providers to manage increases in illness and other health issues. Essential communication between patients and providers can become more difficult as a result of decline in older patients' pragmatic language ability, potentially resulting in health information being misunderstood. With the number of adults aged >60 years in the world projected to double by 2050, pragmatic language deficits in older adults will continue to affect the patient-provider relationship and quality of care.

KEYWORDS: aging, aged, language, communication, physician-patient relations, right cerebral hemisphere

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Introduction

According to the World Health Organization, the number of adults 60 years and older will double between 2000 and 2050.¹ Concerns have been raised in the health care community about how to accommodate this growing population in terms of health care and social implications. Older adulthood represents a unique point in the human life span. It is well known that as the body ages, changes in physical health, cognition, attitudes, behavior, and language ability can occur.²⁻⁵ Moreover, there is substantial research regarding how pathological aging (eg, Alzheimer's disease and other dementias) can result in physical health problems, as well as issues with cognition, language, and social functioning.^{6,7} However, there are fewer data in the literature regarding the relationship between language ability decline during normal, nonpathological aging and the physical and mental changes that ensue.

Among the changes, declines in pragmatic language ability during normal aging have been reported.⁸⁻¹⁰ Pragmatic language ability includes the social aspects of language, including the manner in which speech is presented. It also includes social appropriateness during communication, such as selecting an appropriate conversation topic, responding appropriately to the conversation partner, and maintaining appropriate vocal volume and eye contact. The ability to interpret indirect meaning can also decline with age, such as being able to interpret inferences, sarcasm, metaphors, or humor, also considered part of pragmatic language.¹¹

Importantly, the normal course of age-related declines in pragmatic language ability may translate into changes in interactions between patients and their health care providers. Older adults also tend to have vital relationships with health care providers to manage increases in illness and other health issues. If normal pragmatic language deficits are not recognized by providers or patients themselves, essential communication between patients and providers can become disconnected as a result, potentially resulting in health information being misunderstood. Such disconnected communication then gives rise to concerns about medical adherence in older patients. Decline in normal pragmatic language ability is a valuable area of knowledge for providers who currently serve older adult populations, as well as for providers who may find themselves seeing increasing numbers of older patients. The information can keep providers informed about how to effectively navigate interactions with normally aging patients affected by pragmatic language decline. This article will discuss biological and cognitive bases for age-related pragmatic language decline, as well as specific aspects of pragmatic language and how corresponding deficits may affect communication with health care providers.

The Aging Brain and Pragmatic Language Ability

In children whose brains are in the midst of development, early language functions such as word comprehension are carried out by widespread patterns of neural network activation.¹²



Language and other cognitive functions use several areas of the brain at this time before localization of function. As the brain develops throughout childhood and adolescence, neural pruning occurs, in which maturation of neural networks results in more specific patterns of activation.¹³ Due to the presence of more specified areas of functioning, the brain's hemispheres become asymmetrical in that they are lateralized for certain functions to be carried out by parts of either the left or the right hemisphere. For example, most right-handed (and some left-handed) individuals have a larger language area known as the planum temporale on the left side of the brain in utero, predisposing language functions to be lateralized to the left.¹⁴ For most individuals, after lateralization occurs, Broca's and Wernicke's language areas are located on the left side. The left cerebral hemisphere is responsible for speech production, analytical processing, and sequential processing of language. It is responsible for the production and perception of syllables in speech. The right hemisphere is responsible for processing of meaning and the synthesis of verbal and nonverbal information, including pragmatic language aspects.¹⁵ It is responsible for making inferences and also for the perception of intonation of speech and other acoustic properties, as well as emotion-related aspects of language.

The two hemispheres are connected by the commissural fiber system known as the corpus callosum, which enables transmission of signals between the hemispheres.¹⁶ The left and right hemispheres use complementary specialization, in which both work in conjunction to achieve full comprehension and production of language.¹⁷ During aging, cerebral atrophy occurs, resulting in decreased cerebral and cerebellar volume.¹⁸ However, research on differences in hemispheric aging rate has been contradictory in the past few decades.¹⁹ Some research has suggested that there is little evidence for age-related changes in cognition due to hemispheric asymmetry variations.²⁰ Other theories have proposed that the right hemisphere shows more age-related decline than the left, resulting in the frequently documented right hemisphere deficits, such as processing of emotional voice and facial expressions.²¹ More recently, the hemispheric asymmetry reduction in old adults (HAROLD) model has proposed a decrease in prefrontal cortex lateralization during aging.²² In addition, there has been some evidence for sexual dimorphism in age-related changes in hemispheric asymmetry, with women showing less rapid right hemisphere aging than men.²³

