AGING IN A FAST-PACED WORLD

Rapid Speech and Its Effects on Understanding

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As speech and hearing professionals, many of us work regularly with older adults. Those who do not may soon find themselves encountering an older population with greater frequency. The number of older adults in the United States and Canada is on the rise, and will soon include the baby boomers, some 77 million people born between 1946 and 1964. Baby boomers make up approximately one-third of Americans, the biggest generation in our history. By 2030, nearly 22% of Americans will be older than age 65. It is important that society as a whole addresses the implications of age-related changes for this expanding segment of the population. In this article, we discuss some of the capabilities that can decrease with normal aging, and how clinicians might use this knowledge to promote optimal communicative functioning with older adults.

Aging, Memory, and Speech Rate

If one asks older adults to name their most notable age-related cognitive change, most will reply that their biggest problem is memory. Actually, they may go on to say, early memories are quite good; it is memory for recent events that causes the most trouble. Examples may include not being able to remember the names of people after a series of introductions, or to recall exactly what it was the doctor said about instructions or their medication schedule. However, what we think of as a poor memory often is in reality a declining ability to "take in," or encode, new information. This is a problem for many older adults, especially when new information arrives very rapidly.

Along with memory problems, another common complaint we hear from clients is their difficulty in understanding rapid speech. Speech rate and ability to encode speech content in memory are closely associated. Just as research has shown declines in the capacity of memory in older adults, studies have demonstrated older adults' special difficulty in encoding rapid speech. As speech and hearing professionals, we might naturally attribute this difficulty to age-related changes in peripheral and/or central hearing abilities. However, other changes associated with aging can play a role in speech comprehension difficulties.

Comprehending spoken language may seem automatic, but it is a cognitively and perceptually complex act. One must conduct a perceptual analysis of the speech sounds, identify each word, resolve the syntactic structure of what is being heard, and integrate the newly arriving information with a memory trace of what has already been heard. And this must be accomplished at speech rates which, even in ordinary conversation, average between 140 and 180 words per minute (wpm). A television newsreader working from a prepared script can easily exceed 210 wpm (more than three words per second). We all know the "warp speed" of speech rates heard on some radio and television programs. Indeed, since time is money, advertisers increasingly use rapid speech, often artificially time-compressed via a computer, to pack more information (and legal disclaimers) into less time.

Rapid speech, one might argue, is just an example of living in a fast-paced world where we are bombarded by continuously and rapidly arriving information from hurried conversations, cell phones, faxes, instant messaging, and e-mail. While the goal may be to keep us in instant touch with the world, all this information must be processed with the same brain structures possessed by medieval knights or riders on the pony express. Brain evolution has not kept pace with technological evolution or the fast pace of modern life. This may be particularly challenging for older adults in whom cognitive and sensory systems may undergo gradual slowing over time.

Unlike reading, where one can review an unclear passage, speech travels past the ear quite literally at the speed of sound, and then vanishes. In audition, if the listener misses something, whatever "looking back" occurs must take place through memory. Although variation is wide, the peripheral auditory system often shows age-related decrements in sensitivity (presbycusis), especially in the high frequencies important for speech perception. There may also be decrements in the central auditory pathways affecting central auditory processing tasks, especially those involving temporal processing. To sum up, it is clear that understanding spoken language challenges our processing speed, our memory capacity, and our sensory acuity, three capacities known to undergo age-related changes.

Age-Related Slowing

Although changes in memory and hearing acuity tend to receive the most attention, we emphasize here the general slowing that often occurs in older adults' motor, perceptual, and cognitive function. This slowing results from an age-related decrease in the efficiency of the central nervous system, which can be seen in progressively slower average response times amounting to milliseconds each year, beginning as early as the third decade of life. For example, if we ask an individual to respond with a key press as fast as possible when a light flashes on a screen, what might take someone in their 20s an average of .25 seconds could require .30 seconds for a person in their 70s. This might seem like a small change; however, since complex mental operations are a progression of small steps, it is easy to see that even slight decreases in processing speed could accumulate in a noticeable slowing or disruption of the entire chain of processing. Such age-related changes can affect the ability to understand speech and encode its content in memory, a problem not solved by simple amplification.

Yet, a great deal of variability in processing speed exists among older adults, just as some older adults maintain good hearing into old age while others show declines in acuity. All tasks may show some slowing as one gets older; however, not all cognitive tasks are affected to an equal degree. For example, researchers have found that the typical 75-year-old may take twice as long as a young adult to perform a mental or sensorimotor task not involving language, such as keying in a series of numbers as rapidly as possible. For a language-based task, such as deciding whether a string of letters is a real English word ("nurse) or not ("surne"), there is age-related slowing, but it is much less pronounced than for non-language tasks. Vocabulary knowledge and the ability to use linguistic context in speech comprehension are quite resistant to effects of aging. The fact that language-related abilities are well preserved in normal aging is important in helping to maintain our communication skills well into old age.

What accounts for this preservation of linguistic ability? An important part of the answer lies in the enormous amount of time we spend each day in talking and listening. As such, older adults can be considered "experts" when it comes to language. Older adults have spent a lifetime developing skills in decoding and using spoken language and have accumulated a great deal of knowledge about language and language structure.