Pragmatic language in particular requires the linguistic functions of both hemispheres. For example, when interpreting the pragmatic language ability of sarcasm, one needs the left hemisphere's analytical processing capabilities, such as sequential processing of word order in sentences, in addition to several functions of the right hemisphere, such as the ability to synthesize the words analyzed by the left hemisphere with emotional aspects of speech (ie, sarcastic tone of voice). Within pragmatic language ability is the presence

of tools used to socially navigate communication. Researchers have identified some 30 pragmatic aspects of language to study both people with communication disorders and typical individuals.²⁴ The 30 aspects have been grouped into three main categories: verbal aspects, paralinguistic aspects, and nonverbal aspects. Within the verbal aspects are topic selection, turn-taking initiation, and turn-taking interruption. Conversational topics that are appropriate and dependent on the situation should be selected. For example, personal topics such as the marital problems of family members are not socially appropriate to discuss with an individual to whom one has just been introduced. Initiation of turn taking should occur after a reasonable pause following a conversational partner's contribution, and one should not interrupt the turn of the conversational partner. Previous research has shown that older adults may have difficulty with turn taking due to attentional and temporal demands that may increase between turns, especially when there are multiple conversational partners' turns to monitor.²⁵

In addition, there are paralinguistic aspects of pragmatic language, such as vocal intensity, quality, and prosody. Individuals with proficient pragmatic language skills use appropriate volume of voice depending on the situation. For example, it is socially acceptable to use a loud volume of voice when speaking at a noisy event, but not in a one-on-one interview. Vocal quality involves the level of resonance and breath control used during speech, and this is specific to each individual.²⁶ Vocal quality can be affected by a number of factors, including thickness and length of the vocal folds. With aging come changes in vocal quality. Older men's voices increase in vocal roughness with age.²⁷ Additionally, menopause can significantly affect aging women's vocal quality, with fluctuations in hormones decreasing vocal range to higher tones and increasing vocal fatigue.²⁸ Another paralinguistic aspect is prosody, or the rise and fall, stress, and intonation of speech.²⁴ Prosody (ie, syllabic stress) is used in overall recognition of speech and to process the structure of speech.²⁹ In addition, emotion is communicated through prosody. Older adults show a decreased ability to recognize specific emotions, such as sadness, being portrayed in speech.³⁰ Of course, several paralinguistic aspects may be disrupted if an individual has a voice or other speech disorder that may garble or change vocal quality.³¹

Included in nonverbal aspects are gestures, facial expression, and eye gaze. Gesture use refers to movements that correspond with or complement verbal communication.²⁴ It includes movements of the head, hands, and other body parts. For example, headshakes may indicate negation.³² Pointing during conversation can be used to emphasize certain parts of speech or indicate a change in the direction of the conversation. Often, gestures are used to communicate spatial concepts during conversation, such as depicting events occurring in time by a speaker gesturing to the right or left. Gesture has also been shown to be important when attempting to convey



figurative meaning, such as when using a metaphor.^{33,34} Older adults are more likely to ignore gesture in conversation than younger adults and also use fewer gestures to complement their speech.^{35,36}

Another area of nonverbal pragmatic ability is facial expression, the use of emotion portrayal during conversation.²⁴ Generally, an individual's facial expression matches the emotion in the conversation. If happiness is being conveyed in conversation, successful use of facial expression would dictate that a positive expression be worn. The mouth, eyebrows, and eyes are all important parts of the facial expression.³⁷ Positive emotion is shown on the face with a smile (ie, corners of the mouth turned up), negative emotion is shown with the corners of the mouth turned down, and lack of emotion (ie, neutrality) is expressed with a flat facial expression.²⁴ A furrowed brow can indicate anger or confusion and raised eyebrows can indicate surprise.³⁸ Fear can be indicated by wide-open eyes.³⁹ Older adults perform significantly worse than younger adults in terms of recognition of anger, sadness, fear, and happiness as shown through facial expressions of people in photographs.⁴⁰ They also find it more difficult to detect happiness in bodily expressions and are worse than younger adults at detecting anger being voiced.

Eye gaze is another aspect of nonverbal pragmatic language. Face-to-face conversation promotes expressiveness and is socially oriented, facilitating the conversation partners' focus on one another during the interaction.⁴¹ Eye contact is a major feature of face-to-face conversation. Eye gaze can be used in conversation to focus on what the conversation partner is saying and to provide feedback through emotion expressed through the eyes, such as degree of liking of the conversation partner.^{42,43} Research into eye gaze and aging has revealed age-related declines in eye gaze cues, such as the situation in which a conversation partner encourages an individual to look at something in the environment with him/her.⁴⁴ This process is known as joint attention, which fuels many interactions by creating a social connection between individuals. Interestingly, difficulty with joint attention through eye gaze during aging has been found even after controlling for age-related visual perception impairments.

The final pragmatic language area that has been associated with age-related decline is figurative language. Figurative language is characterized by language with meaning that must be inferred; it is a statement in which something that is said represents something else.⁴⁵ Inferential ability drives the use and comprehension of figurative language, often referred to as *reading between the lines*, or getting the gist of what is said. Some examples of figurative language are metaphors, proverbs, idioms, and irony. Sarcasm is also considered a component of figurative language. Some degree of figurative language is popularized within a culture, such as proverbs (eg, *The early bird catches the worm.*). On the other hand, other forms of figurative language can be generated according to situational demands, such as the use

of metaphors (eg, *The office is a sauna*). Figurative language requires application of known meanings of words in a way that may be unusual and relies heavily on context to aid interpretation.⁴⁶ Figurative language deficits have been found in older adults when working memory problems were concurrently present,⁴⁷ and as memory problems increase with age, ability to process complex language can decrease in older adults.⁴⁸ In addition, previous research has found age-related deficits in the ability to use gestures to facilitate metaphor use, adding to actual difficulty with the use of the metaphor itself during aging.^{35,36}

The social nature of these skills is clear. After all, individuals cannot communicate all by themselves. Arguably, meaning cannot be conveyed without some idea of what the person with whom one is communicating knows (or does not know) or what he or she is capable of understanding. Therefore, deficits in the execution or comprehension of pragmatic aspects of language can be detrimental to communication between conversational partners, causing difficulty with social relations.

It should be noted that baseline skills and time are factors to consider in the course of age-related pragmatic language changes. Not all older adults have the same baseline pragmatic language ability. For example, individual differences exist in the linguistic makeup of each person, which may be consistent from early to later developmental stages.⁴⁹ Factors that may affect the language profiles of all individuals include socialization, environment, and personality, among others. Pragmatic language, being inherently social, may be used by some individuals to a greater degree than others due to differences in either occupations or degree of extroversion. Therefore, the degree to which aging affects pragmatic language ability over time may vary by person, with some individuals showing more severe deficits compared to others. In addition, there are some lifestyle and demographic factors that may determine the individual level of pragmatic language ability. Cognitive reserve refers to an individual's degree of reinforced neural networks and additional synapses that may be protective against cognitive decline.⁵⁰ Factors such as higher education level, more frequent higher-quality social interactions, and bilingualism have been shown to delay or offset symptoms of cognitive aging, such as difficulties with memory and other executive functions.⁵¹ Therefore, as time progresses, there is no uniform transition from normal to reduced levels of pragmatic language skills.

Through assessment of individuals with pragmatic language disorders, researchers have found that the right hemisphere of the brain is instrumental in assisting with carrying out pragmatic aspects.^{17,52} However, issues with pragmatic language often occur in normally aging adults as well. For example, older adults have more difficulty identifying facial emotion and vocal emotion (ie, prosody) than younger adults.^{53,54} Older adults also have more difficulty understanding humorous situations than younger adults,⁵⁵



and humor has been labeled as a right hemisphere-controlled function.^{17,56} Older adults also ignore gesture in conversation more often than do younger adults.³⁵ Difficulties such as these can result in misunderstanding, confusion, and potential frustration in communication between older adults and their conversational partners. In fact, the pragmatic language aspects used in everyday social communication by older adults mirror the pragmatic language aspects used in interactions with health care providers.⁵⁷ If an older adult exhibits deficits in pragmatic language ability during their everyday interactions with family and friends, the same deficits may be evident in interactions with health care providers, if the individual has shown potential risk factors for increased cognitive decline (eg, reduced cognitive reserve). A significant implication for decreased efficacy of the patient-provider interaction concerns the patient's understanding and adherence regarding medical advice, which may suffer due to interruption in the communication of important health information.