Just A Little More Time

Bear in mind that although language competence is well preserved in healthy aging, fast speech still presents a special challenge for older adults. In our lab we have demonstrated this by time-compressing speech, using a computer to delete imperceptibly small elements of the speech signal. What results is speech that sounds quite normal, but is produced in less than the original speaking time. When listening to time-compressed speech, both young and older adults recalled less than for speech heard at slower rates, but this negative effect was dramatically greater for the older adults. We also investigated the effect of restoring the same amount of time that we had previously removed from the utterances, by using the computer to insert pauses at the ends of clauses and sentences, even though the speech itself remained compressed. When we did this, memory performance was close to that for normal speech rates, even for the older adults. This "restoration" of lost processing time gave the older listeners' slower processing rate time to catch up, resulting in an ability to recall what they had heard as well as they did for speech heard at a

normal rate. This work underscores the important role played by individual differences in processing speed in determining comprehension and memory for rapid speech.

We have also demonstrated that when speech content is complex, the effects of rapid speech are even greater. When we tested young and older adults with good hearing for their ages on comprehension of sentences that varied in grammatical complexity as well as in speech rate, the negative effects of the two sources of difficulty did not merely add together. They actually multiplied. That is, the increased speech rates were more detrimental to comprehension when speech was complex, as compared to simple speech. More important, this compounding effect of content complexity and rapid speech was significantly greater for the older adults than it was for their young adult counterparts.

It is easy to imagine how fast speech and complex speech can interact in everyday listening situations. Each day we listen to a variety of speakers, some slow and some fast. In addition, spoken utterances vary in length, some being short and others being longer and more complex. To the extent that older adults fall behind in their speech processing, they are at risk for poor comprehension. This consequence of an otherwise normal processing system that simply needs a bit more time can lead to communication failures; these failures might lead one to the erroneous conclusion that the listener has diminished cognitive function. This can be demoralizing for older individuals and result in a poor self-perception of their ability to understand and remember.

A Positive Note

The effects of aging on language reflect an interestingly mixed picture that characterizes age-related cognitive changes. While it is true that certain mental and perceptual operations become slower with age, as we have noted, we also gain expertise that allows us to compensate for these age-related changes. In the case of comprehending language, as "bottom-up" sensory processes such as hearing become less efficient, older adults can compensate by using their "top-down" linguistic knowledge based on a lifetime of language experience. An important aspect of this is older adults' generally excellent ability to use linguistic context to fill in the gaps of small segments of missed speech.

On another positive note, evidence continues to accumulate showing that older adults can take measures to minimize age-related cognitive declines or even enhance their cognitive performance. In support of that old maxim, "use it or lose it," studies show the benefits of activity including physical, intellectual, and social. Some predictors of successful cognitive aging include good pulmonary capacity, years of education, and verbal ability. An active, engaged lifestyle including intellectually stimulating activities helps maintain our health and our cognitive abilities.

Shaping the Future

Changing demographics tell us that our society has begun an important transition-an unprecedented growth in the older adult population. When considering how best to shape our future culture, we should incorporate our accumulated knowledge about age-related cognitive and sensory changes. We know certain listening situations are especially difficult for older adults, such as attempting to follow a single speaker in a noisy room with many distracting voices. Moreover, older adults have difficulty with rapid speech even under otherwise good listening conditions. When these difficulties are combined with some degree of hearing loss, communication can be so difficult that a large proportion of our population-those who are aging-may be marginalized or excluded from participation in everyday discourse.

As speech and hearing professionals, we are in a unique position to optimize communication functioning for older adults. At a practical level, we can use our knowledge about age-related slowing to guide our interactions with our older adult clients. This may mean slowing our pace a little as we communicate with older adults in our professional capacity. We do not mean that one should drag out each syllable in an auditory version of "slow motion." Nor is it necessarily desirable to use exaggerated intonation or unnaturally simple words or grammar when speaking to older adults. Such speech patterns are sometimes referred to as "elderspeak" and can be quite

correctly perceived by older adults as patronizing. Remember, in healthy aging the comprehension problem is a reduced rate of processing and speed of encoding what has been heard, not the intelligence of the listener. A more beneficial slowing of the speech would be to mimic the laboratory study we described earlier by simply pausing every so often to let what has just been said to "sink in," to give the slower nervous system a bit more time to process what has just been heard.

End Results

Whether we are providing diagnostic testing services, hearing aid fitting or counseling services, we should be sensitive to the communication needs of older adult clients. This should include the realization that they may need a little more time to take in and process the information we are giving them. It may also be wise to incorporate what is known about fast speech into our counseling on reasonable expectations with regard to the benefits of amplification.

On a broader level, we can advocate for the older adult population by promoting efficient information processing for everyone. This is probably cost-effective, as well as important for our quality of life. At both the local and national level, we should strive to raise public awareness about these age-related difficulties with fast speech. It may be helpful to educate clients' families, friends, and social groups about the importance of being mindful of speech rate as well as sound level. We can also educate television and radio broadcasters that the continual use of fast speech may potentially alienate a large and growing proportion of the population.

As speech and hearing professionals and as a society in general, we should maintain the goal of presenting information in a way that facilitates good comprehension. This holds true for comprehension by young adults with good hearing as well as for older adults and for persons with hearing loss. For all of us, the bottom line is that "more and faster" does not promote better information processing, since our capacity includes limitations as well as age-related changes. Using our knowledge about these age-related changes to guide our interaction with older adults and to raise public awareness will allow us to be sensitive to both the needs and cognitive strengths of the large and growing older population.

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