Pragmatic Language and Other Age-related Changes in the Patient-Provider Relationship

As previously stated, changes in the aging body can result in increased incidences of injury and illness, as well as changes in cognition. Many older adults report that availability of, and relationships with, health care providers are important in dealing with everyday health challenges.⁵⁸ As such, it is important to consider the relationship between older adults and their health care experiences. Older adults may find themselves visiting health care providers more frequently or may notice changes in why they are attending providers' appointments. Both the experiences with health care providers and the reasons behind the visits can affect older adults' health perceptions.

In fact, it has been shown that rapport building is more important in treating older adults than when treating younger adults.⁵⁹ However, it often takes more effort on the part of the provider to establish rapport with older adults. Often, this is because of reasons such as mistrust, age differences between the provider and the patient, or fear about medical outcomes.⁶⁰ For neuropsychological assessments in particular, a good deal of understanding must be relayed from the provider to the patient for the patient to understand what is happening and the importance of this type of assessment.⁶¹ Additionally, older adults may take longer to comprehend the reasoning behind why certain treatment may be necessary. All of these factors must be taken into account when attempting to establish rapport between a provider and an older patient.

Rapport building requires pragmatic language production and comprehension on the part of both the patient and the provider. If older patients are hesitant to converse with their provider due to the provider's age or other reasons, difficulty with pragmatic language may only compound a potentially fragile social situation. For example, the age-related declines in facial

expression processing that have been demonstrated may result in older patients misunderstanding the emotion being expressed by the provider. Alternatively, difficulty involving turn-taking initiation and interruption on the part of the patient may result in poorer rapport quality due to disengagement of the provider after several turn-taking attempts. Due to the close social interaction during patient-provider relationships, rapport building's reliance on pragmatic language is important in facilitating a positive health care experience overall.

Another important factor in building rapport with older adults is the consideration of age-related sensory changes that may affect communication. Both patients and providers are likely familiar with changes in vision (ie, presbyopia) and hearing (ie, presbycusis), which may affect older adults' interactions with others. For example, presbyopia research has investigated reduced retinal illuminance, which occurs when pupils reduce in size and transparency in the lens decreases during aging.⁶² These changes in the eyes result in the need for more light to read or carry out other visual tasks. Research has also demonstrated reduced cerebral blood flow to the occipitotemporal cortex due to aging, which has been linked to slower visual processing of faces.⁶³ Although older adults show declines in some visual abilities, sparing of some visual abilities has been demonstrated. For example, older adults use the right side of the parafovea more frequently when reading than do younger adults, increasing their useful field of view.⁶⁴ This ability has been developed for left-to-right reading as a compensatory strategy for decreased processing time.

Another significant sensory effect of aging is hearing loss. Sensorineural hearing loss occurs gradually over time.^{65,66} More than half of older adults experience significant hearing loss⁶⁷ and older adults' pragmatic language use can be negatively affected by hearing loss, including the way they interact in social situations.⁶⁸ Older adults express concern over whether they are missing important information during conversations due to their hearing loss.⁶⁹ Sensory changes can negatively affect the degree to which information is transferred between people, such as in the patient-provider relationship. Remembering that both sensory and pragmatic language changes can affect social communication is important. When time is taken to consider such sensory limitations, it can also build trust and rapport between the provider and the patient.

In addition to the sensory and language changes that affect social communication during aging, certain nonlinguistic cognitive changes may also affect patient-provider communication. Among the most pervasive and relevant changes is executive dysfunction, mainly due to the aging frontal lobes.⁷⁰ Processing speed decreases with age, resulting in more time needed to process information and speech.⁷¹ Attentional processes are also affected by aging, with switching attention between tasks and concentrating attention on relevant stimuli becoming more difficult.⁷² Memory changes, such as decreased working memory capacity, are also common.⁷³ Memory problems are not only often expressed as troublesome by older



adults but can also have a significant impact on abilities such as medication adherence.⁷⁴ Inhibition, such as inhibition of irrelevant information and inhibition of behavioral responses, has also been shown to decline in older age.⁷⁵ Decreased facial emotion recognition has also been demonstrated in older adults, who show more difficulty than younger adults at identifying angry and sad expressions.⁷⁶ In social communication, these cognitive abilities work in conjunction with speech and language processing to achieve effective communication. The additive effects of these declining cognitive areas may cause considerable age-related difficulty in communication between patients and health care providers.

Future Directions

The study of the complex factors that affect older patient-provider interactions is one that has numerous avenues for investigation. One promising area of basic research is the examination of aging patterns in the cerebral hemispheres. To gain a better understanding of how the older patient-provider relationship is affected by pragmatic language changes, knowledge of these aging patterns must be delineated, including the influence of factors such as sex and lifestyle. In addition, more in-depth research needs to be conducted to investigate how the patient-provider relationship can be affected by decline in older patients' pragmatic language ability. For example, are there additional factors that have not yet been considered, such as the role of providers' communication profiles and their own levels of pragmatic language ability? Older patients and their families themselves will benefit from the development of pragmatic language change awareness programs, such as interventions aimed at increasing sensitivity to the changes. The interventions could also provide individuals with suggestions on how to deal with the influence that pragmatic language changes may have on their lives, such as how sarcasm or metaphors may not be accurately comprehended and how to repair communication breakdown caused by pragmatic language problems.

In the near future, as the older adult population continues to grow, more intense training in working with this population should ensue for new health care providers, including training on cognitive and language changes. In addition, experienced providers should pursue continuing education in these areas and learn newer strategies for caring for older patients. Although much of this training will target specific physical and neurological health issues unique to older adults, especially those with commonly occurring neurodegenerative conditions, the training should also include information about communicative changes and language deficits in the normally aging population. As shown by previous research, positive relationships formed between older adults and their providers can be a tool for success during treatment.⁷⁷

Health care providers can also make themselves aware of research findings that have shown links between aging and pragmatic language deficits. For health care providers who voice concerns about lapses in communication or muddled communication with older adults, knowledge about how pragmatic language decline takes place may be valuable. For example, providers who frequently use figurative language when speaking to patients, such as metaphors, idioms, sarcasm, or proverbs, may benefit from knowing that their message may not be clearly received. Older adults show declines in the ability to comprehend these types of language and may not fully understand what the provider is attempting to convey. Similarly, older adults do not detect humor as completely as younger adults.⁷⁸ If a health care provider attempts to develop rapport with a patient using humor and receives little or no reception, it may make aspects of the patient-provider relationship awkward or confusing (refer Table 1 for common language aspects that providers need to avoid when using pragmatic language with older adults). Recognizing the language changes that accompany aging can help health care providers express important health care information to their patients more effectively, as well as improve the patient-provider relationship.

Table 1. Examples of pragmatic language aspects that providers need to avoid when treating older adults.

ASPECT OF PRAGMATIC LANGUAGE	AVOID	USE INSTEAD
<i>Metaphor</i>	Blood cells are just floaters in a pond.	Blood cells circulate through the liquid part of the blood, called plasma.
<i>Idiom</i>	It's a chicken-or-the-egg type of situation.	It's hard to tell what happened first.
<i>Turn-taking (fewer conversational partners to minimize monitoring demands)</i>	Groups of multiple providers explaining a medical procedure.	One provider who condenses the relevant information to present to the patient.
<i>Gesture</i>	Overuse; use of complex strings of gestures, such as to act out a timeline.	Write out or draw timeline or other difficult-to-explain information in the presence of the patient.
<i>Eye gaze</i>	Use of provider's gaze to direct patient's attention to many different locations in the room, such as to present information or reference pictures/charts.	Few focal points or sources of information; little change of visual focus during conversation.



Author Contributions

Conceived and designed the experiments: RHM. Analyzed the data: RHM. Wrote the first draft of the manuscript: RHM. Contributed to the writing of the manuscript: RHM. Agree with manuscript results and conclusions: RHM. Jointly developed the structure and arguments for the paper: RHM. Made critical revisions and approved final version: RHM. The author reviewed and approved of the final manuscript.

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